FRANKLIN PIERCE LAW CENTER EDUCATIONAL REPORT:
PATENT LANDSCAPE OF DENGUE DIAGNOSTIC TECHNOLOGIES

SPRING 2010

PROFESSORS
JON R. CAVICCHI, J.D., LL.M. (Intellectual Property)
STANLEY P. KOWALSKI, Ph.D, J.D.

Project Leader
PRAVIN CONDA

Team Leaders
CRAIG T. AJMO JR. Ph.D.
JENNIFER FADDEN BRYAN
AMRITA CHILUWAL

Director of Science and Technology
CRAIG T. AJMO JR. Ph.D.

Students
TRENT MERRELL
KARA VERRYT

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I. Abbreviation and Definitions

Below is a list of abbreviations and definitions for terms and keywords used throughout the ITTI Spring 2010 report.

Composition of Kits – *See Relevant Technology*

Dengue – defined herein as an infectious disease caused by a virus or the virus itself (single stranded RNA virus, family *Flaviviridae*). Furthermore, the definition can also include the following serotypes: DEN–1, DEN–2, DEN-3, and DEN-4.

Diagnostic Kits Category – *See Relevant Technology*

ELISA – define herein as Enzyme-Linked ImmunoSorbent Assay, which is "one of several methods used in the laboratory to detect and quantify specific molecules. ELISA's rely on the inherent ability of an antibody to bind to the specific structure of a molecule **…** Three frequently used types of ELISA are: sandwich assays, competitive assays and antigen down assays."[1]

Emerging Technology – defined herein as technologies that may apply to dengue diagnostic techniques. Furthermore, this category might include methods of diagnosing viruses, composition of kits, and kits for detecting viruses. This category includes foreign patent documents that mention dengue in the abstract but have no claims or claims in a language other than English.

***Flavivirus* –** defined herein as the genus of the family *Flaviviradae*, the genus includes but not limited to West Nile virus, dengue virus, tick-borne encephalitis virus, and yellow fever virus.

Luminescence Biosensors – defined herein as an assay that uses an enzyme bound to the outer surface of an optical fiber and is used to detect a quantity of material or molecular markers.

Methods of Diagnosing Category – *See Relevant Technology*

Patent Documents – defined herein as issued patents, and patent applications which includes but is not limited to US patents, PCT Applications, EPO Applications.

[1] Eli Lilly and Company and the National Institutes of Health Chemical Genomics Center, *Immunoassay Methods* (2008), http://www.ncgc.nih.gov/guidance/section10.html#flow-chart.

PCR – defined herein as Polymerase Chain Reaction, which is a technique used to amplify the amount of a specific DNA segment from a small amount to thousands or millions of copies of the desired strand.[2]

Relevant Technology - defined herein as technologies that are specific for dengue diagnostic techniques; such technology may claim methods for diagnosing dengue, composition of dengue diagnostic kits and kits for detecting dengue. The category includes patent documents claiming diagnostic techniques for *Flaviviradae,* methods for diagnosing *Flaviviradae,* compositions of *Flaviviradae* diagnostic kits, and kits for detecting *Flaviviradae*.

Diagnostic Kits Category – defined herein as a subcategory of relevant technology that claim diagnostic kits used to detect dengue or *Flaviviradae*.

Method of Diagnosing Category - defined herein as a subcategory of relevant technologies that claim methods for detecting dengue or *Flaviviradae*.

Composition of Kit Category - defined herein as a subcategory of relevant technologies that claim compositions for diagnostic kits used to detect dengue or *Flaviviradae*.

RT-PCR – defined herein as Reverse Transcriptase – PCR, which is a variation of the typical PCR process, wherein reverse transcriptase transcribes RNA into a complementary cDNA strand.[3]

Spectroscopy – defined herein as the use of light, and particle emissions to assess the concentration or amount of a given illumination activated biomarker, which binds to a specific moiety.

[2] Reginald H. Garrett & Charles M. Grisham, *Biochemistry* 396 (3rd ed. 2007).
[3] *Id.*

II. Executive Summary

Diagnostic technologies for dengue fever, a positive-strand RNA viral, mosquito-born, acute febrile disease spreading throughout tropical regions of the world, are critical for effective management and early treatment of this emerging global health threat. Research and development of diagnostic technologies has progressed from standard serological assays and procedures to immunological/antibody tests, DNA amplification techniques and recently towards more advanced and sophisticated biotechnological applications and innovations. Whereas, these technologies will likely be essential for management of dengue fever, they also are, for the most part, protected by intellectual property rights (patents).

This report focuses on patent landscape analysis of dengue diagnostic technologies such as: ELISA, Polymerase Chain Reactions, NS1 assays, Luminescence-based optical fiber biosensors, absorption spectroscopy, and emerging technologies that have the potential to be a dengue diagnostic. The purpose of this patent landscape study was to search, identify and categorize patent documents that are relevant to diagnostic tools, research and development for dengue fever, and thereby provide a preliminary survey of the global status of patenting activity in the dengue diagnostic space.

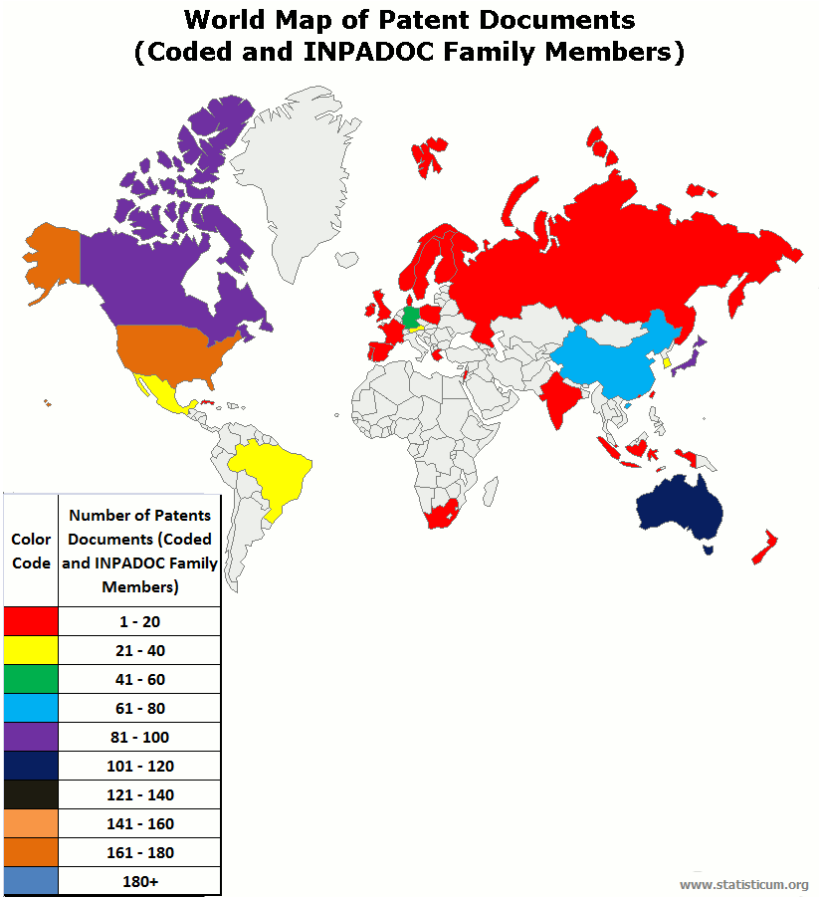

Figure I. Global patenting activity in the dengue diagnostic space. Documents (patent data) used to generate this map include both patent applications and granted patents, derived from INPADOC families of the coded (relevant and emerging technologies) patent documents.

In the course of the patent search and analysis phase, 3,725 patent documents were initially identified for subsequent analysis. Of these, 133 patent documents were found to be relevant technologies. (A patent document was considered to be relevant based on two requirements. First, the document had to specifically claim either diagnosing dengue or a *Flavivirus* (*Flaviviridae*). Second, the patent had to claim a diagnostic kit, a method of diagnosis, a composition of a kit, or a combination thereof.) Additionally, 157 patent documents were classified as emerging technology. (A patent was considered as emerging technology, if it claimed a method of diagnosis of a virus, a kit composition of a virus, or a diagnostic kit of a virus. Further, patents that did not have dengue or *Flavivirus* in the claims, but did mention dengue or *Flavivirus* in the abstract or description were considered emerging technology.)

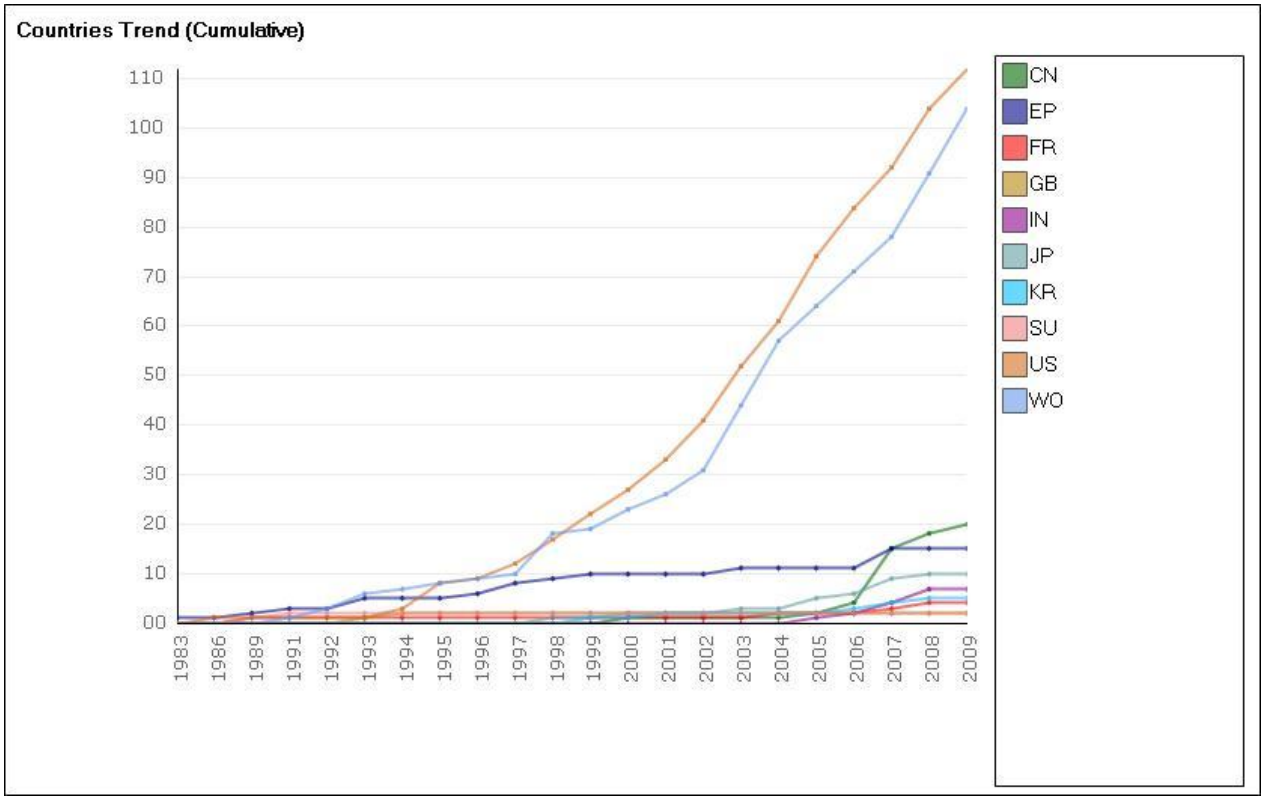

Figure II. Filing date of patent documents in various jurisdictions (including WIPO/PCT and EPO) over 17 years. Patent filing increases in an exponential manner from 1992 in US and WIPO, with a steady increase in all jurisdictions since 2005; global patenting of dengue diagnostics technologies appears to be increasing.

Results suggest that, in the dengue diagnostic technology space, there is a trend towards greater patenting activity across the world, both in the industrialized north (US, Japan and Europe) and in developing countries (Russia, India, China, Brazil, Mexico, South Africa). This further suggests that patentees increasingly consider developing countries as viable commercial markets for distribution and utilization of technologies for the treatment and diagnosis of tropical diseases endemic to these regions.

III. Scope of Technology Analyzed

Dengue Diagnostics

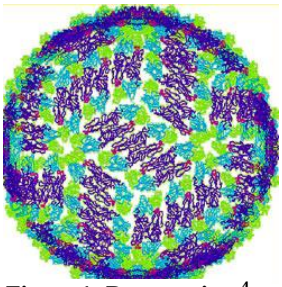

Figure 1: Dengue virus[4]

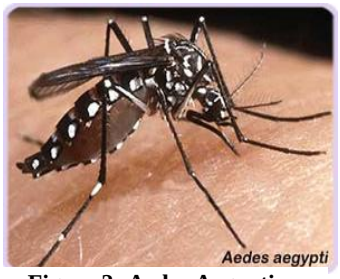

Figure 2: Aedes Aegypti – dengue carrying mosquito[5]

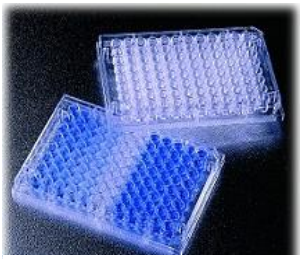

Figure 3: Dengue ELISA diagnostic plate[6]

New diagnostic technologies are being explored that diagnose dengue fever. This mosquito born disease is gaining more recognition as it spreads out of the tropical regions and has the potential of becoming a worldwide disease. While a treatable disease however; appropriate treatment is based on proper diagnosis of a dengue infection. Research has progressed toward developing diagnostic tools that are inexpensive to create, have ease of use in the field where there may be poor medical facilities, are reliable in detecting the different variations of the dengue virus, and are more sensitive for earlier detection. This report focuses on diagnostic technologies including: ELISA, Polymerase Chain Reactions, NS1 assays, Luminescence-based optical fiber biosensors, absorption spectroscopy, and emerging technologies that have the potential to be a dengue diagnostic. The purpose of this patent landscape study was to search, identify and categorize patent documents that are relevant to diagnostic tools, research and development for dengue fever.

[4] MicrobiologyBytes, *Flaviviruses* (April 8, 2009), http://www.microbiologybytes.com/virology/*Flavivirus*es.html.
[5] William G. Gilroy, *Biologist David Severson helps map yellow fever/dengue mosquito genome* (June 2007), http://www.nd.edu/~lumen/2007_06/BiologistDavidSeversonhelpsmapyellowfeverdenguemosquitogenome.shtml.
[6] *Neutral Red (NR) Assay*, http://web.singnet.com.sg/~yocam/animal_cell_culture_and_hybridom.htm

IV. Disclaimer

This is an educational report and is neither inclusive nor comprehensive. Rather, it is an informational resource to facilitate a better understanding of the international patent literature landscape with regard to the diagnostic means applicable to the dengue virus.

This report is not a list of all potentially relevant patents. It is not a Freedom to Operate (FTO) opinion, but instead constitutes an educational analysis of potentially relevant material.

While the search engines utilized in this project are extensive, it is likely that the entire spectrum of patents was not obtained utilizing the various search strategies and methods articulated herein. Therefore, it is not the supposition of this team that all relevant patents were discovered during the creation of this report.

As the team members are not experts in the field of diagnosing the dengue virus, it is highly possible that the categorization of the patents found and coded are incomplete. The team cannot guarantee that the patents discovered were evaluated at the level of expert scientific sophistication.

The limited time frame (15 weeks), the overall semester demands, and the general press of business dictated the number of patents evaluated. As such, additional patents may have been available for evaluation but without the necessary time within which to consider them they may not have been considered.

Again, this report is not a Freedom to Operate (FTO) opinion. It is an educational report.

V. Value Added Features

- Westlaw® Asian-Pacific Database
- World Maps (Statisticum) Representation of Global Patenting
- Patent Insight Pro (PIP) Application World Time Line
- Student – Client Interaction – Determine objective of the report
- Definition/Abbreviation Sections
- Narrow to Broad Searching/Coding
- Patent Storm (Free Web-Based Patent Database Service)
- Derwent World Patent Library (DWPL) Searches

VI. About the Technology

Introduction

Dengue fever, part of the *Flaviviridae* family, is a mosquito born infection that is steadily becoming a growing international public concern. Typically, dengue is mostly found in tropical and sub-tropical region around the world. These locations range from India to the South America. (See Fig. 3) With the aspect of global warming, many expect the presence of dengue fever to slowly spread throughout the world.[7]

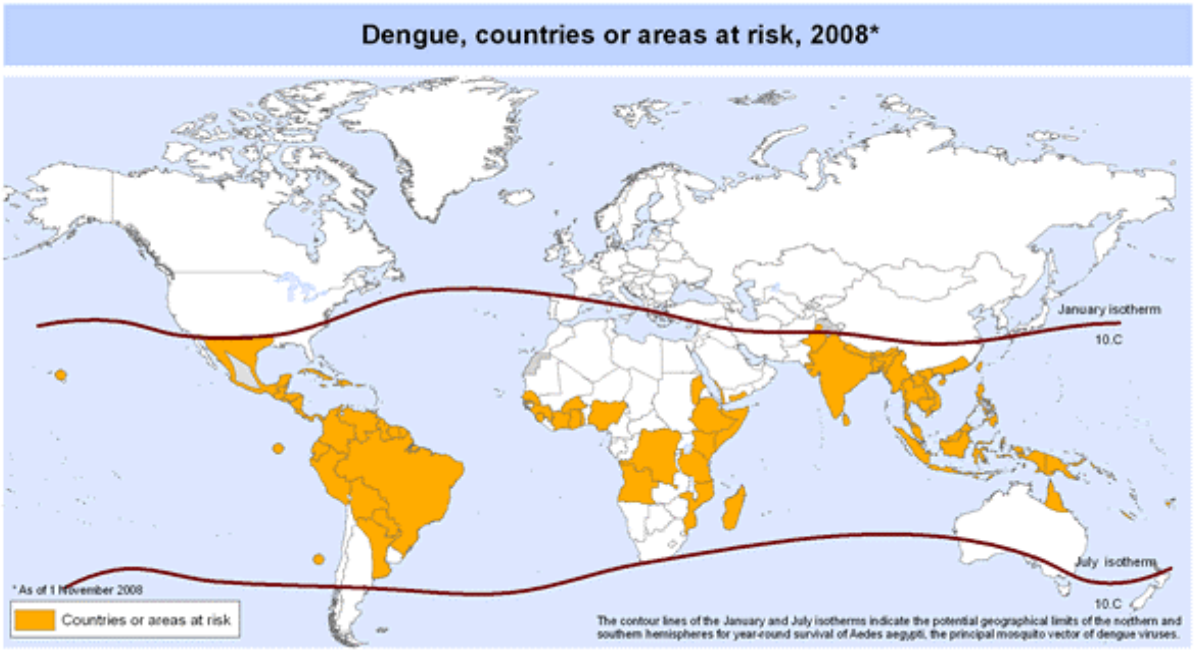

Figure 4: Dengue risk areas around the world[8]

As the risk of dengue fever continues to spread the global effect has grown significantly in recent years. Currently, around 100 countries have dengue as an epidemic when there were only 9 countries that reported dengue in the 1970's. Dengue cases reported in various countries have been increasing steadily over the past few years. (See Fig. 7) The World Health Organization (WHO) estimates that there may be 50 million cases of dengue infection worldwide every year. (See Fig. 5 and Fig. 6) Some 2500 million people are at risk for dengue fever; this would make up two – fifths of the world population. In 1998 alone, there were 616,000 reported cases of dengue in both Americas and 11,000 of these cases were dengue hemorrhagic fever.[9]

[7] Sathyamangalam Swaminathan & Navin Khanna, *Dengue: Recent Advances in Biology and Current Status of Translational Research*, 9 CURRENT MOLECULAR MED. 152 (2009).
[8] *Id*. at 153.
[9] Sustainable Development Networking Programme, *Dengue the Deadly Killer*, http://www.sdnbd.org/dengue_fever.htm.

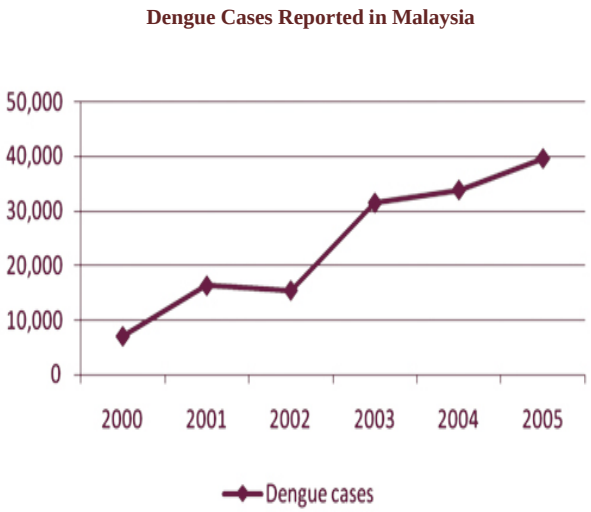

Figure 5: Dengue cases reported in Malaysia for years 2000-2005.[10]

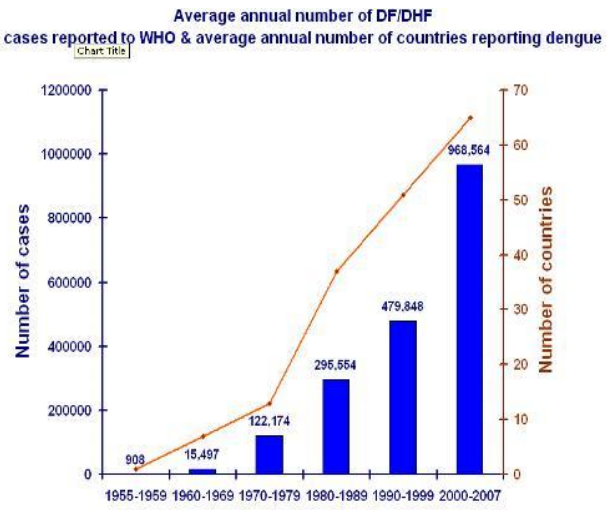

Figure 6: Dengue cases reported to WHO for the years 1995-2007.[11]

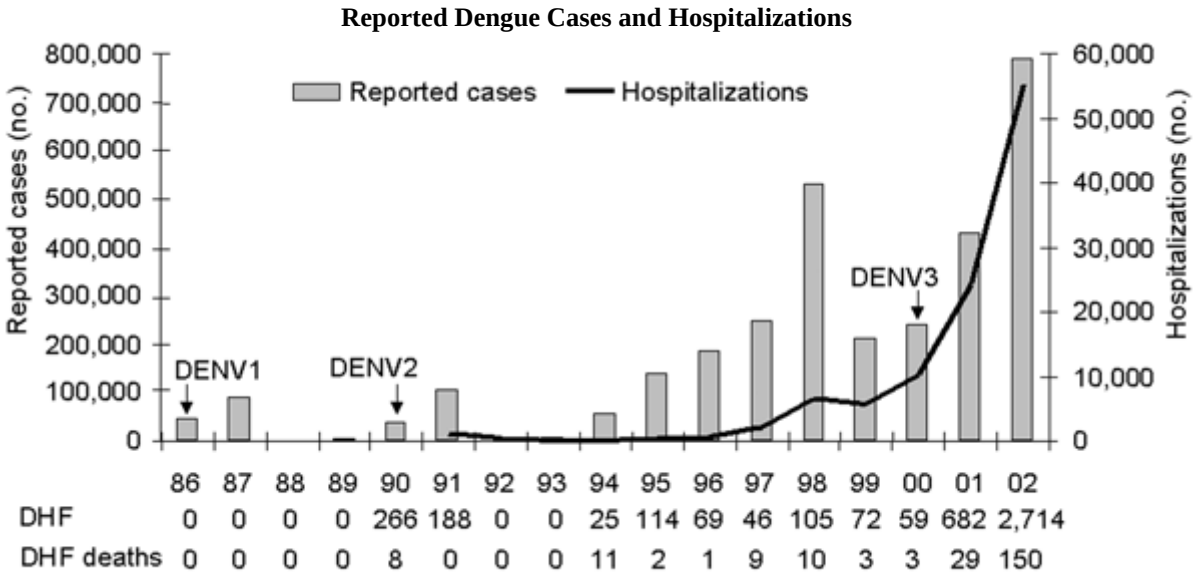

Figure 7: WHO reported cases on DHF deaths[12]

Dengue hemorrhagic fever (DHF), discovered in 1950's, is a potentially deadly complication which develops from a prolonged infection of dengue fever. Currently, this complication is becoming the leading cause of child mortality in several Asian countries. There are four distinct but closely related viruses that cause dengue: DEN-1, DEN-2, DEN-3, DEN-4 are all serotypes

[10] Journal of Environmental Health Research, *Distribution pattern of a dengue fever outbreak using GIS* (2009), http://www.cieh.org/jehr/distribution_pattern_dengue_fever.html.
[11] World Health Organization, *Impact of Dengue*, http://www.who.int/csr/disease/dengue/impact/en/index.html.
[12] CDC Emerging Infectious Diseases, *Dengue and Dengue Hemorrhagic Fever, Brazil, 1981–2002* (Jan. 2005), http://www.cdc.gov/ncidod/Eid/vol11no01/03-1091-G2.htm.

that cause dengue fever. Interestingly, providing immunity to one serotype lowers the resistance and sequential infection to the other serotypes resulting in DHF. During dengue epidemics, around 40 – 50% are susceptible to dengue fever, but this value may reach 80 – 90% when the provided with immunity to one serotype.[13]

1.A Transmission of Dengue Fever

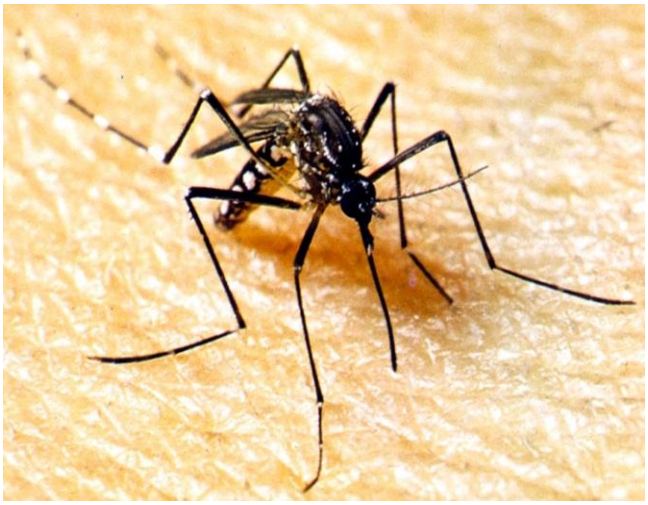

Figure 8: A picture of the Aedes Aegypti mosquito[15]

Dengue fever is transmitted to human most effectively by the *Aedas aegypti* mosquito but the *A. albopictus* and *A. polynesiensis* are also involved in a dengue outbreak. (See Fig. 8) Currently, 2.5 billion people live in areas where the dengue virus and its mosquito vectors are present. The mosquito generally acquires the virus by feeding on the blood of infected human. Once the mosquito feeds on an infected individual the mosquito is capable of transmitting the virus for the rest of its life. Interestingly, a female infected mosquito is also able to transmit the virus to its offspring but the method the virus would be transmitted to the humans from an infected offspring has not been determined. Since the human can have the virus for two to seven days, the *Aedas* Mosquito is able to acquire the virus when they feed on a human during this time.[14]

The WHO noticed that several factors would greatly increase the global resurgence of dengue: failure to control the *Aedes* population, increased airplane travel to dengue epidemic areas, uncontrolled urbanization, unprecedented climate growth and global climate warming. Hence Rainfall and temperature which affect patterns of mosquitoes feeding and reproduction are major factors on the locations and susceptibility of the dengue fever.[16]

[13] Sustainable Development Networking Programme, *supra* note 9.
[14] Swaminathan, *supra* note 7.
[15] Atlas de Parasitologia, *Aedes Aegypti*, http://www.ucm.es/info/parasito/Aedes%20aegypti.jpg.
[16] Swaminathan, *supra* note 7.

1.B. The Dengue Virus and its Life Cycle

The structure of Den -2 virion is shown on the Front page of the report and in Fig. 9. The virion is composed of an envelope (E) and membrane (M) proteins, a lipid bilayer and an inner nucleocapsid (NC) core. The NC core contains a capsid (C) protein which will complex to the genome. The dengue Virus shares many characteristics as the other *Flavivirus*es in that it is a single stranded RNA genome that is packaged by the C protein in a lipid bilayer surrounded by glycoproteins.[18]

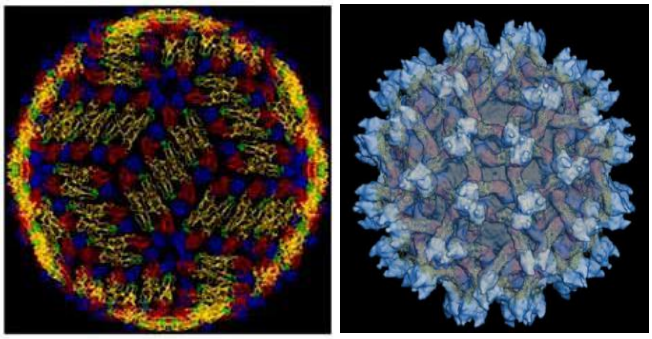

Figure 9: (a) 3d model of DEN-2 mature virion (b) 3d model of DEN-2 immature virion[17]

The life cycle of the dengue typically can be summarized in 5 stages: Entry into Permissive Cells; Translation of the Viral Genome; Genomic RNA Synthesis; Maturation; and Release. (See Fig. 10) These stages are common to many *Flavivirus* infections. The dengue virus also converts from an immature virus, which is inactive to an active mature virus after these stages. (See Fig. 9) [20]

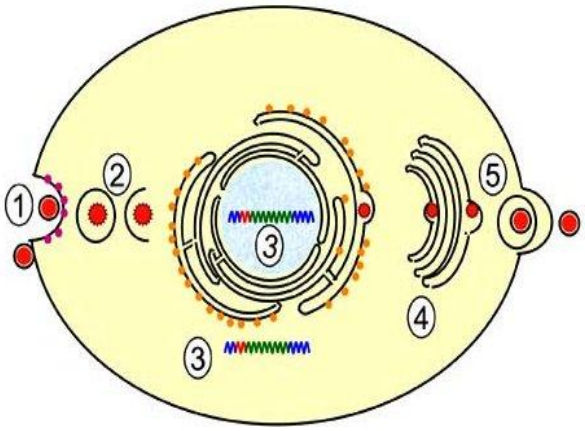

Figure 10: Diagram showing the life cycle of dengue fever[19]

1.B.1 Entry into Cells Stage

The Entry into Permissive Cells stage is when the virus incorporates with target cells through endocytosis. These target cells could be human dendritic cells (DCs), monocytes/macrophages, endothelial cells, B cells, T cells, hepatocytes and neuronal cells. Based on clinical studies on dengue infected patients, mononuclear phagocytic lineage such as monocytes, macrophages and DCs are typically infected in vivo by the dengue virus.[21]

The identification of these DEN virus receptors on these cells have been in much investigation. The DC-Specific Intercellular adhesion molecule 3 Grabbing Nonintegrin (DC-SIGN) is one of the well-characterized molecules that interact with glycerin molecules on the dengue virus E protein. The *Aedes* Mosquitoes secretes a high mannose glycan which adds E protein residue, N67, which is critical for DC-SIGN mediated viral entry of any of the four serotypes.[22]

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[17] Swaminathan, *supra* note 7, at 154.
[18] *Id.* at 153.
[19] *Id.* at 154.
[20] *Id.* at 155.
[21] *Id.*
[22] *Id.*

1.B.2 Translation of the Virus Genome

Once the virus is inside the permissive cell the translation of the virus genome begins. The RNA genome serves as a template for both the replication and translation. This process is typical with other *Flaviviridae* in that the events occur with the association with membranous structures. Translation precedes replication upon the entry of the virus into the permissive cell because the virus encodes replicative proteins in its genome but does not package them in the virions. The virus RNA will be translated into a single polyprotein, which is processed cotranslationally and post-translationally by both the host and viral proteases.[23]

1.B.3 Genome RNA Synthesis

When translation of the virus genome is completed, the genome RNA becomes available as a template for replication. The mechanism from which the viral RNA switches from protein to RNA synthesis is unknown. Viral RNA synthesis in flaviviradae infected cells is generally regarded to be cytoplasmic and occurs in the intracellular membranes. This is a vital aspect of viral RNA synthesis because of the important implications for disease pathogenesis, and hence the possible stage for creating vaccines and antiviral drug development is the ideally the translation stage. During this stage, the immature dengue virion assembles on the surface of the endoplasmic reticulum (ER) after the budding of the structural proteins and synthesized RNA bud to into the lumen of ER. Interestingly, the resultant virion contains the essential components for maturation: E protein, pRM, lipid membranes, and NC. However, these particles cannot induce host-cell fusion and remain non-infectious because the prM protein needs to be further processed. Other sub-viral particles are also produced in the ER but these cells lack the C protein and the genomic RNA and only contain glycoproteins and membrane proteins so they too remain non-infection.[24]

1.B.4 Maturation / Release

The maturation process will begin when both the non-infectious dengue viral and sub-viral particles are transported to the trans-golgi network (TGN). In the TGN, the particles are then cleaved by the host proteases, resulting in a mature infection virion. Both the non-infectious dengue viral and the sub-viral particles are cleaved by the host proteases and are released by exocytosis.[25]

1.C Symptoms of Dengue Fever

Due to the four serotypes of the dengue virion, there is a range of symptoms that are possible with the dengue virion. The range can go from a simple fever or malaise to fatal encephalitis and DHF. Typically, the dengue symptoms grow as the fever progresses. For instance, during a primary infection one might expect to see a sudden onset of fever for 3 to 5 days accompanied with headache, myalgia, arthralgia or muscular pain, retro-orbital pain, anorexia and fine

[23] *Id.*
[24] *Id.*
[25] *Id.*

muclopapular rash on extremities. These symptoms are more likely to be milder in children than adults. [27]

The secondary infection of the disease results in over 90% of the infected cases having either or both DHF and dengue shock syndrome (DSS). These patients were already infected with the primary infection and their symptoms are very similar to the primary infection.

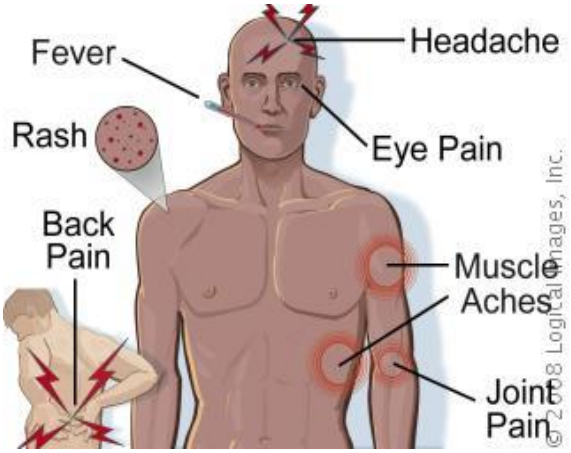

Figure 11: Symptoms of Dengue Fever[26]

Although very similar to the primary infection it is after 3 to 7 days of the secondary infection that the patients begin to display haemorrhagic symptoms such as bleeding internally, particularly in the skin, gums and nasal region. These internal bleedings result in the leakage of plasma into extravascular spaces which cause the hypovolaemia haemorrhagic symptoms to reduce blood pressure and have serious vascular changes which result in coagulopathy, circulatory shock, vomiting and abdominal pain. Furthermore, lymphadenopathy and hepatomegaly also may occur in the presence of blood in stools, vomitus, and urine.[29]

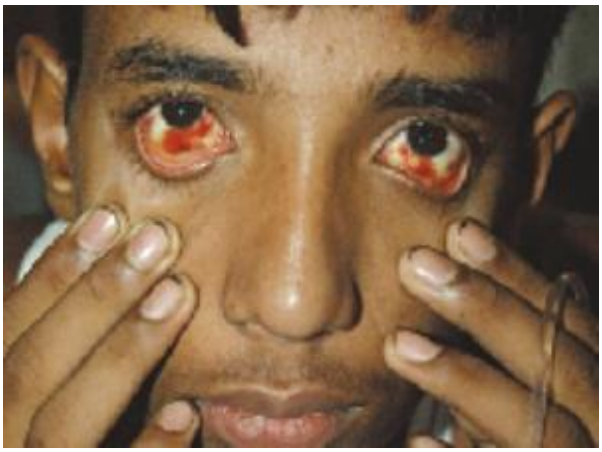

Figure 12: Internal Bleeding within the Eye during a Dengue Infection[28]

Dengue Fever and Virus Diagnosis

In the early stages of infection, isolation and identification of dengue virus is traditionally the only way to diagnose a current dengue infection. In this technique, serum from patients is applied to mosquito cell lines. After amplification of the virus in infected cells, the serotype is identified using monoclonal antibodies specific to each dengue serotype. This technique is only sensitive when there is a relatively high level of infectious particles in the serum. Dengue viraemia is short, typically starting 2 or 3 days before the onset of fever and lasting until day 4 or 5 of illness. Serum is the sample of choice for routine diagnosis by virus detection, although dengue virus can also be detected in plasma, leukocytes and in some tissues obtained at autopsy.[30]

The intrathoracic inoculation of mosquitoes (*Ae. aegypti*, *Ae. albopictus*, *Toxorhynchites*

[26] http://www.teluguflavours.com/health/healthtips/120/dengue%20fever.jpg.
[27] Swaminathan, *supra* note 7, at 155.
[28] SOS-Arsenic.net, *Dengue menace lurking in the wings* (Sept. 3, 2006), http://www.sos-arsenic.net/english/environment/dengu.html
[29] *Id.*
[30] Philippe Buchy et al., *Laboratory Tests for the Diagnosis of Dengue Virus Infection*, *Scientific working group report on dengue meeting report (Oct. 1-5, 2006).*

splendens, *Tx. amboinensis*) is the most sensitive system for the isolation of dengue virus, but because of the particular technical skill and special containment facilities required for direct inoculation of mosquitoes, cell culture is preferable for routine diagnosis. The mosquito cell line C6/36 (clone obtained from *Ae. albopictus*) has become the host cell of choice for routine isolation of dengue virus, although the *Ae. pseudoscutellaris* cell line AP61 has also been used successfully. Mammalian cell cultures such as Vero cells, LLCMK2 and others have also been employed, with less efficiency.

Identification of the dengue virus is generally accomplished using immunofluorescence techniques with serotype-specific monoclonal anti-dengue antibodies on mosquito head squashes or infected cells. Some strains are not easily identified because of a low concentration of virus. Plaque assay is the gold standard methodology for the quantification of dengue virus. Flow cytometry has recently been reported as a useful method for the identification of dengue virus 1 (DEN-1), and allows the virus to be identified 10 hours earlier than with an immunofluorescence assay, using an antinonstructural glycoprotein (NS1) monoclonal antibody.

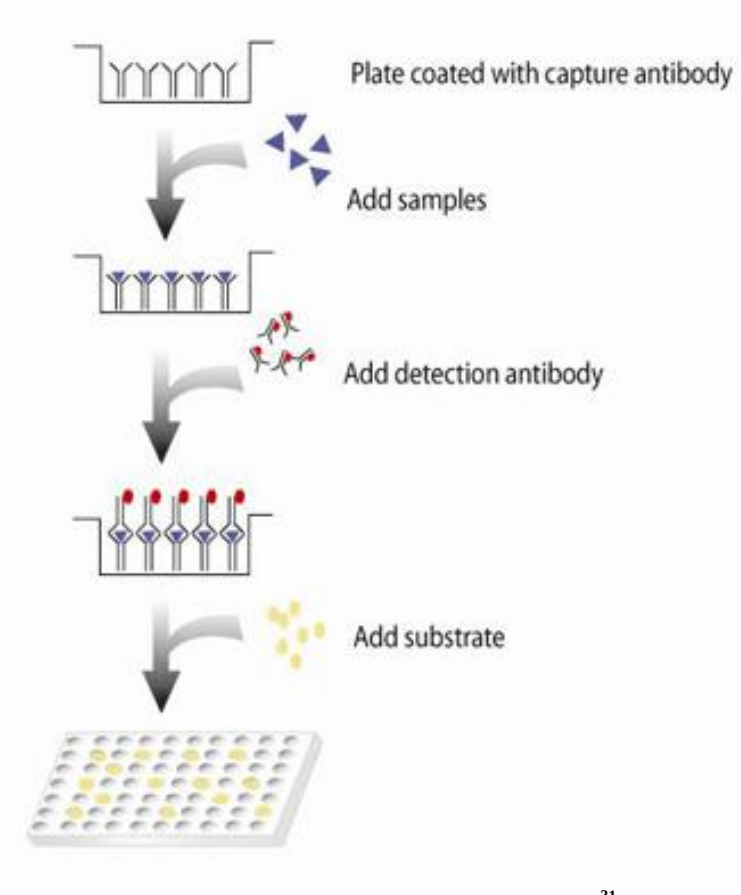

Figure 13: Enzyme linked immunosorbent assay[31]

2.A ELISA/Serotyping

Radioimmunoassay (RIA) was first described by Yalow and Berson in 1959, a discovery for which they won the 1997 Nobel Prize in Physiology or Medicine. In search for alternative labels to replace radioactive isotopes, Enzyme-Linked ImmunoSorbent Assay (ELISA) was introduced in the 1970s. In the typical double antibody sandwich ELISA , antibody attached to the bottom of a well provides both antigen capture and immune specificity, while another antibody linked to an enzyme provides detection and an amplification factor. This approach enables accurate and sensitive detection of the antigen, the cytokine of interest. Because of these desirable features, ELISA has been considered the standard cytokine measurement method and is widely utilized in clinical laboratories and biomedical research. ELISA kits for commonly measured cytokines are commercially available, often from multiple

[31] Signosis BioSignal Capture, *PSA ELISA*, http://www.signosisinc.com/ProductData.cfm?cat=EA-0105.

vendors. Additional advantages of ELISA include the fact that results are highly quantitative and generally reproducible. [32]

2.A.1 ELISA Diagnosis of Dengue

The acquired immune response to infection with dengue virus consists of the production of IgM and IgG antibodies primarily directed against the virus envelope proteins. The immune response varies depending on whether the individual has a primary or a secondary infection. In general, serodiagnosis of dengue is dependent on the stage of the infection. Fig. 14 depicts the general time-line of a primary infection from virus isolation/identification to detection of IgM and IgG.[33]

A primary infection with dengue is characterized by a slow and low-titre antibody response. IgM antibody is the first immunoglobulin isotype to appear. Anti-dengue IgG at low titre is detectable at the end of the first week of illness, increasing slowly thereafter. In contrast, during a secondary infection (a dengue infection in a host that had been previously infected by a dengue virus or other *Flavivirus*) antibody titres rise extremely rapidly and antibody reacts broadly with many *Flavivirus*es . High levels of IgG are detectable even in the acute phase and they rise dramatically over the following 2 weeks. The kinetics of the IgM response are more variable.[35]

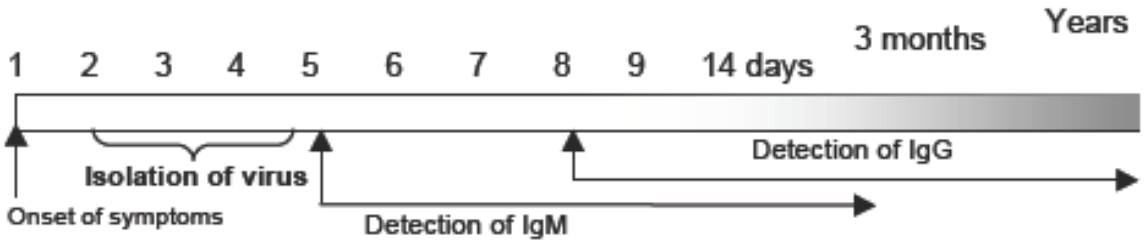

Figure 14: General time-line of a primary infection with dengue virus, from identification and isolation of the virus to detection of IgM and IgG.[34]

Since IgM levels are significantly lower in secondary dengue infections, some false-negative results in tests for anti-dengue IgM are observed during secondary infections. According to the Pan American Health Organization (PAHO) guidelines, IgM antibody is detectable by day 5 of illness in 80% of all dengue cases, and by day 6–10 of illness in 93–99% of cases, and may then remain detectable for more than 90 days. IgM antibody-capture enzyme-linked immunosorbent assay (MAC-ELISA) has become an important tool in the routine diagnosis of dengue; this technique has a sensitivity and specificity of approximately 90% and 98%, respectively, but only when used 5 or more days after the onset of fever. Different formats, such as capture ELISA, capture ultramicroELISA, dot-ELISA, AuBioDOT IgM capture and dipsticks, have been developed. Serum, blood on filter paper, and saliva, but not urine, can be used for detection of IgM if samples are taken within the appropriate time frame (5 days or more after the onset of

[32] Sean X. Leng et al., ELISA and Multiplex Technology for Cytokinmeasurement in Inflammation and Aging and Aging Research, 63(8) J GERONTOL A BIOL. SCI. MED. SCI. 879-884 (2008).
[33] Buchy et al., *supra* note 30.
[34] *Id.*
[35] *Id.*

fever). The different commercial kits available have variable sensitivity and specificity. A further challenge in the diagnosis of dengue is the fact that anti-dengue IgM antibodies also cross-react to some extent with other *Flavivirus*es, such as Japanese encephalitis, St Louis encephalitis and yellow fever.[36]

2.A.2 MAC ELISA

IgM antibody capture ELISA assays will generally follow the following method: Solid-phase support (usually microtitre plate wells) are coated with anti-human IgM antibodies capable of binding all IgM isotype antibodies present in the specimen. Reagent antigen is then added, followed by enzyme-labeled antigen-specific antibodies.[37] If IgM antibodies specific for the antigen in question are present, the "sandwich" complex will result in enzymatic color-change proportional to the concentration of IgM-specific antibody present.[38] This technique appears to be the method of choice in many highly specific and more sensitive assays for IgM infectious disease antibodies.[39]

Up till now, ELISA has been considered the most useful test for dengue diagnosis, due to its high sensitivity and the ease of use.[40] ELISA has been used to detect acute phase (IgM) and convalescent phase (IgG) antibodies, as well as for the detection of antigens (Ag).[41] Since it is easy to perform and there is no need for sophisticated equipment, ELISA has become the most widely used serological method for dengue diagnosis.[42] Also, due to its sensitivity for the detection of acute phase antibodies there is no need for convalescence samples since anti-dengue IgM antibodies appear within five days of the first clinical symptoms.[43] The IgM production varies considerably among the patients. Some patients will have IgM detectable by the 2nd to the 4th day after the beginning of the symptoms, while others do not develop detectable IgM until the 8th day after disease onset.[44] The IgM antibody titers in primary infections are significantly higher than in secondary infections, although the detection of titers of 1:320 in some cases is not uncommon.[45] The IgM production is much lower and transitory in secondary and tertiary infections. A small percentage of patients have secondary infection with no IgM antibodies detected.[46]

In dengue infections, the IgM monotypic response is not correlated with the serotype isolated from patients, and for this reason, MAC-ELISA cannot be used for viral identification.[47] MAC-

[36] *Id.*
[37] Mondofacto, *IgM Antibody Capture ELISA* (Mar. 5, 2000), http://www.mondofacto.com/facts/dictionary?IgM+antibody+capture+ELISA.
[38] *Id.*
[39] *Id.*
[40] Sérgio Oliveira De Paula and Benedito Antônio Lopes da Fonseca, *Dengue: A Review of the Laboratory Tests a Clinician Must Know to Achieve a Correct Diagnosis*, 8(6) BRAZ. J. INFECT. DIS. 390-98 (Dec. 2004).
[41] *Id.*
[42] *Id.*
[43] *Id.*
[44] *Id.*
[45] *Id.*
[46] *Id.*
[47] *Id.*

ELISA has been a valuable tool for the surveillance of dengue and DHF/DSS.[48] During epidemics, MAC-ELISA has the advantage of fast detection of the propagation of transmission.[49] In areas where dengue is endemic, MAC-ELISA can be used as a valuable tool in the evaluation of a great number of clinical samples, with relative ease.[50] The test is simple and easy to do, and it can be used in the analysis of a great number of samples. [51]

2.A.3 IgG ELISA

IgG antibodies are found in all body fluids. They are the most common antibody, constitution about 75% to 80% of all the antibodies in the body, thus, are very important in fighting bacterial and viral infections.[52] Dengue virus-specific immunoglobulin G (IgG) are found in the serum from patients with both acute primary infections and secondary dengue fever. [53] In primary dengue, IgG antibody begins to appear by the fifth day after onset of symptoms. Titres rise slowly for some weeks and then remain detectable for many years.[54] In secondary infections, IgG antibody is generally already present in early acute serum samples and titres rise rapidly over a few days. [55]

The dengue virus IgG-ELISA is intended for the qualitative determination of IgG antibodies against dengue virus in human Serum.[56] Conventional method of diagnosing dengue fever using IgG ELISA method entails obtaining anti-IgG-coated microtiter plates that captures the corresponding dengue virus IgG antibody from the serum of an infected subject.[57] Then horseradish peroxidase (HRP) labeled anti-IgG conjugate is added to the plate.[58] This conjugate binds to the captured dengue IgG antibodies. The immune complex formed by the bound conjugate is visualized by adding Tetramethylbenzidine (TMB) substrate which gives a blue reaction product.[59] The intensity of this product is proportional to the amount of dengue Virus-specific IgG antibodies in the serum. Then, sulphuric acid is added to stop the reaction, which produces a yellow endpoint color, and the color's absorbance at 450 nm is read using an ELISA microwell plate reader.[60] The obtained absorbance value is directly proportional to the amount of dengue-IgG present in the serum of the infected subject.[61]

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[48] *Id.*
[49] *Id.*
[50] *Id.*
[51] *Id.*
[52] Web MD, *Immunoglobulins* (Aug. 18, 2008), http://www.webmd.com/a-to-z-guides/immunoglobulins.
[53] Laue et al., *Detection of Dengue Virus RNA in Patients after Primary or Secondary Dengue Infection by Using the TaqMan Automated Amplification System,* 37 (8) J. OF CLINICAL MICROBIOLOGY, 2543 (1999).
[54] Rigau-Pérez et al., *Dengue and dengue haemorrhagic fever*, 352 THE LANCET 971, 977 (Sept. 19, 1998).
[55] *Id.*
[56] IBL Immuno Biological Laboratories, *Enzyme Immunoassay for the qualitative determination of IgG-class antibodies against Dengue Virus in human serum,* (Dec 18, 2003), http://www.biosupply.co.uk/doc.php?id=2292.
[57] *Id.*
[58] *Id.*
[59] *Id.*
[60] *Id.*
[61] *Id.*

2.A.4 IgM/IgG Ration ELISA

The IgM/IgG ratio is used to determine if a person has a primary or a secondary infection of dengue.[62] A diagnosis of dengue is defined as primary if the capture IgM/IgG ratio is greater than 1.2, and secondary if the ratio is less than 1.2.[63] However, the ratios have been shown to vary depending on whether the person has a serological non-classical or a classical dengue infection.[64] Falconar et al. considered the four subgroups of dengue infection and determined that a ratio of greater than 2.6 was a primary infection, and a ratio less than 2.6 was a secondary infection.[65] Using this ratio, Falconar et al. were able to correctly classify 100% of serological classical dengue and 90% of serological non-classical infections.[66] Commercial vendors have adopted the IgM/IgG ratio test for dengue diagnosis and currently at least four different test kits are available through two different vendors.[67]

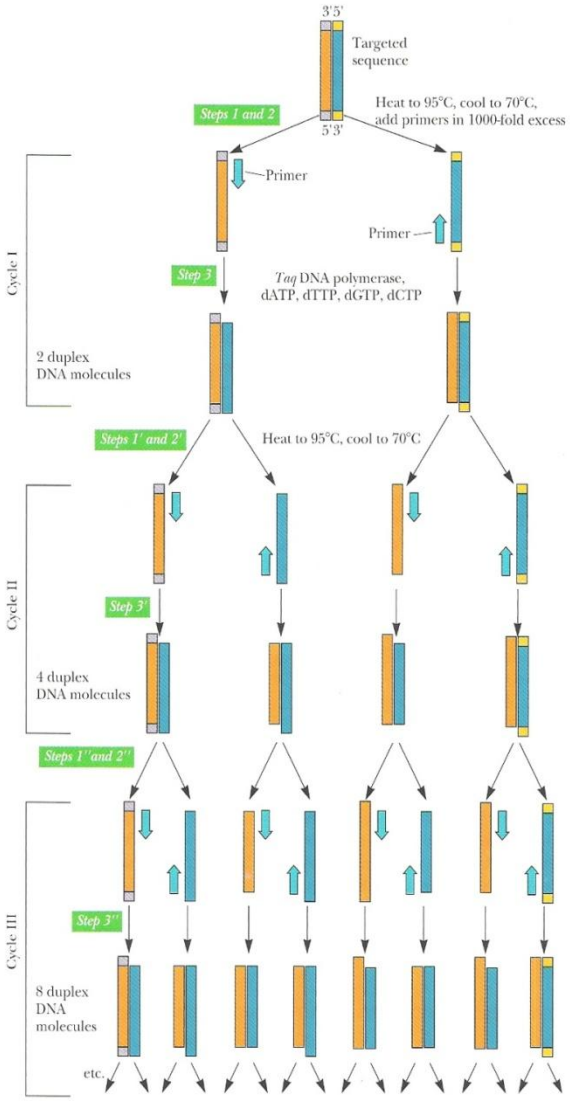

Figure 15: PCR process[68]

2.B Polymerase Chain Reaction (PCR)

Polymerase chain reaction (PCR) is a technique used to amplify the amount of a specific DNA segment from a small amount to thousands or millions of copies of the desired strand. The process is dependent on thermal cycles used to heat and cool the reaction in order to promote DNA melting and enzymatic replication of the DNA. Each repetition of the cycle theoretically doubles the amount of target DNA in the

[62] Buchy et al., *supra* note 30.
[63] *Id.*
[64] *Id.*
[65] AK Falconar et al., *Altered enzyme-linked immunosorbent assay immunoglobulin M (IgM)/IgG optical density ratios can correctly classify all primary or secondary dengue virus infections 1 day after the onset of symptoms, when all of the viruses can be isolated*, 13 CLIN VACCINE IMMUNOL 1044-1051 (2007).
[66] *Id.*
[67] Buchy et al., *supra* note 30; M. Guzman and G. Kouri, *Dengue Diagnosis, Advances and Challenges*, 8(2) INT'L J. OF INFECTIOUS DISEASES 71 (Mar. 2004).
[68] Garrett, s*upra* note 2.

mixture. PCR begins with the preparation of denatured DNA containing the desired segment, which serves as a template for the DNA polymerase. Specific primers are then added to the denatured DNA in excess amounts of 1000 times or greater. The primers prime the DNA polymerase-catalyzed synthesis of the two complementary strands of the desired segment, doubling its concentration in the solution. The mixture is then heated to about 95°C in order to dissociate the DNA into duplexes. The mixture is then cooled to about 70°C to cause the primers to bind to both the newly formed and old strands of DNA. The process is then repeated, creating large magnitudes of the desired DNA strand.[69]

2.B.1 PCR Diagnosis of Dengue

PCR is routinely used in the diagnosis of dengue fever.[70] First, the initial reverse transcription and amplification steps are done using universal or serotype specific dengue primers which target a specific region of the viral genome.[71] When using the serotype specific primers, the primer will anneal in different regions of the viral cDNA depending on the serotype present.[72] Then, a second amplification step, which is serotype specific, occurs. The products of these two amplification steps are separated by electrophoresis. The size of the bands resulting from the electrophoresis identifies the dengue serotypes present.[73]

There are many advantages related to using PCR in the diagnosis of dengue. An advantage of using RT-PCR for the diagnosis of dengue is that the process can be used to detect viral RNA with a high degree of sensitivity. However, the process is susceptible to "contamination and manifests a high degree of variability."[74] Another advantage of using this method for diagnosing dengue is that use of PCR allows dengue detection in long-term storage samples. Additionally, PCR makes possible the classification of dengue serotypes into subtypes according to genotypes because it allows for "the identification of the serotypes responsible for a determined infection focus and the study of the genetic diversity of the strains, in order to identify the origins of epidemics and reveal virulence markers, when helped by nucleotide sequencing."[75] Finally, PCR also permits quick detection and quantification of viral RNA in given samples. Along with advantages of using PCR for the diagnosis of dengue, the method also has some weaknesses. PCR "demands specific laboratory equipment and suitable physical structure." Further, PCR requires "extensive evaluation of protocols under the conditions of the field" of the laboratory because of the possibility that there may be "differences between strains circulating in different places."[76]

[69] Garrett, *supra* note 2.
[70] Buchy et al., *supra* note 30.
[71] *Id*.
[72] Nina Rocha Dutra et al. *The laboratorial diagnosis of dengue: Applications and implications*, J. OF GLOBAL INFECTIOUS DISEASES, 38-44 (2009).
[73] Buchy et al., *supra* note 30.
[74] Swaminathan, *supra* note 7.
[75] Dutra et al., *supra* note 70.
[76] *Id*.

2.B.2 RT-PCR

Reverse-transcriptase polymerase chain reaction (RT-PCR), a variation of the typical PCR process, is useful when RNA is the desired nucleic acid to be amplified.[77] RT-PCR begins with a reverse transcriptase step to synthesize a cDNA strand complementary to the RNA.[78] This cDNA strand is used at the template for the additional PCR cycles.[79]

2.B.2.A Real-Time RT-PCR Diagnosis of Dengue

Real-time RT-PCR is a one-step assay system that uses primer pairs and fluorescent probes that are specific to each dengue serotype.[80] Electrophoresis is not needed in real-time RT-PCR because the use of the fluorescent probe enables detection of the reaction products in real time.[81] Real-time RT-PCR assays can be either singleplex or multiplex.[82] Singleplex assays can only detect one dengue serotype at a time, whereas multiplex serotypes use a single reaction to determine all four serotypes.[83] Multiplex assays are less sensitive but faster than singleplex assays.[84] Also, multiplex assays create the ability to determine the complete viral load in a given sample, which is believed to be important in determining the severity of dengue.[85]

2.C Novel Diagnostic Tools

Traditionally dengue has been diagnosed by virus isolation or serological methods, but advances in rapid detection technology and molecular techniques have created a range of novel diagnostic tests that will improve case management and disease control efforts.[86] An ideal dengue diagnostic test should (1) detect dengue infection at an early stage, and if possible provide a marker for severe disease, (2) be positive for ~3 days after fever onset to identify patients presenting at a later stage, (3) distinguish among dengue stereotypes, and dengue viruses from other *Flavivirus*es, (4) differentiate primary from secondary infections, and (5) be easy to perform, stable with a long shelf-life and inexpensive.[87] With these novel tools there also needs to be an improvement in the quality and quantity of the proficiency test and an exchange of information and experiences in endemic areas.[88]

The novel tests that have been recently developed include NS1 assays, luminescence-based optical fiber biosensors, monoclonal antibody mAb4E11, natural cytotoxicity receptor immunoglobulins (NCR-Igs), recombinant proteins, microsphere-based immunoassay (MIA) and

[77] Garrett, *supra* note 2.
[78] *Id.*
[79] *Id.*
[80] Buchy et al., *supra* note 30.
[81] *Id.*
[82] *Id.*
[83] *Id.*
[84] *Id.*
[85] *Id.*
[86] *Id.*
[87] Swaminathan, *supra* note 7.
[88] Guzman, *supra* note 67, at 75.

biosensor technology using mass spectroscopy.[89] We will discuss a few of these new techniques below.

2.C.1 NS-1 Assays

The NS1 gene product is a glycoprotein produced by all *Flavivirus*es and is essential for viral replication and viability.[90] During viral replication, NS1 is localized to cellular organelles. The protein is secreted by mammalian cells, but not by insect cells.[91] The secreted form of the protein is a hexamer composed of dimer subunits.[92] Glycosylation of this protein is believed to be important for secretion.[93] NS1 antigen appears as early as day 1 after the onset of fever and declines to undetectable levels after day 5–6. NS1 is also a complement-fixing antigen and it produces a very strong humoral response.[94] Because this protein is secreted, many studies have been dedicated to the utility of NS1 as a tool for the diagnosis of infection with dengue virus.[95] These studies focus on various aspects of diagnosis, including antigen-capture enzyme-linked immunosorbent assay (ELISA), and NS1-specific IgM and IgG responses.[96]

In the last 6 years there have been several studies addressing the use of NS1 antigen and anti-NS1 antibodies as a tool for the diagnosis of dengue.[97] An antigen-capture ELISA test was described, with sensitivities ranging from 4 to 1 ng/ml.[98] These studies identified a correlation between disease severity and the quantity of NS1 antigen in the serum.[99] Recently, a serotype-specific monoclonal antibody-based NS1 antigen-capture ELISA that showed good serotype specificity has been developed.[100] Researchers have standardized an NS1 serotype specific IgG indirect ELISA to differentiate primary and secondary dengue virus infections and demonstrated a good correlation between anti-NS1 serotype-specific IgG (determined by ELISA) and PRNT results.[101] The NS1 serotype-specific IgG ELISA worked reliably for the serotyping of dengue virus in convalescent-phase sera from patients with primary infection and in acute-phase sera from patients with secondary infection (which would detect the serotype that caused the first infection), but not so with convalescent phase sera from patients with secondary infections.[102] Because the results of these studies were varied, results correlating with IgM and IgG assays as well as disease severity and predictors of viraemia, further evaluation of this assay should be performed to determine the main differences between each study.[103]

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[89] Buchy et al., *supra* note 30.
[90] *Id.*
[91] *Id.*
[92] *Id.*
[93] *Id.*
[94] *Id.*
[95] *Id.*
[96] *Id.*
[97] *Id.*
[98] *Id.*
[99] *Id.*
[100] *Id.*
[101] *Id.*
[102] *Id.*
[103] *Id.*

Commercial kits for the detection of NS1 antigen in serum samples are available. These assays do not differentiate between the serotypes. As NS1 antigen appears early in infection and before the appearance of antibody, such assays are useful for early case detection and for outbreak investigations.[104] Evaluations of these assays should be performed to assess their utility and cost–effectiveness.[105]

2.C.2 New Dengue Antibodies for ELISA Assays

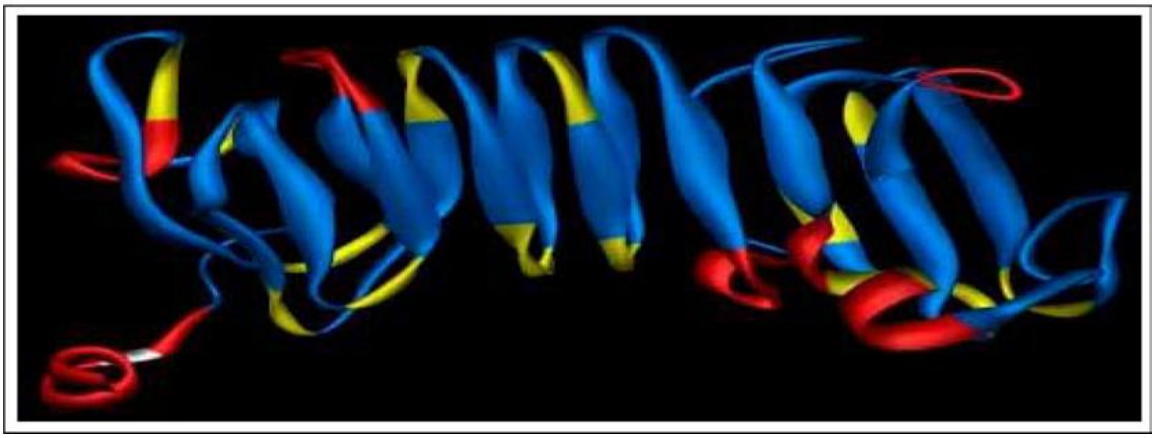

Figure 16: computer-generated representation of the r-DME-G protein in solution.[106]

Recently dengue-specific synthetic antigens, recombinant dengue multiepitope protein (r-DME-G) have been designed for the purpose of diagnosing dengue.[107] This multiepitope protein consists of several key IgG-specific immunodominant epitopes that are encoded by E, NS1 and NS3 proteins of the dengue virus.[108] The E protein is the major structural component and the most immunogenic of all dengue viral proteins, which elicits the first and longest-lasting antibodies.[109] NS1 and NS3 proteins are non-structural proteins that elicit significant antibody responses upon dengue infection.

In a standard ELISA, r-DME-G is able to accurately detect anti-dengue IgG antibody in serum from subjects infected with dengue virus.[110] In the assay, r-DME-G is used as a capture antigen which binds to anti-dengue IgG antibody.[111]

Similarly, another recombinant antigen, trpE-DEN have been developed. This antigen consists of proteins that represent all four serotypes of dengue virus and can be used in standard ELISA as a capture protein for the detection of dengue IgG or IgM antibodies.[112]

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[104] *Id.*
[105] *Id.*
[106] Ravulapalli et al., *A Custom-Designed Recombinant Multiepitope Protein as a Dengue Diagnostic Reagent*, 41PROTEIN EXPRESSION & PURIFICATION, 140 (2005).
[107] *Id.*
[108] *Id.*
[109] *Id.*
[110] *Id.*
[111] Ravulapalli et al., *supra* note 136-47.

2.C.3 Luminescence-Based Optical Fiber Biosensor

Optical fibers are made of a glass or plastic core surrounded by a clad material of lower refractive index.[113] Light is reflected at the core-clad interface based on the difference in refractive indices.[114] Light propagates through the fiber core and is transmitted the length of the fiber with minimal attenuation.[115] Because of these properties, optical fibers are ideal to use for sensing as they enable light to be carried over long distances.[116]

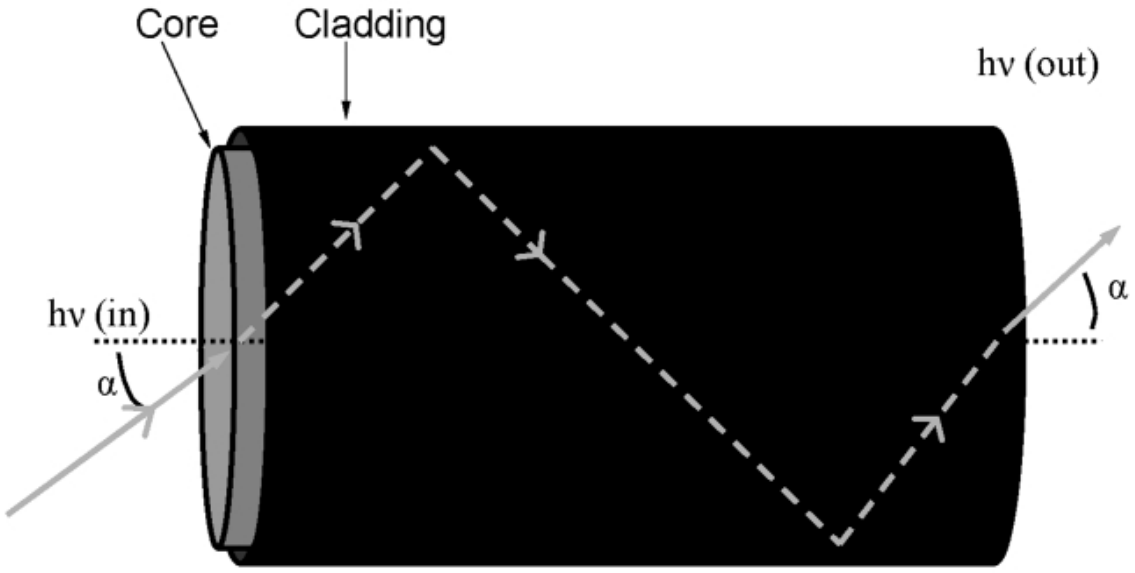

Figure 17: Schematic of an optical fiber [117]

In fluorescence-based sensing, excitation light is delivered through the fiber to a fluorescent indicator which is attached to the fiber's distal end.[118] The resulting isotropic fluorescence emission is transmitted back through the fiber to a detector.[119] Fluorescence assays can be multiplexed by simultaneously using multiple indicators reporting at different wavelengths.[120] All fluorescence imaging systems require specific instrumentation, but some common system components are present in all systems.[121]

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[112] Simmons et al., *Evaluation of Recombinant Dengue Viral Envelope B Domain Protein Antigens for the Detection of Dengue Complex-Specific Antibodies*. 58(2) AM. J. TROP. MED. HYG.144-51 (1998).

[113] Jason R. Epstein & David R. Walt, *Fluorescence-based fibre optic arrays: a universal platform for sensing,* CHEMICAL SOCIETY REVIEWS 203 (2003).

[114] *Id.*

[115] *Id.*

[116] *Id.*

[117] *Id.*

[118] *Id.* at 204.

[119] *Id.*

[120] *Id.*

[121] *Id.*

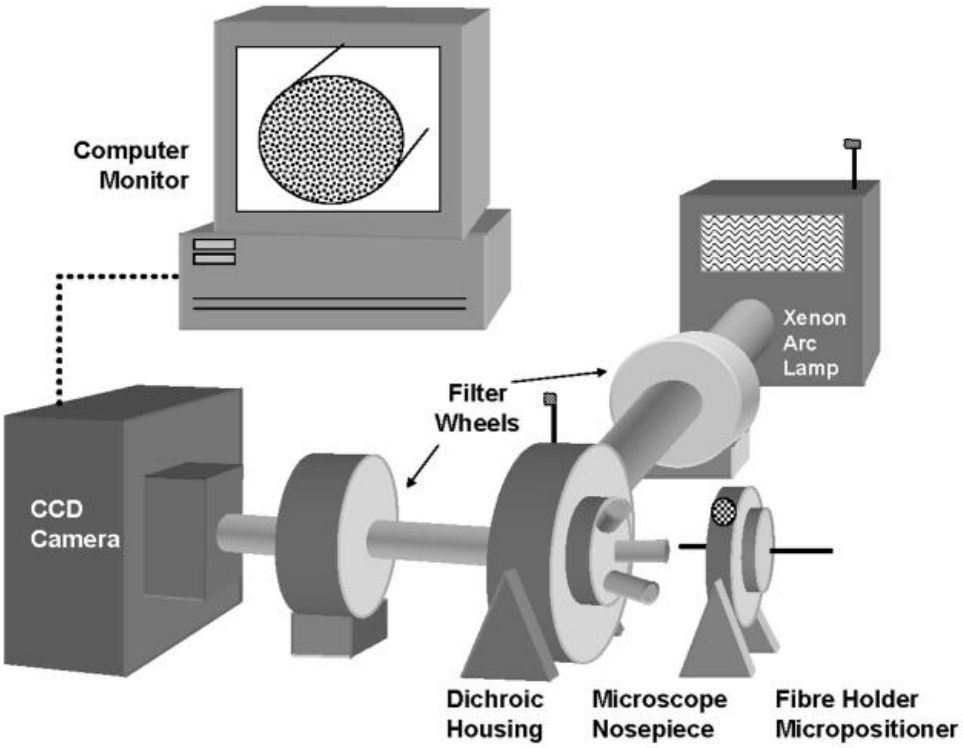

Figure 18: General Fluorescence Imaging System[122]

Fluorescence-based optical fiber biosensors contain a biological recognition element that can convert a binding into a detectable signal.[123] Luminescence-based techniques differ from fluorescence-based techniques in that luminometry does not require an excitation source or interference filter, luminescent analytes do not undergo photobleaching, and luminescence based techniques are most suitable for use on a DNA microarray.[124] In 2006, the DENFRAME project proposed using chemiluminescent optical-fiber biosensors to detect virions, genome and anti-dengue antibodies in order to aid in the diagnosis of dengue.[125] The optical fiber can be set with enzymes to detect genetic material.[126] One of the major advantages of using luminescence-based optical fiber biosensors is that luminometry is up to five orders of magnitude more sensitive than absorption spectroscopy.[127]

2.C.4 Absorption Spectroscopy/Chromatography

Advances in biosensor technology using mass spectrometry have allowed rapid advances in providing rapid discrimination of the biological components of complex mixtures.[128] The mass spectrometry produced can be considered the specific fingerprint or molecular profile of the

[122] *Id.*
[123] *Id.* at 210.
[124] *Id.*
[125] *Id.*
[126] *Id.*
[127] Buchy et al., *supra* note 30.
[128] *Id.*

virus that was analyzed.[129] Using a database of infectious agents, the mass spectrometry can quickly identify thousands of types of viruses, recognize an unidentified organism and then describe how it is related to previously identified organisms. [130] The identification would be helpful in dengue diagnosis by determining the specific dengue stereotype but also can be helpful during an outbreak to determine the dengue genotype. [131] Kits are available to test for dengue; the samples are processed by DNA extraction, PCR amplification, mass spectroscopy and then a computer analyzes the results.[132] The advantage of this system comes from its relatively short period of time it takes to identify a pathogen, compared with standard methods.[133] Also, by identifying the infectious agent responsible for an outbreak could be determined quicker with mass spectroscopy then with conventional methods.[134]

Conclusion

As dengue fever become as growing health concern within the world, many researchers foresee a range of diagnostic tests becoming available to effectively detect dengue fever. The current patent landscape will provide an overview into the patents available for diagnostic tools available for dengue fever and will also provide an insight as to where these tools are currently being researched. Furthermore, this report will show the range of countries that are protected by these patent inventions and will provide a head start for conducting a patent landscape for future studies in dengue fever vaccines.

[129] *Id.*
[130] *Id.*
[131] *Id.*
[132] *Id.*
[133] *Id.*
[134] *Id.*

VII. Patent Search Methodology and Results

Patent Search Methodology

The International Technology Transfer Institute (ITTI) team, under the direction of Professor Jon Cavicchi and technical supervisor Dr. Stanley Kowalski, began reviewing recent literature on the technology relating to the dengue virus and methods of diagnosing the dengue virus. The ITTI team commenced their searching with the basic search terms: dengue, diagnos*, and kit; then reviewed the results.

The ITTI team began with a conference call between, ITTI team members, Professor Cavicchi, Dr. Stanley Kowalski and Dr. Anatole F. Krattiger in January 2010. The scope of the project was defined as conducting a patent landscape analysis of technologies pertaining to means of diagnosing the dengue virus.

This semester, Thomson Innovation®, a patent search platform, that integrates the best of the suite of Thomson tools, Aureka®, Delphion® and Micropatent®, was utilized. Thomson Innovation® is a single, integrated solution that combines intellectual property, scientific literature, business data and news with analytic, collaboration and alerting tools in a robust platform.

The six-member ITTI team was divided into three groups. Each group was lead by a team leader, while a project leader oversaw the entire ITTI project.

Recent literature and a synonym list developed by the ITTI team were utilized to determine keywords. These keywords were then used to do preliminary searches on Thomson Innovation® and/or the USPTO. The initial keywords used in the two main categories in the search rounds were:

Dengue	Diagnostic	Specific Test
Flavivir*	Diagnos*	PCR or Polymerase Chain Reaction
Vir*	Detect*	ELISA or Enzyme-Linked Immunosorbent Assay
IgM	Kit*	NS1* or NS-1*
IgE	Identific*	Immunoglobin
IgG	Mark*	Assay*
IgA	BioMark*	Analyt*
Mosqui*	Immunodetec*	Optic* Biosens*
Hemorrhagic*		Chromatograph*
Haemorrhagic*		Cytomet*
Sero*		Spectrosco*
		Antibo*
		Monoclon*
		Clycoprote*
		Primer*
		MicroArray*
		MicroChip*

The team commenced an intense three-month journey of patent searching and coding. Thomson Innovation® was the primary patent searching database used by the team members. In addition to Thomson Innovation®, the ITTI team also used Westlaw®'s Asian-Pacific database.

These searches utilized keywords derived from the literature reviewed and initial searches to generate useful search strings; the searches also used United States Patent Classifications and International Patent Classifications that were identified through subsequent searches and team meetings. The combination of keywords and classifications in search strings was useful for parsing the technology into compartments and allowing each team member to generate a different set of search results that keywords alone could not provide. This approach generated a broad set of patents. From here, keywords and classifications generated from this broad set of patents were used in subsequent rounds of searching. After each round of searching, team meetings would identify the most important keywords, and classifications for use in subsequent search strings that became more defined and effective.

Many of these keywords were searched using the search field of "Title, Abstract and Claims" within Thomson Innovation®. It was determined that searches under the "Description" and "Specification" fields were to be too broad. It was useful to limit each search using the specific terms under the search field of "Claims."

Patent Search Results

The search strings gave us an outcome of more than 3,500 patents. Below is a list of search strings used in Thompson Innovation®.

2.A Patent Search Tables

Database	Thomson Innovation *Title Abstract Claims:* EP App, EP Grant, US App, US Grant, WO App
Keywords	dengue diagnos* kit*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(Dengue and diagnos* and kit*);
Total Hits	101

Database	Thomson Innovation *Title Abstract:* EP App, EP Grant, US App, US Grant, WO App
Keywords	dengue, diagnos*, ELISA
Classification/ Sub-Classification	Not Applicable
Search String	TAB=(dengue and diagnos* and ELISA);
Total Hits	6

Database	Thomson Innovation *Title Abstract Claims:* EP App, EP Grant, US App, US Grant, WO App
Keywords	dengue, diagnos*, flavivir*, kit*, biomark*, mark*, detec*, identif*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*))
Total Hits	1268

Database	Thomson Innovation *Title Abstract:* EP App, EP Grant, US App, US Grant, WO App
Keywords	dengue, diagnos*, flavivir*, kit*, biomark*, mark*, detec*, indentif*
Classification/ Sub-Classification	Not Applicable
Search String	TAB=((Dengue or flavivir*) AND (diagnos* or kit* or biomark* or mark* or detect* or indentif*))
Total Hits	243

Database	Thomson Innovation *Title Abstract:* EP App, EP Grant, US App, US Grant, WO App
Keywords	dengue, diagnos*, flavivir*, kit*, biomark*, mark*, detec*, identif*, microarray*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*) and microarray*)
Total Hits	13

Database	Thomson Innovation *Title Abstract:* EP App, EP Grant, US App, US Grant, WO App
Keywords	dengue, diagnos*, flavivir*, kit*, biomark*, mark*, detec*, identif*, microchip*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*) and microchip*)
Total Hits	4

Database	Thomson Innovation *Title Abstract:* EP App, EP Grant, US App, US Grant, WO App
Keywords	dengue, diagnos*, flavivir*, kit*, biomark*, mark*, detec*, identif*, immunoglob*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*) and immunoglob*)
Total Hits	94

Database	Thomson Innovation *Title Abstract:* EP App, EP Grant, US App, US Grant, WO App
Keywords	dengue, diagnos*, flavivir*, kit*, biomark*, mark*, detec*, identif*, Enzyme Liked Immunosorbent assay
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*) and Enzyme ADJ linked ADJ immunosorbent ADJ assay)
Total Hits	19

Database	Thomson Innovation *Title Abstract Claims:* EP App, EP Grant, US App, US Grant, WO App
Keywords	Dengue, deng*, flaviv*, elisa, enzyme linked immunosorbent assay, immunoassay, enzyme assay, immunosorbent assay, immuno* assay, floresc* assay, vir*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((ELISA or (Enzyme ADJ linked ADJ immunosorbent ADJ assay) or immunoassay or (enzyme ADJ assay) or (immunosorbent ADJ assay) or (immuno* ADJ assay)) or (flouresc* ADJ assay) AND (vir*)) AND DSC=(dengue or deng* or flaviv*);
Total Hits	808

Database	Thomson Innovation *Title Abstract Claims:* EP CN App, CN Util, DWPI, JP App, JP Grant, JP Util, KR App, KR Grant, KR Util
Keywords	dengue, diagnos*, flavivir*, kit*, biomark*, mark*, detec*, identif*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*));
Total Hits	505

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications
Keywords	Dengue, flavivir*, virus, diagnos*, kit*, detect*, identific*, mark*, biomark*, immunodetect*, IgG, IgM, ELISA, spectrosco*, cytometer*, chromatograph*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(virus and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i g m)) and (igg or (i g g)) or ELISA or (E L I S A) or spectrosco* or cytometr* or Chromatograph*))) AND DSC=(dengue* or flavivir*);
Total Hits	3568

Database	Thomson Innovation *Asian Translated:* Japanese Utility Models, Japanese Granted, Japanese Application
Keywords	Dengue, flavivir*, virus, diagnos*, kit*, detec*, identific*, mark*, biomark*, IgG, IgM, ELISA, spectrosco*, cytometer*, chromatograph*, immunodetec*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(virus and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i g m)) and (igg or (i g g)) or ELISA or (E L I S A) or spectrosco* or cytometr* or Chromatograph*))) AND DSC=(dengue* or flavivir*);
Total Hits	151

Database	Thomson Innovation *Asian Translated:* Chinese Utility Models, Chinese Applications
Keywords	Dengue, flavivir*, virus, diagnos*, kit*, detect*, identific*, mark*, biomark*, IgG, IgM, ELISA, spectrosco*, cytometer*, chromatograph*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(virus and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i g m)) and (igg or (i g g)) or ELISA or (E L I S A) or spectrosco* or cytometr* or Chromatograph*))) AND DSC=(dengue* or flavivir*);
Total Hits	0

Database	Thomson Innovation *Asian Translated:* Korean Utility Models, Korean Granted/Examined, Korean Applications
Keywords	Dengue, flavivir*, virus, diagnos*, kit*, detect*, identific*, mark*, biomark*, immunodetec*, IgG, IgM, ELISA, spectrosco*, cytometer*, chromatograph*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(virus and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i g m)) and (igg or (i g g)) or ELISA or (E L I S A) or spectrosco* or cytometr* or Chromatograph*))) AND DSC=(dengue* or flavivir*);
Total Hits	103

Database	Thomson Innovation Enhanced Patent Data - DWPI
Keywords	Dengue, flavivir*, virus, diagnos*, kit*, detect*, identific*, mark*, biomark*, immunodetec*, IgG, IgM, ELISA, spectrosco*, cytometer*, chromatograph*
Classification/ Sub-Classification	Not Applicable
Search String	TID=(((dengue or flavivir*) and virus) and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i ADJ g ADJ m)) and (igg or (i ADJ g ADJ g)) or ELISA or (E ADJ L ADJ I ADJ S ADJ A) or spectrosco* or cytometr* or Chromatograph*))) AND ABD=((dengue or flavivir*) and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i ADJ g ADJ m)) and (igg or (i ADJ g ADJ g)) or ELISA or (E ADJ L ADJ I ADJ S ADJ A) or spectrosco* or cytometr* or Chromatograph*)));
Total Hits	55

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications
Keywords	Dengue, flavivir*, diagnos*, kit*, detec*, identif*, mark*, biomark*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*));
Total Hits	1322

Database	Thomson Innovation *Asian Translated:* Japanese Utility Models, Japanese Granted, Japanese Application
Keywords	Dengue, flavivir*, diagnos*, kit*, detec*, identif*, mark*, biomark*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*));
Total Hits	21

Database	Thomson Innovation *Asian Translated:* Chinese Utility Models, Chinese Applications
Keywords	Dengue, flavivir*, diagnos*, kit*, detec*, identif*, mark*, biomark*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*));
Total Hits	77

Database	Thomson Innovation *Asian Translated:* Korean Utility Models, Korean Granted/Examined, Korean Applications
Keywords	Dengue, flavivir*, diagnos*, kit*, detec*, identif*, mark*, biomark*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*));
Total Hits	39

Database	Thomson Innovation Enhanced Patent Data - DWPI
Keywords	Dengue, flavivir*, diagnos*, kit*, detec*, identif*, mark*, biomark*
Classification/ Sub-Classification	Not Applicable
Search String	TID=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*)) AND ABD=((dengue or flavivir*) and (diagnos* or kit* or detec* or identif* or mark* or biomark*));
Total Hits	88

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications
Keywords	Dengue, flavivir*, diagnos*, kit*, detec*, identific*, mark*, biomark*, IgG, IgM, ELISA, spectrosco*, cytometer*, chromatograph*, immunodetec*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i g m)) and (igg or (i g g)) or ELISA or (E L I S A) or spectrosco* or cytometr* or Chromatograph*)));
Total Hits	1236

Database	Thomson Innovation *Asian Translated:* Japanese Utility Models, Japanese Granted, Japanese Application
Keywords	Dengue, flavivir*, diagnos*, kit*, detec*, identific*, mark*, biomark*, IgG, IgM, ELISA, spectrosco*, cytometer*, chromatograph*, immunodetec*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i g m)) and (igg or (i g g)) or ELISA or (E L I S A) or spectrosco* or cytometr* or Chromatograph*)));
Total Hits	21

Database	Thomson Innovation *Asian Translated:* Chinese Utility Models, Chinese Applications
Keywords	Dengue, flavivir*, diagnos*, kit*, detec*, identific*, mark*, biomark*, IgG, IgM, ELISA, spectrosco*, cytometer*, chromatograph*, immunodetec*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i g m)) and (igg or (i g g)) or ELISA or (E L I S A) or spectrosco* or cytometr* or Chromatograph*)));
Total Hits	78

Database	Thomson Innovation *Asian Translated:* Korean Utility Models, Korean Granted/Examined, Korean Applications
Keywords	Dengue, flavivir*, diagnos*, kit*, detec*, identific*, mark*, biomark*, IgG, IgM, ELISA, spectrosco*, cytometer*, chromatograph*, immunodetec*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i g m)) and (igg or (i g g)) or ELISA or (E L I S A) or spectrosco* or cytometr* or Chromatograph*)));
Total Hits	39

Database	Thomson Innovation Enhanced Patent Data - DWPI
Keywords	Dengue, flavivir*, diagnos*, kit*, detec*, identific*, mark*, biomark*, IgG, IgM, ELISA, spectrosco*, cytometer*, chromatograph*, immunodetec*
Classification/ Sub-Classification	Not Applicable
Search String	TID=((dengue or flavivir*) and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i ADJ g ADJ m)) and (igg or (i ADJ g ADJ g)) or ELISA or (E ADJ L ADJ I ADJ S ADJ A) or spectrosco* or cytometr* or Chromatograph*))) AND ABD=((dengue or flavivir*) and ((diagnos* or detect* or kit* or Identific* or Mark* or BioMark* or Immunodetec*) or ((igm or (i ADJ g ADJ m)) and (igg or (i ADJ g ADJ g)) or ELISA or (E ADJ L ADJ I ADJ S ADJ A) or spectrosco* or cytometr* or Chromatograph*)));
Total Hits	76

Database	Thomson Innovation Enhanced Patent Data - DWPI
Keywords	Dengue, Flavivir, Diagnos*, Detect* , Kit*, Identif*, Mark*, BioMark*, IgG, ELISA, assay
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identific* or Mark* or BioMark*) and (IgG and assay))
Total Hits	12

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications *Asian Translated:* Japanese Utility Models, Japanese Granted, Japanese Application, Chinese Utility Models, Chinese Applications, Korean Utility Models, Korean Granted/Examined, Korean Applications Enhanced Patent Data - DWPI
Keywords	Dengue, Flavivir, Diagnos*, Detect* , Kit*, Identif*, Mark*, BioMark*, IgG, ELISA, assay
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identif* or Mark* or BioMark*) and (IgG) and (ELISA or assay)
Total Hits	65

Database	Thomson Innovation *Full Text:* U.S. Granted, US Applications, WIPO Application
Keywords	Dengue, Flavivir*, Diagnos*, Detect* , Kit*, Identif*, Mark*, BioMark*, ELISA, assay Antibo*, Monoclon*, Glycoprote*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identif* or Mark* or BioMark*) and (Antibo* or Monoclon* or Glycoprote*) and (ELISA or assay));
Total Hits	157

Database	Thomson Innovation *Full Text:* U.S. Granted, US Applications, WIPO Application
Keywords	Dengue, Flavivir*, Diagnos*, Detect* , Kit*, Identific*, Mark*, BioMark*, IgG, ELISA, assay
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identific* or Mark* or BioMark*) and (IgG and (assay or ELISA)))
Total Hits	16

Database	Thomson Innovation *Full Text:* U.S. Granted, US Applications, WIPO Application
Keywords	Dengue, Flavivir*, Diagnos*, Detect* , Kit*, Identific*, Mark*, BioMark*, IgG, ELISA, assay
Classification/ Sub-Classification	Not Applicable
Search String	DSC=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identific* or Mark* or BioMark*) and (IgG and assay)) AND CL=((Dengue or Flavivir*))
Total Hits	4211

Database	Thomson Innovation *Full Text:* U.S. Granted, US Applications, WIPO Application
Keywords	Dengue, Flavivir*, Diagnos*, Detect* , Kit*, Identific*, Mark*, BioMark*, IgG, ELISA, assay
Classification/ Sub-Classification	Not Applicable
Search String	DSC=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identific* or Mark* or BioMark*) and (IgG and assay)) AND CL=((Dengue or Flavivir*))
Total Hits	412

Database	Thompson Innovation US Grant, GB App, US App, FR App, WO App, DE Util, EP Grant, DE Grant, EP App, DE App, JP Util, JP Grant, JP App, CN Util, CN App, KR Util , KR Grant, KR App, Other, DWPI
Keywords	Dengue, Flavivir*, Diagnos*, Detect* , Kit*, Identif*, Mark*, BioMark*, IgG, ELISA, assay
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identif* or Mark* or BioMark*) and (IgG) and (ELISA or assay))
Total Hits	75

Database	Thomson Innovation US Grant, GB App, US App, FR App, WO App, DE Util, EP Grant, DE Grant, EP App, DE App, JP Util, JP Grant, JP App, CN Util, CN App, KR Util , KR Grant, KR App, Other, DWPI
Keywords	Dengue, Flavivir, Diagnos*, Detect* , Kit*, Identif*, Mark*, BioMark*, ELISA, assay Antibo*, Monoclon*, Glycoprote
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identif* or Mark* or BioMark*) and (Antibo* or Monoclon* or Glycoprote*) and (ELISA or assay));
Total Hits	587

Database	Thompson Innovation US Grant, GB App, US App, FR App, WO App, DE Util, EP Grant, DE Grant, EP App, DE App, JP Util, JP Grant, JP App, CN Util, CN App, KR Util , KR Grant, KR App, Other, DWPI
Keywords	Dengue, Flavivir, Diagnos*, Detect* , Kit*, Identif*, Mark*, BioMark*, IgG, ELISA, assay
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identif* or Mark* or BioMark*) and (IgG) and (ELISA or assay));
Total Hits	76

Database	Thomson Innovation US Grant, GB App, US App, FR App, WO App, DE Util, EP Grant, DE Grant, EP App, DE App, JP Util, JP Grant, JP App, CN Util, CN App, KR Util , KR Grant, KR App, Other, DWPI
Keywords	Dengue, Flavivir*, Diagnos*, Detect* , Kit*, Identif*, Mark*, BioMark*, ELISA, assay Antibo*, Monoclon*, Glycoprote
Classification/ Sub-Classification	Not Applicable
Search String	(CTB=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identif* or Mark* or BioMark*) and (Antibo* or Monoclon* or Glycoprote*) and (ELISA or assay))) AND (CL=((Dengue or Flavivir*)));
Total Hits	283

Database	Thomson Innovation US Grant, GB App, US App, FR App, WO App, DE Util, EP Grant, DE Grant, EP App, DE App, JP Util, JP Grant, JP App, CN Util, CN App, KR Util , KR Grant, KR App, Other, DWPI
Keywords	Dengue, Flavivir, Diagnos*, Detect* , Kit*, Identif*, Mark*, BioMark*, ELISA, assay Antibo*, Monoclon*, Glycoprote*
Classification/ Sub-Classification	Not Applicable
Search String	(CTB=((Dengue or Flavivir*) and (Diagnos* or Detect* or Kit* or Identif* or Mark* or BioMark*) and (Antibo* or Monoclon* or Glycoprote*) and (ELISA or assay))) AND (CL=((Diagnos* or Detect* or Kit* or Identif* or Mark* or BioMark*)));
Total Hits	250

Database	Thomson Innovation *Full Text:* U.S. Granted, US Applications,
Keywords	virus, Diagnos*, Detect* , Kit*, Identif*, Mark*, BioMark*, ELISA, assay Antibo*, Monoclon*, Glycoprote*
Classification/ Sub-Classification	Not Applicable
Search String	CL=((Diagnos* or Detect* or Kit* or Identif*) and (((IgG) and (ELISA or assay)) or ((Antibo* or Monoclon* or Glycoprote*) and (ELISA or assay)))) AND CL=(virus);
Total Hits	939

Database	Thomson Innovation *Full Text:* U.S. Granted, US Applications,
Keywords	Virus, Diagnos*, Detect* , Kit*, Identif*, Mark*, BioMark*, IgG, ELISA, assay, antbo*, monoclon*, glycoprote*
Classification/ Sub-Classification	Not Applicable
Search String	CL=((Diagnos* or Detect* or Kit* or Identif* or Mark* or BioMark*) and (((IgG) and (ELISA or assay)) or ((Antibo* or Monoclon* or Glycoprote*) and (ELISA or assay)))) AND CL=(virus);
Total Hits	952

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, WIPO Application, European Granted, European Application
Keywords	Dengue diagnos* detect* identify* kit* mark* biomark*
Classification/ Sub-Classification	Not Applicable
Search String	TAB=(dengue AND (diagnos* or detect* or identif* or kit* or mark* or biomark*));
Total Hits	114

Database	Thomson Innovation Enhanced Patent Data - DWPI
Keywords	Dengue diagnos* detect* identify* kit* mark* biomark*
Classification/ Sub-Classification	Not Applicable
Search String	TID=(dengue AND (diagnos* or detect* or identif* or kit* or mark* or biomark*)) AND ABD=(dengue AND (diagnos* or detect* or identif* or kit* or mark* or biomark*));
Total Hits	62

Database	Thomson Innovation *Asian Translated:* Japanese Utility Models, Japanese Granted, Japanese Application
Keywords	Dengue diagnos* detect* identify* kit* mark* biomark*
Classification/ Sub-Classification	Not Applicable
Search String	TAB=(dengue AND (diagnos* or detect* or identif* or kit* or mark* or biomark*));
Total Hits	1

Database	Thomson Innovation *Asian Translated:* Chinese Utility Models, Chinese Applications
Keywords	Dengue diagnos* detect* identify* kit* mark* biomark*
Classification/ Sub-Classification	Not Applicable
Search String	TAB=(dengue AND (diagnos* or detect* or identif* or kit* or mark* or biomark*));
Total Hits	21

Database	Thomson Innovation *Asian Translated:* Korean Utility Models, Korean Granted/Examined, Korean Applications
Keywords	Dengue diagnos* detect* identify* kit* mark* biomark*
Classification/ Sub-Classification	Not Applicable
Search String	TAB=(dengue AND (diagnos* or detect* or identif* or kit* or mark* or biomark*));
Total Hits	5

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, WIPO Application, European Granted, European Application,
Keywords	Dengue* flavivir* diagnos* detect* identify* mark* kit* biomark* immunodetec* pcr polymerase chain reaction primer optic* biosens* analyt*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and ((pcr or (polymerase adj chain adj reaction)) or (primer and (pcr or (polymerase adj chain adj reaction))) or (optic* and biosens*) or (optic* and biosens* and analyt*)));
Total Hits	114

Database	Thomson Innovation Enhanced Patent Data - DWPI
Keywords	Dengue* flavivir* diagnos* detect* identify* mark* kit* biomark* immunodetec* pcr polymerase chain reaction primer optic* biosens* analyt*
Classification/ Sub-Classification	Not Applicable
Search String	TID=(((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and ((pcr or (polymerase adj chain adj reaction)) or (primer and (pcr or (polymerase adj chain adj reaction))) or (optic* and biosens*) or (optic* and biosens* and analyt*)))) AND ABD=(((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and ((pcr or (polymerase adj chain adj reaction)) or (primer and (pcr or (polymerase adj chain adj reaction))) or (optic* and biosens*) or (optic* and biosens* and analyt*))));
Total Hits	5

Database	Thomson Innovation *Asian Translated:* Japanese Utility Models, Japanese Granted, Japanese Application
Keywords	Dengue* flavivir* diagnos* detect* identify* mark* kit* biomark* immunodetec* pcr polymerase chain reaction primer optic* biosens* analyt*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and ((pcr or (polymerase adj chain adj reaction)) or (primer and (pcr or (polymerase adj chain adj reaction))) or (optic* and biosens*) or (optic* and biosens* and analyt*))));
Total Hits	7

Database	Thomson Innovation *Asian Translated:* Chinese Utility Models, Chinese Applications
Keywords	Dengue* flavivir* diagnos* detect* identify* mark* kit* biomark* immunodetec* pcr polymerase chain reaction primer optic* biosens* analyt*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and ((pcr or (polymerase adj chain adj reaction)) or (primer and (pcr or (polymerase adj chain adj reaction))) or (optic* and biosens*) or (optic* and biosens* and analyt*))));
Total Hits	10

Database	Thomson Innovation *Asian Translated:* Korean Utility Models, Korean Granted/Examined, Korean Applications
Keywords	Dengue* flavivir* diagnos* detect* identify* mark* kit* biomark* immunodetec* pcr polymerase chain reaction primer optic* biosens* analyt*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and ((pcr or (polymerase adj chain adj reaction)) or (primer and (pcr or (polymerase adj chain adj reaction))) or (optic* and biosens*) or (optic* and biosens* and analyt*))));
Total Hits	1

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application,, European Granted, European Application
Keywords	Dengue* flavivir* vir* detect* diagnose* identif* immunodetec* mark* biomark* kit* pcr polymerase chain reaction* primer biosens* optic* lumines*
Classification/ Sub-Classification	Not Applicable
Search String	DSC=(dengue* or flavivir*) AND CTB=(vir*) AND CL=((detect* or diagnos* or identif* or immunodetec* or mark* or biomark* or kit*) and ((pcr or (polymerase adj chain adj reaction*) or primer) or (biosens* or (optic* and biosens*) or (lumines* and biosens*))));
Total Hits	588

Database	Thomson Innovation *Asian Translated:* Japanese Utility Models, Japanese Granted, Japanese Application
Keywords	Dengue* flavivir* vir* detect* diagnose* identif* immunodetec* mark* biomark* kit* pcr polymerase chain reaction* primer biosens* optic* lumines*
Classification/ Sub-Classification	Not Applicable
Search String	DSC=(dengue* or flavivir*) AND CTB=(vir*) AND CL=((detect* or diagnos* or identif* or immunodetec* or mark* or biomark* or kit*) and ((pcr or (polymerase adj chain adj reaction*) or primer) or (biosens* or (optic* and biosens*) or (lumines* and biosens*))));
Total Hits	26

Database	Thomson Innovation *Asian Translated:* Korean Utility Models, Korean Granted/Examined, Korean Applications
Keywords	Dengue* flavivir* vir* detect* diagnose* identif* immunodetec* mark* biomark* kit* pcr polymerase chain reaction* primer biosens* optic* lumines*
Classification/ Sub-Classification	Not Applicable
Search String	DSC=(dengue* or flavivir*) AND CTB=(vir*) AND CL=((detect* or diagnos* or identif* or immunodetec* or mark* or biomark* or kit*) and ((pcr or (polymerase adj chain adj reaction*) or primer) or (biosens* or (optic* and biosens*) or (lumines* and biosens*))));
Total Hits	14

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications
Keywords	Dengue* flavivir* cir* detec* diagnose* identify* kit* mark* biomark* immunodetec*
Classification/ Sub-Classification	IPC C12Q-1/70 G01N-33/569 C07K-14/005 C07K-14/18 A61K-39/12 A61P-31/00 A61K-39/00 C12Q-1/68
Search String	DSC=(dengue* or flavivir*) AND CTB=(vir* and (detec* or diagnos* or identif* or kit* or mark* or biomark* or immunodetec*)) AND IC=((c12q000170) or (g01n0033569) or (c07k0014005) or (c07k001418) or (a61k003912) or (a61p003100) or (a61k003900) or (c12q000168));
Total Hits	3072

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application,, European Granted, European Application
Keywords	Dengue* flavivir* cir* detec* diagnose* identify* kit* mark* biomark* immunodetec*
Classification/ Sub-Classification	US 424/218.1 435/5, 6, 7.1-7.2, 7.22, 7.23, 7.3-7.35, 7.37, 7.5-7.91, 40.5-40.52
Search String	DSC=(dengue* or flavivir*) AND CTB=(vir* and (detec* or diagnos* or identif* or kit* or mark* or biomark* or immunodetec*)) AND UC=((424/218.1) or (435/5) or (435/6) or (435/7.1) or (435/7.2) or (435/7.22) or (435/7.23) or (435/7.3) or (435/7.31) or (435/7.32) or (435/7.33) or (435/7.34) or (435/7.35) or (435/7.37) or (435/7.5) or 435/7.51 or 435/7.52 or 435/7.53 or 435/7.54 or 435/7.55 or 435/7.56 or 435/7.57 or 435/7.58 or 435/7.59 or 435/7.6 or 435/7.61 or 435/7.62 or 435/7.63 or 435/7.64 or 435/7.65 or 435/7.66 or 435/7.67 or 435/7.68 or 435/7.69 or 435/7.7 or 435/7.71 or 435/7.72 or 435/7.73 or 435/7.74 or 435/7.75 or 435/7.76 or 435/7.77 or 435/7.78 or 435/7.79 or 435/7.8 or 435/7.81 or 435/7.82 or 435/7.83 or 435/7.84 or 435/7.85 or 435/7.86 or 435/7.87 or 435/7.88 or 435/7.89 or 435/7.9 or 435/7.91 or 435/40.5 or 435/40.51 or 435/40.52);
Total Hits	79

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	Dengue, Flavivi*, Diagnos*, Kit*, Biomark*, and DEN
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(Dengue* or Flavivi*) AND CTB=(diagnos* or kit* or biomark*)) AND (CTB=(DEN*))
Total Hits	534

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	Dengue, Flavivi*, Kit*, and Diagn*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((Dengue or Flavivi*) AND (kit* or diagn*))
Total Hits	779

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	Dengue, Flavivi*, MAC-ELISA, and IgM
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((Dengue or Flavivi*) AND (MAC-ELISA or IgM));
Total Hits	49

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	Dengue and Flavi*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(Dengue or flavi*)
Total Hits	6343

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	IgM, Diagn*, Detect*, Kit*, Identi*, Mark*, and Biomark*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(IgM and (Diagn* or detect* or kit* or Identi* or mark* or biomark*))
Total Hits	2941

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	Dengue, Flavivi*, Test, Kit, and Diagn*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((Dengue or Flavivir*) and (test* or kit* or Diagn*))
Total Hits	1066

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	Dengue, Flavivi*, Diagnos*, Kit, Detect* and Identif*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(Dengue or flavivir* AND (diagnos* or kit* or detect* or indentif*))
Total Hits	2098

Database	Thomson Innovation *Asian Translated:* Japanese Utility Models, Japanese Granted, Japanese Application, Chinese Utility Models, Chinese Applications, Korean Utility Models, Korean Granted/Examined, Korean Applications Enhanced Patent Data - DWPI
Keywords	Dengue*, Flavivir*, Diagnos*, Detect*, Identif*, Mark*, Kit*, Biomark*, Immunodetec*, *Elisa, Elisa*, IgM, "enzyme?linked immunosorbent assay", "enzyme linked immunosorbent assay", and MACELISA
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and (*Elisa or Elisa* or IgM or "enzyme?linked immunosorbent assay" or "enzyme linked immunosorbent assay" or MACELISA));
Total Hits	11

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	Dengue*, Flavivir*, Diagnos*, Detect*, Identif*, Mark*, Kit*, Biomark*, Immunodetec*, *Elisa, Elisa*, IgM, "enzyme?linked immunosorbent assay", "enzyme linked immunosorbent assay", and MACELISA
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and (*Elisa or Elisa* or IgM or "enzyme?linked immunosorbent assay" or "enzyme linked immunosorbent assay" or MACELISA));
Total Hits	27

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	Dengue*, Flavivir*, Diagnos*, Detect*, Identif*, Mark*, Kit*, Biomark*, Immunodetec*, NS1*, and NS-1
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and (NS1* or NS-1));
Total Hits	39

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	Dengue*, Flavivir*, Diagnos*, Detect*, Identif*, Mark*, Kit*, Biomark*, Immunodetec*, NS1*, NS-1, and assay
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and (NS1* or NS-1 or assay*));
Total Hits	111

Database	Thomson Innovation *Asian Translated:* Japanese Utility Models, Japanese Granted, Japanese Application Enhanced Patent Data - DWPI
Keywords	Dengue*, Flavivir*, Diagnos*, Detect*, Identif*, Mark*, Kit*, Biomark*, Immunodetec*, NS1*, and NS-1
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and (NS1* or NS-1));
Total Hits	1

Database	Thomson Innovation *Asian Translated:* Chinese Utility Models, Chinese Applications, Korean Utility Models, Korean Granted/Examined, Korean Applications Enhanced Patent Data - DWPI
Keywords	Dengue*, Flavivir*, Diagnos*, Detect*, Identif*, Mark*, Kit*, Biomark*, Immunodetec*, NS1*, and NS-1
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and (NS1* or NS-1));
Total Hits	7

Database	Thomson Innovation *Asian Translated:* Korean Utility Models, Korean Granted/Examined, Korean Applications Enhanced Patent Data - DWPI
Keywords	Dengue*, Flavivir*, Diagnos*, Detect*, Identif*, Mark*, Kit*, Biomark*, Immunodetec*, NS1*, and NS-1
Classification/ Sub-Classification	Not Applicable
Search String	CTB=((dengue* or flavivir*) and (diagnos* or detect* or identif* or mark* or kit* or biomark* or immunodetec*) and (NS1* or NS-1));
Total Hits	2

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	ELISA, Diagnostic, and Kit
Classification/ Sub-Classification	Not Applicable
Search String	TAB=(Elisa AND (diagnostic or kit))
Total Hits	524

Database	Thomson Innovation *Full Text:* U.S. Granted, British Applications, US Applications, French Application, WIPO Application, German Utility Models, European Granted, German Granted, European Application, German Applications Enhanced Patent Data - DWPI
Keywords	Virus, Diagnostic, and Kit
Classification/ Sub-Classification	Not Applicable
Search String	TAB=(virus and (diagnostic or kit))
Total Hits	4335

Database	Thomson Innovation *Full Text:* U.S. Granted, US Applications, WIPO Application, European Granted, European Application
Keywords	Dengue, Diagnos*, Detect, Identif*, Kit*
Classification/ Sub-Classification	Not Applicable
Search String	TAB=((Dengue) and (Diagnos* or Detect* or Identif* or Kit*)) AND CL=((Diagnos* or Detect* or Identif* or Kit*)) AND DP>=(19040101);
Total Hits	69

Database	Thomson Innovation *Full Text:* U.S. Granted, US Applications, WIPO Application, European Granted, European Application
Keywords	Dengue, Flavivi*, Diagnos*, Detect, Identif*, Kit*
Classification/ Sub-Classification	Not Applicable
Search String	TAB=((Dengue or Flavivi*) and (Diagnos* or Detect* or Identif* or Kit*)) AND CL=((Diagnos* or Detect* or Identif* or Kit*)) AND DP>=(19040101);
Total Hits	173

Database	Thomson Innovation *Full Text:* U.S. Granted, US Applications, WIPO Application, European Granted, European Application
Keywords	IgM, IgE, IgG, Iga, Sero*, Flavivir*, Diagnos*, Detect*, Identif*, Kit*, Biomark*
Classification/ Sub-Classification	Not Applicable
Search String	CL=(igM or IgE or igG or igA or Sero*) AND CTB=(Detect* or Diagnos* or Identif* or Mark* or Bio adj mark*) AND CTB=(Flavivir*);
Total Hits	123

Database	Thomson Innovation *Full Text:* U.S. Granted, US Applications, WIPO Application, European Granted, European Application
Keywords	IgM, IgE, IgG, Iga, Screen*, Vir*, Dengue*, Flavivir*, Diagnos*, Detect*, Identif*, Biomark*
Classification/ Sub-Classification	Not Applicable
Search String	CL=((Diagnos* or Detect* or Mark* or Bio adj Mark* or Identif* or Screen*) and Vir*) AND DSC=((Flavivir* or Dengue*)) AND CTB=((IgM or igE or igG or IgA));
Total Hits	247

Database	Thomson Innovation *Full Text:* DWPI
Keywords	Flavivir*, dengue*, detect*, diagnos*, identif*, kit*, screen*
Classification/ Sub-Classification	Not Applicable
Search String	ALLD=(flavivir* or dengue*) AND ABD=(detect* or diagnos* or identif* or kit* or screen*) AND DP>=(19040101);v
Total Hits	674

Database	Thomson Innovation *Full Text:* Korean Utility Models, Korean Granted/Examined, Korean Applications, Chinese Utility Models, Chinese Applications, Japanese Utility Models, Japanese Granted, Japanese Application
Keywords	IgM, IgE, IgG, Iga, Screen*, Vir*, Dengue*, Flavivir*, Diagnos*, Detect*, Identif*, Biomark*
Classification/ Sub-Classification	Not Applicable
Search String	CTB=(Dengue* or Flavivir*) AND CL=(Detect* or Diagnos* or Identif* or Kit* or Bio adj mark* or screen*) AND DP>=(19040101);
Total Hits	129

Patent Search Results Summary

3.A Categorization Summary

Patent Documents for diagnosing the dengue fever were coded using three relevancy categories, one of those categories having four descriptive subcategories. The following categories were defined as follows for the purpose of this report.

Coding Categorization of Patent Documents:

1. "Relevant Technology" – The first requirement to be relevant technology is that the patent claims a diagnostic kit, method of diagnosis, or a component of diagnostic kits such as specific antibodies or PCR Primer DNA. In order to be a relevant technology category, the diagnostic kit, method of diagnosis, or component of diagnostic kits claims a kit or method for diagnosing dengue or *Flavivirus* (*Flaviviridae*).

> For example, a claim that is described as "A dengue virus detection method comprising: a. exposing patient sera containing dengue virus to Dendritic cell-specific intracellular adhesion molecule . . ." as is found in patent document US20070134695A1 would be sufficient to be relevant because the patent claims either dengue or *Flavivirus.*
>
> However, the claim language "A kit for the detection of the presence of a virus in a direct clinical sample suspected of containing the virus, wherein the virus has a characteristic enzyme, said kit comprising . . ." as found in patent document US5766841A, would be insufficient for this category of the report because the patent does not claim dengue or *Flavivirus*.

The four descriptive subcategories of the relevant technology category comprise:

I. ELISA – Enzyme Linked Immunosorbent Assay and NS-1
II. PCR - Polymerase Chain Reaction
III. Luminescence Biosensors
IV. Spectroscopy

2. "Emerging Technology" – To be an emerging technology, the patent should claim a diagnostic kit, a method of diagnosis, or a composition of diagnostic kits such as specific antibodies or PCR Primer DNA. The emerging technology category differs from the relevant technology category in that the patent could claim a diagnostic kit, a method of diagnosis, or a composition of diagnostic kits such as specific antibodies or PCR Primer DNA for any type of virus although the technology is not specific for diagnosing dengue or a *Flavivirus* (*Flaviviradae*). In addition, a

patent with claims in a language other than English would also fall under the emerging technology category.

> For example, a patent claiming, "What is claimed is: A probe comprising a nucleotide sequence which can hybridize DNA I of an enteric virus . . ." as found in patent document WO2003014397A1, would be considered an emerging technology patent.
>
> Additionally, a secondary relevant patent could include a foreign patent that did not have claims or the claims were not translated, but based on the abstract, the document appeared to be of some relevance. For example a patent with no claims that has an abstract describing, "a method for the diagnosis or the screening of an arbovirus infection and preferably a flaviviridae infection and more preferably a flavivirus infection . . ." as found in patent document WO2008152528A3, would fall under a emerging technology category.

3. Irrelevant – Patent documents determined to be irrelevant fall outside the parameters of the relevant and emerging technology categories. For example, these patent documents do not include a diagnostic kit, a method of diagnosis, or a composition of diagnostic kits specifically for diagnosis of dengue or *Flavivirus*. In addition, the irrelevant category also includes patent documents that specified an irrelevant virus, such as Hepatitis B. As mentioned previously, if the patent document mentioned a diagnostic kit, a method of diagnosis, or a composition of diagnostic kits for a general virus, this would fall under the emerging technology category.

3.B Patent De-Duplication Process

Each of the six team-members conducted searches independent of one another. All of the members search strings were combined and were then de-duplicated according to the INPADOC Family ID. The de-duplication step refers to the removal of patents documents within the same family so as to reduce redundancy during the patent coding process. There is no option to directly de-duplicate patents into one-per-family in Innovation®, we utilized the *Display and Sort* option in Innovation® to group together the family members having the same INPADOC family ID, and manually reduced the patents documents.

The manually de-duplication process includes several steps. First, all issued US patents within one INPADOC family were kept. Second, for a family having no US issued patent, all EP issued patents were be kept for coding. Finally, when no issued patent was available within one INPADOC family, patent applications with earliest priority date was be kept for review, and usually WIPO application or applications are the ones with the earliest priority date within one family. However, some families only contain foreign patents or patent applications such as

Japan patents/applications, Korea patents/applications or China patents/applications. For these foreign patents or patent applications, we reviewed the translations made by Innovation and coded them accordingly.

3.C Patent Coding Results Summary

Final de-duplication brought in a result of 3,725 patent documents. The result was then extracted, using MicroPatent®, into PDF files containing title, abstracts and claims for coding. The 3,725 patent documents were divided among the six team members for coding.

Each team member analyzed the claims in the documents and coded under one or more of the following nine categories.

1. Diagnostic Kit
2. Methods of Diagnosis
3. Compositions of Kits
4. ELISA
5. PCR
6. Luminescence Biosensors
7. Spectroscopy
8. Dengue Specific
9. *Flavivirus* Specific

Of the 3,725 patent documents, 133 patent documents were found to be relevant technology, as noted by the yellow highlighting on the Master Spreadsheet shown in Section 3D. A patent document was considered to be relevant based on two requirements. First, the document had to specifically claim either diagnosing dengue or a *Flavivirus* (*Flaviviridae*). Second, the patent had to claim a diagnostic kit, a method of diagnosis, a composition of a kit, or a combination thereof. The coding results were inserted into the Master Spreadsheet showing the categories of each patent.

Of the 3,725 patent documents, 157 were coded as emerging technology, as noted by the purple highlighting on the Master Spreadsheet shown in Section 3E. In order for a patent to be coded as emerging technology, it must claim a method of diagnosis of a virus, a kit composition of a virus, or a diagnostic kit of a virus. It did not suffice if the patent claimed, for example, diagnosis of a disease. Further, patents that did not have dengue or *Flavivirus* in the claims, but did mention dengue or *Flavivirus* in the abstract or description were considered emerging technology patents. However, mentioning dengue or *Flavivirus* in the abstract or description was not a requirement; the patent could claim a diagnosis method for a virus without the mention of dengue or *Flavivirus* in the patent and still be considered emerging technology.

Some of the emerging technology patents have notes on the Master Spreadsheet which say that the claims for the patent were in a language other than English. If all of the claims, abstract and description were in a language other than English, the team was unable to code the document. Therefore, these patent documents may be categorized as irrelevant because it was impossible to ascertain whether the claims specified diagnosing dengue or *Flavivirus*. However, if adequate operational language was detected in any other portion of the document, it was included in the emerging technology category.

Each patent document was initially coded by an individual team member, with emphasis placed on claim language to determine the relevancy of the patent document to the diagnosis of dengue. In determining the relevancy of the claims to the diagnosis of dengue, the individual team member would first establish if the claims related to the diagnosis of a virus. If the document did not relate to the diagnosis of a virus, the document was coded as irrelevant. The team member would then determine if the claims were specific to dengue or *Flavivirus*. If the claims were for the specific purpose of diagnosing dengue or an infection of a *Flavivirus*, then the patent document was coded as relevant. If the claims pointed to a specific diagnostic method, the team member would look at the language of the claims to determine if the method was ELISA, PCR, the use of luminescence biosensors or spectroscopy.

If the patent did not specifically mention dengue or *Flavivirus* in the claims, but still claimed a diagnostic method, diagnostic kit, or kit composition relating to the diagnosis of a virus, the patent was coded as emerging technology.

3.D Spreadsheet for Relevant Technology Patent Documents

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
US6750009B2	Multiple viral replicon culture systems		1						Y			Ted
US20090274718A1	CHIMERIC PROTEINS THAT INDUCE EFFECTS DIRECTED AGAINST VIRUSES	35			Y				Y			Ted
US6136538A	Silent inducible virus replicons and uses thereof	17								Y		Ted
US6416763B1	Recombinant nonstructural protein subunit vaccine against flaviviral infection			10, 11, 12, 13, 14	Y				Y			Ted
US20030170697A1	Detection and treatment of infections with immunoconjugates	29	1	27					Y			Ted
US6749857B1	Recombinant dimeric envelope vaccine against flaviviral infection	20, 21		18, 19						Y		Ted
US6197568B1	Method and compositions for isolation, diagnosis and treatment of polyanion-binding microorganisms		1						Y	Y		Ted
US20090092622A1	MOLECULES, COMPOSITIONS, METHODS AND KITS FOR APPLICATIONS ASSOCIATED WITH FLAVIVIRUSES	45, 47	46							Y		Ted
US20090280471A1	METHODS FOR RAPID IDENTIFICATION OF PATHOGENS IN HUMANS AND ANIMALS		88			Y				Y		Ted
US20030134274A1	Nucleic acid sequence detection employing probes comprising non-nucleosidic coumarin derivatives as polynucleotide-crosslinking agents	19	1			Y			Y			Ted
US20090226478A1	Early detection of flaviviruses using the NS1 glycoprotein			25	Y					Y		Ted
US6190859B1	Method and kit for detection of dengue virus	2	1						Y			Ted
US6682883B1	Diagnosis of flavivirus infection		1		Y				Y	Y		Ted
US7378235B2	Method for screening compounds against Flaviviruses by using persistent virus-infected cell system		1		Y					Y		Ted
US20040022811A1	Recombinant vaccine against dengue virus	23	22	1					Y			Ted
US7622113B2	Monoclonal antibodies that bind or neutralize dengue virus		19	1	Y				Y			Ted
US7189403B2	Attenuated flavivirus strains containing a mutated M-ectodomain and their applications		15	1					Y			Ted
US6544770B2	Quantitation of viruses by light scattering		1				Y		Y			Ted
US20020150890A1	Fluorescence polarization method		1		Y					Y		Ted
US20090176236A1	Compositions and Methods for Detecting Certain Flaviviruses, Including Members of the Japanese Encephalitis Virus Serogroup	1	17	1, 2		Y				Y		Ted
US6793488B1	Flavivirus detection and quantification assay	6	11, 17	1		Y			Y	Y		Ted

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
US6333150B1	Isothermal transcription based assay for the detection and genotyping of dengue virus	11, 13	1, 2	18	Y				Y			Ted
US7052878B1	Serotype and dengue group specific flurogenic probe based PCR (TaqMan) assays against the respective C and NS5 genomic and 3' non-coding regions of dengue virus			1, 2		Y			Y			Ted
US7041255B2	Detection of dengue virus	1		10		Y			Y			Ted
US20080318266A1	FLUORESCENCE POLARIZATION INSTRUMENTS AND METHODS FOR DETECTION OF EXPOSURE TO BIOLOGICAL MATERIALS BY FLUORESCENCE POLARIZATION IMMUNOASSAY OF SALIVA, ORAL OR BODILY FLUIDS		1		Y					Y		Ted
US20090104230A1	COMPOSITIONS AND METHODS OF USING CAPSID PROTEIN FROM FLAVIVIRUSES AND PESTIVIRUSES	17	9							Y		Ted
US20080248064A1	Localization and Characterization of Flavivirus Envelope Gylcoprotein Cross-Reactive Epitopes and Methods for their Use		34	1	Y					Y		Pravin
US6117640A	Recombinant vaccine made in E. coli against dengue virus	2, 4	1, 3		Y				Y			Pravin
US4853326A	Carbohydrate perturbations of viruses or viral antigens and utilization for diagnostic prophylactic and/or therapeutic applications		1, 2, 17		Y					Y		Pravin
US20100035231A1	ANTIGEN CAPTURE ANTI-DENGUE IGA ELISA (ACA-ELISA) FOR THE DETECTION OF A FLAVIVIRUS SPECIFIC ANTIBODY	25	1, 2		Y					Y		Pravin
US20090074781A1	Dengue virus peptide vaccine and methods of preparing and using the same	31, 32	25, 28		Y				Y			Pravin
US20080220409A1	Antigen of Dengue Virus Type 1		9	1	Y				Y			Pravin
US20090214589A1	Recombinant lentiviral vector for expression of a flaviviridae protein and applications thereof as a vaccine	37	34, 36		Y					Y		Pravin
US6017535A	cDNA sequence of Dengue virus serotype 1 (Singapore strain)	18		1,2	Y				Y			Pravin
US5824506A	Dengue virus peptides and methods	7	5	1	Y				Y			Pravin
US6153392A	Devices and methods comprising an HBcAg from hepatitis B virus			1	Y					Y		Pravin
US5939254A	Methods and reagents for rapid diagnosis of dengue virus infection	6	1	1-15		Y			Y			Pravin
US20070009884A1	Methods and apparatuses for detecting chemical or biological agents	40	1, 15, 41, 80, 81		Y		Y		Y			Kara

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
US20050272679A1	Modified polynucleotides and uses thereof		3			Y				Y		Kara
US20040209244A1	Anti-dengue virus antibodies, compositions, methods and uses		30	57					Y			Kara
US20060024766A1	Bifunctional molecules		91		Y				Y			Kara
US20060003352A1	Mass tag PCR for mutliplex diagnostics		1			Y			Y	Y		Kara
US20050214796A1	Compositions, methods and detection technologies for reiterative oligonucleotide synthesis	31	1, 9	23				Y	Y			Kara
US20050227275A1	Nucleic acid detection system		18			Y			Y	Y		Kara
US20060172325A1	Detection of nucleic acids		9	1		Y			Y			Kara
US20020122168A1	Spectrophotometric system and method for the identification and characterization of a particle in a bodily fluid		1					Y	Y			Kara
US20040142322A1	Continuous non-radioactive polymerase assay		1			Y			Y			Kara
US20060286548A1	Method of making recombinant human antibodies for use in biosensor technology		1		Y		Y	Y	Y	Y		Kara
US20060099573A1	Diagnostic assays		4		Y				Y			Kara
US20070134695A1	Dengue virus detection measured by immunocytometry in a dendritic cell surrogate		1		Y			Y	Y			Kara
US20070014803A1	METHODS AND COMPOSITIONS FOR DIAGNOSIS AND TREATMENT OF VIRAL AND BACTERIAL INFECTIONS		40		Y				Y	Y		Kara
US20050031588A1	2'-branched nucleosides and Flaviviridae mutation	83	81			Y				Y		Kara
US20060188982A1	Multiplexed analysis for determining a serodiagnosis of viral infection		1		Y				Y	Y		Kara
US20010024795A1	Immunoassay technique using multispecific molecules	41	1		Y				Y	Y		Kara
US20050118603A1	Target detection system having a conformationally sensitive probe comprising a nucleic acid based signal transducer			1		Y				Y		Kara
US20030228571A1	Method for rapid detection and identification of viral bioagents		1			Y			Y	Y		Kara
WO2008001084A1	MULTIPLE LABELLING FOR ANALYTE DETECTION | MARQUAGE MULTIPLE POUR DÉTECTION ANALYTIQUE		15		Y					Y		Amrita
WO2009139725A1	POINT OF CARE TEST FOR THE DETECTION OF EXPOSURE OR IMMUNITY TO DENGUE VIRUS | ANALYSE HORS LABORATOIRE POUR LA DÉTECTION D'UNE EXPOSITION OU D'UNE IMMUNITÉ AU VIRUS DE LA DENGUE	37-42	19	35-26	Y				Y			Amrita

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
WO2004078986A1	INFECTIOUS FLAVIVIRUS PSEUDO-PARTICLES CONTAINING FUNCTIONAL PRM AND/OR E PROTEINS | PSEUDO-PARTICULES DE FLAVIVIRUS INFECTIEUSES CONTENANT DES PROTEINES D'ENVELOPPE PRM ET/OU E FONCTIONNELLES	26	24		Y				Y		Y	Amrita
CN101449165A	Competitive enzyme linked immunosorbent assay (C-ELISA) for the detection of a flavivirus specific antibody	33	1		Y				Y	Y		Amrita
WO2009145810A2	ST2-BASED DENGUE FEVER DIAGNOSTIC | DIAGNOSTIC DE LA FIÈVRE DENGUE BASÉ SUR ST-2	17	11	1		Y			Y			Amrita
EP967484A1	METHODS FOR DETECTING OR ASSAYING VIRUS | METHODES PERMETTANT DE DETECTER OU D'ANALYSER UN VIRUS | METHODEN ZUM NACHWEIS UND ZUR ANALYSE VON VIRUS	15, 16	12	13	Y				Y	Y		Amrita
CN101479606A	Antigen capture anti-dengue Iga ELISA (ACA-ELISA) for the detection of a flavivirus specific antibody	26	2		Y				Y	Y		Amrita
WO2007046893A2	METHODS AND COMPOSITIONS FOR GENERATING BIOACTIVE ASSEMBLIES OF INCREASED COMPLEXITY AND USES | PROCEDES ET COMPOSITIONS PERMETTANT DE PRODUIRE DES ENSEMBLES BIOACTIFS DE COMPLEXITE AUGMENTEE ET UTILISATIONS		30						Y			Jenn
WO2005017488A2	METHOD AND SYSTEM FOR IDENTIFYING BIOLOGICAL ENTITIES IN BIOLOGICAL AND ENVIRONMENTAL SAMPLES | PROCEDE ET SYSTEME POUR IDENTIFIER DES ENTITES BIOLOGIQUES DANS DES ECHANTILLONS BIOLOGIQUES ET DE MILIEUX AMBIANTS		34			Y				Y		Jenn
WO2007083147A2	HIGH THROUGHPUT TESTING FOR PRESENCE OF MICROORGANISMS IN A BIOLOGICAL SAMPLE | RECHERCHE À HAUT DÉBIT DE MICRO-ORGANISMES DANS UN ÉCHANTILLON BIOLOGIQUE		1						Y			Jenn
WO2003062408A1	VIRUS-LIKE PARTICLES | PSEUDO-PARTICULES VIRALES		11	10	Y					Y		Jenn

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
WO2005054854A1	FLUORESCENCE POLARIZATION INSTRUMENTS AND METHODS FOR DETECTION OF EXPOSURE TO BIOLOGICAL MATERIALS BY FLUORESCENCE POLARIZATION IMMUNOASSAY OF SALIVA, ORAL OR BODILY FLUIDS | INSTRUMENTS ET PROCEDES DE POLARISATION DE FLUORESCENCE POUR LA DETECTION D'EXPOSITION AUX MATIERES VIVANTES PAR LE DOSAGE IMMUNOLOGIQUE PAR LA POLARISATION DE FLUORESCENCE DE LA SALIVE, DE LIQUIDES BUCCAUX OU ORGANIQUES		1					Y		Y		Jenn
WO2005014627A1	RECOMBINANT DENGUE MULTI EPITOPE PROTEINS AS DIAGNOSTIC INTERMEDIATES | PROTEINES A EPITOPES MULTIPLES DE DENGUE RECOMBINANTES EN TANT QU' INTERMEDIAIRES DE DIAGNOSTIC		21, 22, 23, 24	1	Y				Y			Jenn
WO2000040759A2	USES OF FLAVIVIRUS RNA-DEPENDENT RNA POLYMERASES | UTILISATIONS D'ARN POLYMERASES DEPENDANT D'ARN DE FLAVIVIRUS	19	11			Y				Y		Jenn
WO1999025378A1	IMMUNOGLOBULIN MOLECULES HAVING A SYNTHETIC VARIABLE REGION AND MODIFIED SPECIFICITY | MOLECULES D'IMMUNOGLOBULINE A PARTIE VARIABLE DE SYNTHESE ET A SPECIFICITE MODIFIEE	101	105		Y					Y		Jenn
WO2007034507A2	TETRAVALENT DENGUE SPECIFIC DOMAIN III BASED CHIMERIC RECOMBINANT PROTEIN | PROTEINE DE RECOMBINAISON CHIMERIQUE TETRAVALENTE BASEE SUR LE DOMAINE III SPECIFIQUE DE LA DENGUE	10	17	1	Y				Y			Jenn
CN101576560A	An immunologic diagnostic reagent kit for detecting III-type dengue virus NS1 antigen and an application thereof	1			Y				Y			Trent
CN101100694A	Reagent kit for detecting dengue fever virus and its special amplification primer and probe	5		1					Y			Trent
CN101240350A	Primer and probe sequence for detecting dengue virus IV type nucleotide fragment			1		Y			Y			Trent
CN101629215A	Kit for simultaneously rapidly detecting epidemic type B encephalitis virus, dengue virus and West Nile virus and detection method thereof	1	8	7		Y			Y			Trent
SG139546A1	DIAGNOSTIC TEST	2	1		Y				Y			Trent
CN101226196A	An immunological diagnosis kit for detecting II typed dengue virus NS1 antigen	1		1					Y			Trent
CN101240349A	Primer and probe sequence for detecting dengue virus II type nucleotide fragment			1		Y			Y			Trent

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
CN101139638A	Primer and probe sequence used for detecting ribonucleotide segment of dengue virus III			1		Y			Y			Trent
CN101551393A	An immunological diagnosis reagent kit for detecting IV type dengue virus NS1 antigen	1							Y			Trent
CN101144107A	A leading object and probe sequence for detecting dengue fever virus nucleotide section	1							Y			Trent
WO1995011998A1	STRUCTURED SYNTHETIC ANTIGEN LIBRARIES AS DIAGNOSTICS, VACCINES AND THERAPEUTICS | BIBLIOTHEQUES STRUCTUREES D'ANTIGENES DE SYNTHESE UTILISABLES A DES FINS DE DIAGNOSTIC, DE VACCIN ET DE THERAPIE	11	7	1					Y			Trent
GB2279652A	Primers for the detection and sequencing of flaviviruses	7	1	3		Y			Y	Y		Trent
GB2279954A	Oligonucleotide sequences for the detection of flaviviral RNA	13	1	12		Y				Y		Trent
CN101308138A	Dengue virus IgM antibody enzyme-linked immunoassay diagnostic kit	1		2	Y				Y			Trent
WO1992016661A1	METHOD FOR DETECTION OF VIRAL RNA | PROCEDE DE DETECTION D'ARN VIRAL		2			Y				Y		Trent
CN101308137A	Dengue virus IgG antibody enzyme linked immunodiagnosis reagent kit			1					Y		method of detect Den in abstract	Trent
KR2008003989A	Oligonucleotides for Detecting Nucleic Acid Moleculesfrom Dengue Virus | OLIGONUCLEOTIDES CAPABLE OF SPECIFICALLY HYBRIDIZING WITH NUCLEIC ACID OF DENGUE VIRUSES BY IDENTIFYING TYPES OF DENGUE VIRUSES ACCURATELY AND SIMULTANEOUSLY THROUGH MULTIPLEX PCR | The oligonucleotide for the dengue virus nucleic acid detection.	16, 17				Y			Y			Trent
JP04268245B2	A non-infectious flavivirus form particle|grain and its manufacturing method			6	y					Y		Pravin
CN101078726A	A device for detecting immunoglobulin			1					Y		litmus test for dengue virus	Pravin
JP2009530607A		2			Y					Y		Jenn

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
WO2006025990A2	LOCALIZATION AND CHARACTERIZATION OF FLAVIVIRUS ENVELOPE GLYCOPROTEIN CROSS-REACTIVE EPITOPES AND METHODS FOR THEIR USE | LOCALISATION ET CARACTERISATION D'EPITOPES D'ENVELOPPE DE GLYCOPROTEINE DE FLAVIVIRUS A REACTIVITE CROISEE ET LEURS METHODES D'UTILISATION	36	34		Y					Y		Jenn
WO2002004947A2	SPECTROPHOTOMETRIC SYSTEM AND METHOD FOR THE IDENTIFICATION AND CHARACTERIZATION OF A PARTICLE IN A BODILY FLUID | SYSTEME SPECTROPHOTOMETRIQUE ET PROCEDE DESTINE A IDENTIFIER ET CARACTERISER UNE PARTICULE DANS UN FLUIDE CORPOREL		1					Y	Y			Amrita
CN1360678A	Early detection of flaviviruses using NS1 glycoprotein	1			Y				Y	Y		Amrita
WO2006054297A2	NOVEL NUCLEOTIDE AND AMINO ACID SEQUENCES, AND ASSAYS AND METHODS OF USE THEREOF FOR DIAGNOSIS | NOUVELLES SEQUENCES NUCLEOTIDIQUES ET D'ACIDES AMINES, ET LEURS DOSAGES ET LEURS PROCEDES D'UTILISATION POUR LE DIAGNOSTIC		56						Y			Amrita
WO2004076619A2	NEW DENGUE AND WEST NILE VIRUSES PROTEINS AND GENES CODING THE FOREGOING, AND THEIR USE IN VACCINAL, THERAPEUTIC AND DIAGNOSTIC APPLICATIONS | NOUVELLES PROTEINES DES VIRUS DU WEST NILE ET DE LA DENGUE, GENES CODANT CES PROTEINES, ET LEUR UTILISATION DANS DES APPLICATIONS VACCINALES, THERAPEUTIQUES ET DIAGNOSTIQUES		14	12	Y				Y			Amrita
WO2005056600A2	MONOCLONAL ANTIBODIES THAT BIND OR NEUTRALIZE DENGUE VIRUS | ANTICORPS MONOCLONAUX SE LIANT OU NEUTRALISANT LE VIRUS DE LA DENGUE		21 ,22		Y				Y			Amrita
WO2009046540A1	FLOW FOCUSING METHOD AND SYSTEM FOR FORMING CONCENTRATED VOLUMES OF MICROBEADS, AND MICROBEADS FORMED FURTHER THERETO | PROCÉDÉ DE FOCALISATION D'ÉCOULEMENT ET SYSTÈME DE CRÉATION DE VOLUMES CONCENTRÉS DE MICROBILLES, ET MICROBILLES FORMÉES À LA SUITE DE CELUI-CI		37						Y			Amrita

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
WO2005012872A2	LIQUID CRYSTAL BASED ANALYTE DETECTION | DETECTION D'ANALYTE A BASE DE CRISTAUX LIQUIDES	1								Y		Ted
WO2003095477A2	MINIPROTEIN LIGANDS AND OTHER POLYPEPTIDES AND METHODS FOR MAKING AND USING SAME | LIGANDS DE PETITES PROTEINES ET AUTRES POLYPEPTIDES ET PROCEDES DE FABRICATION ET D'UTILISATION CORRESPONDANTS		36		Y				Y	Y		Ted
WO1993022440A1	CDNA SEQUENCE OF DENGUE VIRUS SEROTYPE 1 (SINGAPORE STRAIN) | SEQUENCE DE L'ADN COMPLEMENTAIRE DU SEROTYPE 1 DU VIRUS DE LA DENGUE (SOUCHE SINGAPOUR)	17			Y				Y			Ted
CN101363848A	Double-antigen sandwich method for antibody detection of indirectly marking nanometre particles and the reagent kit thereof	1			Y				Y			Ted
WO2000012128A2	RECOMBINANT NONSTRUCTURAL PROTEIN SUBUNIT VACCINE AGAINST FLAVIVIRAL INFECTION | VACCIN A SOUS–UNITE PROTEIQUE NON STRUCTURALE RECOMBINANTE CONTRE LES INFECTIONS A FLAVIVIRUS		16	1	Y					Y		Trent
EP2003144A1	Method for the diagnosis or the screening of an arbovirus infection, reagents useful in said method and their applications | Diagnose- oder Screening-Verfahren für eine Arbovirusinfektion, Reagenzien für dieses Verfahren und deren Anwendung | Procédé de diagnostic ou de dépistage d'une arbovirose, réactifs utiles dans ledit procédé et leurs applications	26	1						Y	Y		Trent
WO1999034020A1	ISOTHERMAL TRANSCRIPTION BASED ASSAY FOR THE DETECTION AND GENOTYPING OF DENGUE VIRUS | DOSAGE BASE SUR LA TRANSCRIPTION ISOTHERMIQUE PERMETTANT DE DETECTER ET DE DETERMINER LE GENOTYPE DU VIRUS DE DENGUE	5	1			Y				Y		Trent
US7282341B2	Assay for the diagnosis of flaviviral infection using antibodies with high affinity for NS1 protein of flavivirus in hexameric form		1		Y				Y	Y		Jenn
US20030175304A1	Recombinant dimeric envelope vaccine against flaviviral infection	25, 26	20			Y				Y		Jenn
US20050064395A1	Liquid crystal based analyte detection		1							Y		Jenn

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
KR2009028704A	ANTIGEN CAPTURE ANTI-DENGUE IGA ELISA(ACA-ELISA) FOR THE DETECTION OF A FLAVIVIRUS SPECIFIC ANTIBODY | The antigen capture claim - dengue Ｉ gA E L Ｉ S A for the detection of the Flavivirus specific antibody (ＡＣＡ-ＥＬＩＳＡ)	3	1							Y	Derwent	Ted
EP638122B1	CDNA SEQUENCE OF DENGUE VIRUS SEROTYPE 1 (SINGAPORE STRAIN) | SEQUENCE DE L'ADN COMPLEMENTAIRE DU SEROTYPE 1 DU VIRUS DE LA DENGUE (SOUCHE SINGAPOUR) | CDNS SEQUENZ DES DENGUE VIRUS SEROTYPE 1 (SINGAPUR STAMM)	17							Y			Ted
US5851757A	Indicator cell line for detecting RNA viruses and method therefor		1							Y		Ted
US20100041015A1	COMPETITIVE ENZYME LINKED IMMUNOSORBENT ASSAY (C-ELISA) FOR THE DETECTION OF A FLAVIVIRUS SPECIFIC ANTIBODY	32			Y				Y	Y		Trent
US20020155435A1	Detection of dengue virus	15	1			Y			Y			Trent
US20100040643A1	FLAVIVIRUS IMMUNOGENS AND METHODS OF USE		34	35	Y					Y		Trent
US6855521B2	Serotype and dengue group specific flurogenic probe based PCR (TaqMan) assays against the respective C and NS5 genomic and 3' non-coding regions of dengue virus		1			Y			Y			Trent
US20070134256A1	Monoclonal antibodies that bind or neutralize dengue virus		21, 22		Y				Y			Amrita
US5968732A	Isothermal transcription based assay for the detection and genotyping of dengue virus	5	1	7		y			y			Pravin
WO1998049351A1	METHODS AND REAGENTS FOR RAPID DIAGNOSIS OF DENGUE VIRUS INFECTION | PROCEDES ET REACTIFS DE DIAGNOSTIC RAPIDE DE L'INFECTION PAR LE VIRUS DE LA DENGUE	6	1			y			y			Pravin
WO1999033965A1	BIFUNCTIONAL MOLECULES | MOLECULES BIFONCTIONNELLES			1	y				y			Pravin
WO2001079546A2	FLAVIVIRUS DETECTION AND QUANTIFICATION ASSAY | DETECTION DE FLAVIVIRUS ET ANALYSE DE QUANTIFICATION	6	11	1		y				y		Pravin
WO2002055089A2	IMMUNOASSAY TECHNIQUE USING MULTISPECIFIC MOLECULES | TECHNIQUE DE DOSAGE IMMUNOLOGIQUE UTILISANT DES MOLECULES MULTISPECIFIQUES		1		y				y	y		Pravin
WO2003084384A2	DIAGNOSIS OF FLAVIVIRUS INFECTION | DIAGNOSTIC DE L'INFECTION A FLAVIVIRUS	13	1		y					y		Pravin

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminscence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
WO2003100035A2	METHOD FOR RAPID DETECTION AND IDENTIFICATION OF VIRAL BIOAGENTS | PROCEDE DE DETECTION ET D'IDENTIFICATION RAPIDE D'AGENTS BIOLOGIQUES VIRAUX		1			y			y	y		Pravin
WO2004016586A2	COMPOSITIONS AND METHODS RELATED TO FLAVIVIRUS ENVELOPE PROTEIN DOMAIN III ANTIGENS | COMPOSITIONS ET METHODES ASSOCIEES AUX ANTIGENES DE DOMAINE III DE LA PROTEINE D'ENVELOPPE DU FLAVIVIRUS	32	43		y					y		Pravin
WO2006025990A3	LOCALIZATION AND CHARACTERIZATION OF FLAVIVIRUS ENVELOPE GLYCOPROTEIN CROSS-REACTIVE EPITOPES AND METHODS FOR THEIR USE | LOCALISATION ET CARACTERISATION D'EPITOPES D'ENVELOPPE DE GLYCOPROTEINE DE FLAVIVIRUS A REACTIVITE CROISEE ET LEURS METHODES D'UTILISATION	36	34		Y				Y	Y		Kara
WO2008135237A1	COMPLEMENT FACTOR H-DERIVED SHORT CONSENSUS REPEAT-ANTIBODY CONSTRUCTS | ANTICORPS DE SYNTHÈSE À SÉQUENCE SCR DÉRIVÉE DU FACTEUR H DU COMPLÉMENT	42		25					Y			Kara
WO2009025743A2	USE OF TRAIL COMPOSITIONS AS ANTIVIRAL AGENTS | UTILISATION DE COMPOSITIONS TRAIL EN TANT QU'AGENTS ANTIVIRAUX	31			Y				Y			Kara
WO2009132195A1	IMMORTAL AVIAN CELL LINE AND METHODS OF USE | LIGNÉE CELLULAIRE AVIAIRE IMMORTELLE ET PROCÉDÉS D'UTILISATION		26		Y					Y		Kara
US20090130683A1	PREDICTING AND DIAGNOSING PATIENTS WITH AUTOIMMUNE DISEASE		1						Y			Pravin
WO2008152528A2	METHOD FOR THE DIAGNOSIS OR THE SCREENING OF AN ARBOVIRUS INFECTION, REAGENTS USEFUL IN SAID METHOD AND THEIR APPLICATIONS | PROCÉDÉ DE DIAGNOSTIC OU DE CRIBLAGE D'UNE INFECTION PAR ARBOVIRUS, RÉACTIFS UTILES DANS LE PROCÉDÉ ET LEURS APPLICATIONS		1									Ted
CN1963515A	A colloidal gold test strip for detecting dengue fever virus antibody								Y		litmus test for dengue	Trent
JP2010506166A		5							Y		English Translated Claim	Jenn

3.E Spreadsheet for Emerging Technology Patent Documents

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
FR2871888A1	METHODE DE DIAGNOSTIC OU DE DEPISTAGE D'UNE INFECTION CLINIQUE OU ASYMPTOMATIQUE PAR UN FLAVIVIRUS DU GROUPE ENCEPHALITIQUE				Y					Y	In French	Trent
DE102006000305A1	Diagnose des Dengue-hämorrhagischen Fiebers durch Kombination von Untersuchungen zum Nachweis des Dengue-NS1-Nichtstrukturproteins und des terminalen Komplementkomplexes (SC5b-9)				Y						In German	Trent
WO1992002548A1	RECOMBINANT BACULOVIRUS EXPRESSING PROTEINS E AND NS1 OF FLAVIVIRIDAE VIRUSES AND FLAVIVIRIDAE-RELATED VIRUSES | BACULOVIRUS RECOMBINANT EXPRIMANT LES PROTEINS E ET NSI DE VIRUS APPARTENANT AUX FLAVIVIRIDAE OU DE VIRUS APPARENTES AUX FLAVIVIRIDAE					Y					Claims in French but Abstract very relevant	Trent
FR2654113A1	Process for the diagnosis of viruses belonging to the family of Flaviviridae | PROCEDE DE DIAGNOSTIC DE VIRUS APPARTENANT A LA FAMILLE DES FLAVIVIRIDAE.									1	In french	Trent
EP546031A1	ENTEROVIRUS PEPTIDES | PEPTIDES ANTI-ENTEROVIRUS | PEPTIDE VON ENTEROVIREN										In German	Amrita
EP800084A1	Technique for detecting infections with TBE-virus and other flaviviruses | Technique de détection des infections par TBE-virus et autre flavivirus | Technik zum Nachweis von Infektionen mit dem TBE-Virus und anderen Flaviviren				Y						In German Abstract Relevant	Amrita
WO2009094955A3	METHOD FOR QUANTIFICATION OF THE DENGUE NS1 ANTIGEN ON AN IMMUNOCHROMATOGRAPHIC STRIP | PROCÉDÉ DE QUANTIFICATION DE L'ANTIGÈNE NS1 DE LA DENGUE SUR BANDE IMMUNOCHROMATOGRAPHIQUE | PROCEDIMIENTO PARA LA CUANTIFICACIÓN DEL ANTÍGENO NS1 DE DENGUE EN TIRA INMUNOCROMATOGRÁFICA.							Y			In German but abstract relevant	Amrita

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
WO2004111086A2	PEPTIDE ANALOGUES COMPRISING AT LEAST ONE TYPE OF AMINOACYL AZA-β | ANALOGUES PEPTIDIQUES COMPRENANT AU MOINS UN RESIDU AZA-ß										In French	Jenn
WO2003087122A3	SEQUENCES INVOLVED IN THE PHENOMENA OF TUMOUR SUPPRESSION, TUMOUR REVERSION, APOPTOSIS AND/OR RESISTANCE TO VIRUSES, AND THE USE OF THE SAME AS MEDICAMENTS | SEQUENCES IMPLIQUEES DANS LES PHENOMENES DE SUPPRESSION TUMORALE, REVERSION TUMORALE, APOPTOSE ET/OU RESISTANCE AUX VIRUS ET LEUR UTILISATION COMME MEDICAMENTS										claims french detection abstract	Pravin
WO2009036933A3	DOWN REGULATION OF THE GENE EXPRESSION BY MEANS OF NUCLEIC ACID-LOADED VIRUS-LIKE PARTICLES | RÉGULATION À LA BAISSE DE L'EXPRESSION GÉNIQUE À L'AIDE DE PARTICULES PSEUDOVIRALES CHARGÉES D'ACIDE NUCLÉIQUE | HERABREGULATION DER GENEXPRESSION MITTELS NUKLEINSÄURE-BELADENER VIRUSÄHNLICHER PARTIKEL										German Claims based on Abstract seems relevant	Kara
WO2009144132A1	DIAGNOSTIC REAGENT, CONTAINING BIOPARTICLES, METHOD FOR PRODUCTION THEREOF AND USE THEREOF AS INTERNAL STANDARD IN NUCLEIC ACID PREPARATION AND NUCLEIC ACID DETECTION METHODS | RÉACTIF DE DIAGNOSTIC CONTENANT DES BIOPARTICULES, PROCÉDÉ POUR SA PRÉPARATION, ET SON UTILISATION EN TANT QU'ÉTALON INTERNE DANS DES PROCÉDÉS DE PRÉPARATION ET DE DÉTECTION D'ACIDES NUCLÉIQUES | DIAGNOSTISCHES REAGENS, ENTHALTEND BIOPARTIKEL, VERFAHREN ZU SEINER HERSTELLUNG UND SEINE VERWENDUNG ALS INTERNER STANDARD IN NUKLEINSÄUREPRÄPARATIONS- UND NUKLEINSÄURENACHWEIS-VERFAHREN										Claims in German Diagnositic of Viruses	Kara

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
WO1999009414A1	USE OF RECOMBINANT ENVELOPE PROTEINS FOR DIAGNOSING THE DENGUE VIRUS | UTILISATION DE PROTEINES D'ENVELOPPE RECOMBINANTES POUR LE DIAGNOSTIC DU VIRUS DE LA DENGUE										Claims in French but Abstract very relevant	Jenn
FR2929407A1	DISPOSITIF D'ANALYSE OU DE COMPARAISON BIOLOGIQUE, PROCEDES ASSOCIES, PROCEDE DE FABRICATION ET UTILISATIONS										Claims in French but Mentions Dengue	Kara
FR2923670A1	APPAREIL PORTABLE DE TELECOMMUNICATIONS AVEC MICROSCOPE NUMERIQUE INTEGRE										Everything in French Talks about Dengue	Kara
EP341470A1	Kit and method for the quantitative determination of antibodies | Kit und Verfahren zur quantitativen Bestimmung von Antikörpern | Trousse et méthode de détermination quantitative d'anticorps										In german/ Based on Abstract Only	Ted
WO2003087154A3	SEQUENCES INVOLVED IN THE PHENOMENA OF TUMOUR SUPPRESSION, TUMOUR REVERSION, APOPTOSIS AND/OR RESISTANCE TO VIRUSES, AND THE USE OF THE SAME AS MEDICAMENTS | SEQUENCES IMPLIQUEES DANS LES PHENOMENES DE SUPPRESSION TUMORALE, REVERSION TUMORALE, APOPTOSE ET/OU RESISTANCE AUX VIRUS ET LEUR UTILISATION COMME MEDICAMENTS										claims in french , detection	Pravin
US20090197245A1	Rapid detection of dengue virus					Y			Y			Pravin
JP2006071631A	DETECTION METHOD FOR VIRUS IN PESTIVIRUS OF FRAVIVIRUS, AND USE THEREOF IN IMMUNO-CHROMATOGRAPHY | The detection method of a Flaviviridae Pestivirus virus, and use in the immuno chromatography										No claims but relevant abstract	Trent
JP2009189327A	VIRUS INSPECTION METHOD AND MODEL ANIMAL | The viral test method and a model animal										No Claims but relevant abstract	Trent

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
IN20070248411					y				Y		No Claims but abstract looks relevant	Trent
IN20060202313									Y		No Claims but Abstract looks relevant	Trent
SU1678837A1						y			Y	Y	based on abstract	Pravin
KR2007121853A	COMPOSITIONS AND METHODS FOR DETECTING CERTAIN FLAVIVIRUSES, INCLUDING MEMBERS OF THE JAPANESE ENCEPHALITIS VIRUS SEROGROUP										No Claims but Abstract Made it Relevant	Ted
WO2008152528A3	METHOD FOR THE DIAGNOSIS OR THE SCREENING OF AN ARBOVIRUS INFECTION, REAGENTS USEFUL IN SAID METHOD AND THEIR APPLICATIONS | PROCÉDÉ DE DIAGNOSTIC OU DE CRIBLAGE D'UNE INFECTION PAR ARBOVIRUS, RÉACTIFS UTILES DANS LE PROCÉDÉ ET LEURS APPLICATIONS										No claims just abstract	Amrita
WO2000012128A9	RECOMBINANT SUBUNIT VACCINE AGAINST FLAVIVIRAL INFECTION | VACCIN A SOUS-UNITE PROTEIQUE NON STRUCTURALE RECOMBINANTE CONTRE LES INFECTIONS A FLAVIVIRUS									Y		Jenn
WO2004007717A1	PROTEOMIC SCREEN TO IDENTIFY DISEASE-RELATED BIOLOGICAL MOLECULES AND INHIBITORS THERETO | CRIBLAGE PROTEOMIQUE POUR IDENTIFIER DES MOLECULES BIOLOGIQUES ASSOCIEES A DES MALADIES ET LEURS INHIBITEURS										detection of virus	Pravin
WO2004046331A2	2'-BRANCHED NUCLEOSIDES AND | NUCLEOSIDE A RAMIFICATION EN 2' ET MUTATION DE										detection of virus	Pravin
US5766841A	Kit for visually detecting the presence of a clinical specimen										Detection of Virus	Pravin
US6406913B1	Assay method utilizing induced luminescence								Y			Pravin
WO1993025710A1	PREPARATION OF NUCLEIC ACID FROM MONONUCLEAR CELLS | PREPARATION D'ACIDE NUCLEIQUE A PARTIR DE CELLULES MONONUCLEAIRES					y					detection of virus	Pravin

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
WO1994013837A1	METHOD FOR DETECTING A VIRUS | PROCEDE DE DETECTION D'UN VIRUS					y					detection of virus	Pravin
WO1999006832A1	METHOD FOR THE SPECIFIC DETECTION OR DIAGNOSIS OF PRIMARY INFECTION AND REAGENT KITS USABLE THEREIN | PROCEDE POUR LA DETECTION OU LE DIAGNOSTIC SPECIFIQUE DE PRIMO-INFECTIONS ET KITS DE REACTIFS UTILISABLES DANS CE PROCEDE										detection of Virus	Pravin
WO2000049413A2	RAPID ASSAY FOR ARTHROPOD–BORNE DISEASE VECTORS AND PATHOGENS | ESSAI DE DETECTION RAPIDE POUR VECTEURS DE MALADIES ET PATHOGENES VEHICULES PAR LES ARTHROPODES										detection of Virus in an arthropod	Pravin
WO2001042429A1	INFECTION OF EUKARYOTIC CELLS WITH VIRUSES | INFECTION DES CELLULES EUCARYOTES AVEC DES VIRUS IN VITRO											Pravin
WO2002099130A2	VIRUS DETECTION USING DEGENERATE PCR PRIMERS | DETECTION DE VIRUS AU MOYEN D'AMORCES PCR DEGENEREES										detection of a virus	Pravin
WO2003014397A1	PROBE FOR DETECTION OF ENTERIC VIRUS DETECTION KIT AND METHOD FOR ENTERIC VIRUS WITH THE SAME | SONDE DESTINEE A LA DETECTION DE VIRUS ENTERIQUES, KIT DE DETECTION ET PROCEDE DE DETECTION DE VIRUS ENTERIQUES										detection of a virus enteric	Pravin
US6326480B1	Antisense reporter system for assaying RNA virus replication											Ted
US7432111B2	Non-continuous immunoassay device and immunoassay method using the same											Ted
US7556812B2	Dengue and West Nile viruses proteins and genes coding the foregoing, and their use in vaccinal, therapeutic and diagnostic applications				Y				Y			Ted
US6270958B1	Detection of negative-strand RNA viruses											Ted
US20100009344A1	LIQUID CRYSTAL BASED ANALYTE DETECTION											Pravin
US20070128586A1	Therapeutic, prophylactic and diagnostic agents									Y		Pravin
US20080003614A1	MAVS in the prevention and treatment of viral diseases								Y	Y		Pravin
US20080113338A1	DETERMINATION OF RISK OF DEVELOPING DENGUE HEMORRHAGIC FEVER/DENGUE SHOCK SYNDROME, METHODS AND COMPOSITIONS THEREFOR				Y							Pravin

Publication Number	Title	Diagnostic Kits	Methods of Diagnosis	Compositions of Kits	E.L.I.S.A.	P.C.R.	Luminescence Biosensors	Spectroscopy	Dengue Specific	Flavivirus Specific	Notes	Reviewed By
US20080292644A1	Compositions and methods for identifying response targets and treating flavivirus infection responses				Y				Y	Y		Pravin
US20060121489A1	High throughput screening of aptamer libraries for specific binding to proteins on viruses and other pathogens								Y	Y		Kara
US20050025709A1	D-amino acid peptides								Y			Kara
US20050003403A1	Polyvalent protein complex											Kara
US20060040408A1	Lateral flow format, materials and methods								Y			Kara
US20040161788A1	Sample processing								Y			Kara
US20020172937A1	Rapid assay for arthopod-borne disease vectors and pathogens								Y			Kara
US20040180147A1	Direct micro-patterning of lipid bilayers using UV light and selected uses thereof									Y		Kara
US20050277181A1	Compositions and methods for detecting pathogen infection								Y			Kara
US20030045001A1	Immunochromatographic test strip with arcuate sample application zone for ease-of-use in the field								Y			Kara
US20060104899A1	Production and use of novel peptide-based agents for use with bi-specific antibodies								Y			Kara
US20040229213A1	Exhaustive analysis of viral protein interactions by two-hybrid screens and selection of correctly folded viral interacting polypeptides									Y		Kara
WO2007140506A1	MODIFIED MICROBIAL NUCLEIC ACID FOR USE IN DETECTION AND ANALYSIS OF MICROORGANISMS | ACIDE NUCLÉIQUE MICROBIEN MODIFIÉ DESTINÉ À LA DÉTECTION ET À L'ANALYSE DE MICRO-ORGANISMES											Amrita
WO2009134717A1	CHIMERIC WEST NILE/DENGUE VIRUSES | VIRUS DU NIL OCCIDENTAL ET/OU DE LA DENGUE, CHIMÉRIQUES								Y			Amrita
WO2007093043A1	METHOD FOR DETECTING PATHOGENS USING MICROBEADS CONJUGATED TO BIORECOGNITION MOLECULES | PROCÉDÉ DE DÉTECTION DE PATHOGÈNES COMPRENANT L'UTILISATION DE MICROBILLES CONJUGUÉES À DES MOLÉCULES DE BIORECONNAISSANCE.								Y			Amrita

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EP2078201A2	DENGUE DIAGNOSIS AND TREATMENT | DENGUE-DIAGNOSE UND -BEHANDLUNG | DIAGNOSTIC ET TRAITEMENT DE LA DINGUE										No Claim but relevant abstract	Amrita
WO1999012959A1	CARBOHYDRATE CROSSLINKED GLYCOPROTEIN CRYSTALS | CRISTAUX DE GLYCOPROTEINE RETICULES AUX HYDRATES DE CARBONE				Y							Jenn
WO2004008122A1	SENSITIZER-LABELED ANALYTE DETECTION | DETECTION D'ANALYTE MARQUE PAR UN SENSIBILISATEUR											Jenn
WO2006029891A2	CHANGE OF THE LOAD STATE OF MHC MOLECULES | MODIFICATION DE L'ETAT DE CHARGE DE MOLECULES MHC | ÄNDERUNG DES BELADUNGSZUSTANDES VON MHC-MOLEKÜLEN											Jenn
WO2004018998A2	METHOD USING REAL-TIME PCR | PROCEDE PERMETTANT D'UTILISER L'AMPLIFICATION EN CHAINE PAR POLYMERASE EN TEMPS REEL					Y						Jenn
WO2006014232A3	DENGUE PROTEASE SUBSTRATES AND INHIBITORS | SUBSTRATS ET INHIBITEURS DES PROTEASES DE LA DENGUE											Jenn
WO2005086612A2	FLUORINATED CARBOHYDRATE CONJUGATES | CONJUGUES GLUCIDIQUES FLUORES											Jenn
WO2004108899A2	PNI MICROARRAY AND USES | MICRO-RESEAU PNI ET SON UTILISATION											Jenn
WO2006135818A2	RECIRCULATING MICROFLUIDIC DEVICE AND METHODS OF USE | DISPOSITIF MICROFLUIDIQUE DE RECIRCULATION ET SES PROCEDES D'UTILISATION											Jenn
WO2000007015A1	IMMUNOASSAY DEVICE | DISPOSITIF D'ANALYSE IMMUNOLOGIQUE											Jenn
WO2006046509A1	CANTILEVER SENSOR, SENSOR SYSTEM AND METHOD OF DETECTING ANALYTE IN SPECIMEN LIQUID | CAPTEUR EN PORTE-À-FAUX, SYSTÈME DE CAPTEUR ET PROCÉDÉ DE DÉTECTION D'UNE SUBSTANCE À ANALYSER DANS UN ÉCHANTILLON LIQUIDE											Jenn

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WO2006120230A2	HOST CELL SPECIFIC BINDING MOLECULES CAPABLE OF NEUTRALIZING VIRUSES AND USES THEREOF | MOLECULES DE LIAISON SPECIFIQUES DE CELLULE HOTE CAPABLES DE NEUTRALISER DES VIRUS ET LEURS UTILISATIONS											Jenn
IN200800018I1											No Claims but Dengue Specific in Derwent	Trent
WO1996038474A2	DIAGNOSIS OF, AND VACCINATION AGAINST, A POSITIVE STRANDED RNA VIRUS USING AN ISOLATED, UNPROCESSED POLYPEPTIDE				Y	Y			Y			Trent
IN200502539I1									Y		No Claims but relevant dengue language in abstract	Trent
CN101109751A	Method for detecting dengue virus inside of mosquito by technology of immunofluorescence						Y		Y			Trent
CN101139637A	Primer and probe sequence for detecting dengue virus I type nucleotide segment										No claims but diagnositic kit and dengue in derwent	Trent
US20090325276A1	INTEGRATED MICROFLUIDIC ASSAY DEVICES AND METHODS											Pravin
JP2003516142A											no claims but absstract looks relevant	Pravin
KR2000068915A											detection of virus	Pravin
JP2010500559A											detection of a virus	Pravin
JP2010502937A										Y	detection of virus	Pravin
WO2005058229A2	ANTIVIRAL PROTEINS WITH IMPROVED PROPERTIES AND METHODS THEREFOR | PROTEINES ANTIVIRALES DOTEES DE PROPRIETES AMELIOREES, ET PROCEDES ASSOCIES										method of detection	Pravin

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WO2003036299A2	PROCEDURE FOR QUANTITATIVE DETERMINATION OF VIRAL OR BACTERIAL PARTICLES HAVING A CHOLESTEROL-CONTAINING ENVELOPE | PROCEDE PERMETTANT UNE DETERMINATION QUANTITATIVE DE PARTICULES VIRALES OU BACTERIENNES PRESENTANT UNE ENVELOPPE CONTENANT DU CHOLESTEROL									Y	detection of virus	Pravin
SU1836422A3	VIRUS EXTRACTION METHOD FOR UNAPPARENT, ACUTE AND CHRONIC FORMS OF FLAVI VIRUS INFECTIONS									Y	diagnosis of virus	Pravin
JP2004363921A	MOSAIC IMAGE FORMATION SYSTEM, AND PROGRAM AND METHOD | A mosaic image formation system, a program, and a method										detection of virus, digital card	Pravin
CN101500591A	Compositions and methods using same for the detection of viruses										Detection of Virus - Claim 11	Pravin
IN200701689I1											No Claims but looks relevant based on Derwent	Jenn
WO2004042001A2	VIRUS-LIKE PARTICLES, METHODS OF PREPARATION, AND IMMONOGENIC COMPOSITIONS | PARTICULES PSEUDOVIRALES, PROCEDE DE FABRICATION ET COMPOSITIONS IMMUNOGENIQUES										Detection of Virus	Amrita
JP2006153831A	CANTILEVER SENSOR, SENSOR SYSTEM, AND METHOD FOR DETECTING SUBSTANCE TO BE DETECTED IN SPECIMEN LIQUID | The detection method of the detection-target substance in a cantilever sensor, a sensor system, and a test-substance liquid										No Claims but looks relevant according to abstract	Amrita
IN200800488I1									Y		No Claims but looking at abstract	Amrita
CA2495138A1	MULTIPLEXED ANALYSIS FOR DETERMINING A SERODIAGNOSIS OF VIRAL INFECTION | ANALYSE MULTIPLEXEE POUR L'ETABLISSEMENT D'UN SERODIAGNOSTICD'UNE INFECTION VIRALE										Detection of Virus	Amrita

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WO2007100500A2	SAMPLE PROCESSING | TRAITEMENT D'ÉCHANTILLON											Ted
EP1454988A1	Infectious flavivirus pseudo-particles containing functional prM-E envelope proteins | Pseudo-particules du flavivirus infectieuses contenant des protéines prM-E d'enveloppe | Infektiöse Flavivirus Pseudo-Partikel, welche funktionelle prM-E Hüllproteine enthalten											Ted
IN200800017I1											No Claims but detection for dengue in derwent	Kara
TW200927939A						Y					No Claims but talk about the method for diagnosis dengue	Kara
KR2002042533A											No Claims but talked about flavivirus, and kit for detecting flavivirus	Kara
US20080318207A1	SEQUENCE COVARIANCE NETWORKS, METHODS AND USES THEREFOR											Kara
US6387628B1	Mass spectrometric detection of polypeptides										Just Virus (Look at Descp)	Jenn
EP100955A3	Monoclonal immunoglobulin M antibodies and method of preparation | Anticorps monoclonaux immunoglobuline M et procédé pour leur préparation | Monoklonale Immunoglobulin-M-Antikörper und Verfahren zu deren Herstellung										No Claims and IGM Detection	Jenn
US20030087284A1	Virus-binding particles, virus-separating reagent, separation of viruses, and detection of viruses										Look at Descp	Jenn

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US20040086949A1	Method for preparing a ligand presenting assembly (LPA), an LPA and uses thereof										Look at Desc	Jenn
EP1137800B1	METHOD FOR PURIFYING OR ISOLATING VIRAL NUCLEIC ACIDS | PROCEDE DE PURIFICATION OU D'ISOLEMENT D'ACIDES NUCLEIQUES VIRAUX | VERFAHREN ZUR REINIGUNG BZW. ISOLIERUNG VIRALER NUKLEINSÄUREN										Look in Desc	Jenn
US20020146686A1	Methods and compositions for the diagnosis and treatment of viral disease using 55092											Jenn
US20080199972A1	Spectroscopic Method For the Detection of Analytes											Jenn
US7476387B2	Chimeric empty viral-like particles derived from the infectious bursal disease virus (IBDV), process for their production and applications											Ted
EP1958637A1	Pharmaceutical composition for the treatment of IL-8 mediated diseases | Pharmazeutische Zusammensetzung zur Behandlung von IL-8-vermittelten Erkrankungen | Composition pharmaceutique pour le traitement de maladies induites par IL-8								Y			Ted
EP1975250A1	Rapid determination of genotypic differences | Rasche Bestimmung genotypischer Unterschiede | Détermination rapide de différences génotypiques											Ted
US7057027B2	Enhanced triple-helix and double-helix formation with oligomers containing modified pyrimidines										Look in Description	Ted
EP673510A1	SUSPENSION VON TEILCHEN MIT EINEM KLEINEREN DURCHMESSEN ALS 1 MICRO M MIT IMMOBILISIERTEN ENZYM UND PROTEIN | SUSPENSION DE PARTICULES POSSEDANT UN DIAMETRE INFERIEUR A 1 MICRO M AVEC ENZYME ET PROTEINE IMMOBILISES | SUSPENSION OF PARTICLES WITH A DIAMETER OF LESS THAN 1 MICRO M WITH IMMOBILIZED ENZYME AND PROTEIN										Based on Abstract / No Claims	Ted
US5594121A	Enhanced triple-helix and double-helix formation with oligomers containing modified purines										Based on Abstract	Ted

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EP827552B1	DETECTION D'UNE SEQUENCE NUCLEOTIDIQUE AVEC AMPLIFICATION DE SIGNAL | NACHWEIS VON NUKLEOTIDSEQUENZEN DURCH SIGNALAMPLIFIZIERUNG | NUCLEOTIDE SEQUENCE DETECTION WITH SIGNAL AMPLIFICATION										Relevant Based on Abstract	Ted
EP835449A1	VERFAHREN ZUM GLEICHZEITIGEN NACHWEIS VON UNTERSCHIEDLICHEN ANTIKÖRPERN | PROCEDE DE DETECTION SIMULTANEE DE DIFFERENTS ANTICORPS ET/OU ANTIGENES | METHOD FOR THE SIMULTANEOUS DETECTION OF DIFFERENT ANTIBODIES AND/OR ANTIGENS										No Claims/ Look in Abstract	Ted
US20100021937A1	METHOD FOR DETECTING PATHOGENS USING MICROBEADS CONJUGATED TO BIORECOGNITION MOLECULES											Trent
US20020156584A1	Insect collection and test				Y							Trent
US7514400B2	Synthetic mimics of mammalian cell surface receptors: method and compositions										Detecting Virus in claims	Amrita
US20080279863A1	THERAPEUTIC ANTIBODIES FOR TREATMENT AND PROPHYLAXIS OF TRANSMITTABLE VIRAL DISEASES										Detects Tranmittable Virus	Amrita
US20090075274A1	MULTIPLEXED QUANTITATIVE DETECTION OF PATHOGENS					Y					Detects Viral Pathogen	Amrita
US20080021674A1	Methods for Enhancing the Analysis of Particle Detection							Y			Detection of Virus	Amrita
US20090081675A1	METHODS, COMPOUNDS AND SYSTEMS FOR DETECTING A MICROORGANISM IN A SAMPLE					Y					Detection of Virus	Amrita
US20100003667A1	MULTIPLE LABELLING FOR ANALYTE DETECTION				Y						Detection of Virus	Amrita
US6297004B1	Recombinant viruses displaying a nonviral polypeptide on their external surface										Detection of Virus	Pravin
US5989805A	Immortal avian cell line to grow avian and animal viruses to produce vaccines										detection of Virus	Pravin
US6183950B1	Method and apparatus for detecting viruses using primary and secondary biomarkers										detection of Virus	Pravin
US7670766B2	Early detection of flaviviruses using the NS1 glycoprotein				y				Y	Y		Pravin

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WO1993002202A1	COMPOSITIONS AND METHODS FOR REPRODUCING POSITIVE DIAGNOSTIC INDICATIONS | COMPOSITIONS ET PROCEDES DE REPRODUCTION D'INDICATIONS DIAGNOSTIQUES POSITIVES										detection of virus	Pravin
WO1995026416A1	NUCLEIC ACID BIOSENSOR DIAGNOSTICS | PROCEDE DE DIAGNOSTIC PAR BIOCAPTEURS D'ACIDE NUCLEIQUE										detection of virus	Pravin
WO1998018006A1	DEVICES AND METHODS COMPRISING A SERUM ALBUMIN-TARGET ANTIGEN COMPLEX | DISPOSITIFS ET PROCEDES A BASE D'UN COMPLEXE CONSTITUE PAR DE L'ALBUMINE SERIQUE ET UN ANTIGENE CIBLE				y						detection of virus	Pravin
WO2002016555A3	HTERT-IMMORTALISED CELL LINES, THEIR PREPARATION AND USE | LIGNEES CELLULAIRES, LEUR PREPARATION ET LEUR UTILISATION										detection of a virus	Pravin
WO2003004526B1	SEQUENCES INVOLVED IN PHENOMENA OF TUMOUR SUPPRESSION, TUMOUR REVERSION, APOPTOSIS AND/OR RESISTANCE TO VIRUSES AND THEIR USE AS MEDICINES | SEQUENCES IMPLIQUEES DANS LES PHENOMENES DE SUPPRESSION TUMORALE, REVERSION TUMORALE, APOPTOSE ET/OU RESISTANCE AUX VIRUS ET LEUR UTILISATION COMME MEDICAMENTS										based on abstract claims on french	Pravin
WO2004079334A2	BIOMARKER DETECTION BASED ON ASPECTS OF ION MOBILITY | DETECTION DE MARQUEURS BIOLOGIQUES EN FONCTION DES ASPECTS DE LA MOBILITE IONIQUE										detection of a virus	Pravin
WO2004100787A1	DEVICE FOR DETECTING BIOLOGICAL AGENTS AND CHEMICAL SUBSTANCES | DISPOSITIF DE DETECTION D'AGENTS BIOLOGIQUES ET DE SUBSTANCES CHIMIQUES										No Claims/ Detection of Viruses	Kara
WO2005001128A3	MATERIALS AND METHODS FOR PRODUCING DNA LIBRARIES AND DETECTING AND IDENTIFYING MICROORGANISMS | MATERIAUX ET PROCEDES DE PRODUCTION DE BIBLIOTHEQUES D'ADN, DETECTION ET IDENTIFICATION DE MICRO-ORGANISMES										No Claims/ Library in Abstract	Kara

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WO2005031300A3	DEVICE FOR DETECTING BIOLOGICAL AND CHEMICAL PARTICLES | DISPOSITIF DE DETECTION DE PARTICULES BIOLOGIQUES ET CHIMIQUES										In Claims claim a Plate that can be used to detect Viruses	Kara
WO2005078443A1	DETERMINATION OF INFECTION BY THE IMMUNE RESPONSE TO A CARBOHYDRATE MOIETY | DETERMINATION D'INFECTION PAR LA REPONSE IMMUNITAIRE A UN GROUPE FONCTIONNEL GLUCIDIQUE										Just Detecting Viral	Kara
WO2006057569A1	CONTACTLESS DEVICE FOR DETERMINING BIOLOGICAL AGENTS AND CHEMICAL SUBSTANCES IN BIOLOGICAL MEDIA | DISPOSITIF SANS CONTACT SERVANT A DETERMINER LES AGENTS BIOLOGIQUES ET LES SUBSTANCES CHIMIQUES DANS UN MILIEU BIOLOGIQUE										No Claims	Kara
WO2007034507A3	TETRAVALENT DENGUE SPECIFIC DOMAIN III BASED CHIMERIC RECOMBINANT PROTEIN | PROTEINE DE RECOMBINAISON CHIMERIQUE TETRAVALENTE BASEE SUR LE DOMAINE III SPECIFIQUE DE LA DENGUE										No Claims but has detection and Diagnosis of Dengue	Kara
WO2007100397A2	COMPOSITIONS FOR USE IN IDENTIFICATION OF ADVENTITIOUS CONTAMINANT VIRUSES | COMPOSITIONS DESTINEES A ETRE UTILISEES POUR L'IDENTIFICATION DE VIRUS CONTAMINANTS ADVENTICES										No Claims but rapid identification of viruses	Kara
WO2007146197A1	METHODS AND REAGENTS FOR VIRUS ISOLATION AND DETECTION | PROCÉDÉS ET RÉACTIFS DESTINÉS À L'ISOLEMENT ET À LA DÉTECTION DE VIRUS										Just Method of Detecting Virus	Kara
WO2008041953A2	DENGUE DIAGNOSIS AND TREATMENT | DIAGNOSTIC ET TRAITEMENT DE LA DINGUE										No Claims but Diagnosis of Dengue	Kara
WO2008048300A2	PATHOGEN DETECTION BIOSENSOR | Biocapteur de détection pathogène										No Claims but Detection of Virus	Kara

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WO2008053992A1	EFFICIENT METHOD FOR DETECTING ANTIGEN, VIRUS, CELL AND MICROORGANISM | PROCÉDÉ EFFICACE POUR LA DÉTECTION D'ANTIGÈNE, DE VIRUS, DE CELLULES ET DE MICRO-ORGANISMES										No Claim Method of Detecting Virus	Kara
WO2009005542A2	DETECTION OF BIOAGENTS USING A SHEAR HORIZONTAL SURFACE ACOUSTIC WAVE BIOSENSOR | DÉTECTION D'AGENTS BIOLOGIQUES À L'AIDE D'UN CAPTEUR BIOLOGIQUE À ONDES ACOUSTIQUES DE SURFACE À CISAILLEMENT HORIZONTAL										No Claims	Kara
WO2009019455A3	ANALYSIS OF NUCLEIC ACIDS OF VARYING LENGTHS BY DIGITAL PCR | ANALYSE D'ACIDES NUCLÉIQUES PAR PCR NUMÉRIQUE										No Claims	Kara
WO2009038840A2	COMPOSITIONS FOR USE IN IDENTIFICATION OF ADVENTITIOUS CONTAMINANT VIRUSES | COMPOSITIONS DESTINÉES À ÊTRE UTILISÉES POUR L'IDENTIFICATION DE VIRUS CONTAMINANTS ADVENTICES										No Claims Identification of Virus	Kara
WO2009049406A1	USE OF PS20 /WFDC1 AND INTERFERONS TO DIAGNOSE, MONITOR AND TREAT VIRAL DISEASES | DIAGNOSTICS ANTIVIRAUX ET THÉRAPIES AFFÉRENTES										Method for detecting Viral Disease	Kara
WO2009052623A1	THERAPEUTIC AND DIAGNOSTIC METHODS USING TIM-3 | MÉTHODES THÉRAPEUTIQUES ET DIAGNOSTIQUES UTILISANT LE TIM-3										Detection of Virus in Claims	Kara
WO2009072441A1	DETECTION METHOD AND DETECTION KIT | PROCÉDÉ DE DÉTECTION ET COFFRET DE DÉTECTION										No Claims Detecting Virus in Abstract	Kara
WO2009091983A1	METHODS FOR DETECTING AN ANALYTE | PROCÉDÉS DE DÉTECTION D'UN ANALYTE										Virus Detection in Claims	Kara
WO2009092068A1	METHODS OF DETECTING SIGNATURES OF DISEASE OR CONDITIONS IN BODILY FLUIDS | PROCÉDÉS DE DÉTECTION DE SIGNATURES D'UNE MALADIE OU D'ÉTATS DANS DES FLUIDES CORPORELS										Infectious Agent is Virus	Kara

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WO2009094955A2	PROCEDIMIENTO PARA LA CUANTIFICACIÓN DEL ANTÍGENO NS1 DE DENGUE EN TIRA INMUNOCROMATOGRÁFICA. | PROCÉDÉ DE QUANTIFICATION DE L'ANTIGÈNE NS1 DE LA DENGUE SUR BANDE IMMUNOCHROMATOGRAPHIQUE | METHOD FOR QUANTIFICATION OF THE DENGUE NS1 ANTIGEN ON AN IMMUNOCHROMATOGRAPHIC STRIP										No Claims but seems relevant in abstract	Kara
WO2009098789A1	METHOD OF DETECTING PATHOGENIC VIRUS IN CRUSTACEAN BY LAMP METHOD AND REAGENT KIT FOR DETECTION | PROCÉDÉ DE DÉTECTION D'UN VIRUS PATHOGÈNE DANS UN CRUSTACÉ PAR LA MÉTHODE LAMP ET COFFRET DE RÉACTIFS POUR LA DÉTECTION										No Claims Detecting a Pathogenic Virus	Kara
WO2009116266A1	METHOD AND KIT FOR DETECTION/IDENTIFICATION OF VIRUS-INFECTED CELL | PROCÉDÉ ET COFFRET POUR LA DÉTECTION/L'IDENTIFICATION D'UNE CELLULE INFECTÉE PAR UN VIRUS										No claims method of detecting or identifying virus	Kara
WO2009140735A1	ANALYTE DETECTION BY MICRONEEDLE PATCH WITH ANALYTE SELECTIVE REAGENTS. | DÉTECTION DE SUBSTANCES À ANALYSER PAR UN TIMBRE À MICRO-AIGUILLES AVEC DES RÉACTIFS SÉLECTIFS										Detecting Virus	Kara
WO2009143555A1	CONCENTRATION FILTERING AND ANALYSIS OF FLUIDS | FILTRAGE DE CONCENTRATION ET ANALYSE DE FLUIDES										Detecting Virus	Kara
WO2009157683A2	RT-PCR METHOD USING N-PRIMER AND KIT FOR RT-PCR COMPRISING N-PRIMER | PROCÉDÉ DE TRANSCRIPTION INVERSE-AMPLIFICATION EN CHAÎNE PAR POLYMÉRASE (RT-PCR) UTILISANT UNE AMORCE N ET KIT POUR RT-PCR COMPRENANT LADITE AMORCE N					Y					No Claims but Method to Detection Virus in Abstract	Kara
WO2010009398A1	METHODS FOR PCR-BASED DETECTION OF "ULTRA SHORT" NUCLEIC ACID SEQUENCES | PROCÉDÉS POUR UNE DÉTECTION À BASE DE PCR DE SÉQUENCES D'ACIDE NUCLÉIQUE "ULTRACOURT"										Detecting Virus in claims	Kara
WO2010011002A1	METHOD AND SYSTEM FOR DIAGNOSING VIRUS | PROCÉDÉ ET SYSTÈME DE DIAGNOSTIC VIRAL										Detecting Virus	Kara

Patent Document Analytics

The following results reflect an analysis of the 3725 coded patent documents. The distribution of relevancy is as follows: Number of Relevant Technology Patent Documents: 133; Number of Emerging Technology Patent Documents: 157. This analysis was mostly performed using Thomson Innovation®, but Westlaw®'s Asia Pacific database was also used (shown in Appendix G). The majority of these graphs and charts were generated using Thomson Innovation®'s "*Analyze Charts*" function but other data processing tools such as Microsoft Office Suite®, Statisticum.org, and GNU Image Manipulation Program.

4.A. Relevant Technology Patent Documents

The following sub-sections within *4.A* present patent documents categorized as relevant technology. These patent documents were coded yellow in our spread sheet (Section 3D). There were a total of 133 patent documents that were coded into the relevant technology category.

4.A.1 Patent Count v. Country

The following table and graphs show the top countries and organizations with Dengue diagnostic holdings. This analysis is based on the number of published patents documents each country or organization has published or issued. The three countries/organizations having the most patents and applications are the United States, WIPO, and China. Country Codes are as follows: US = United States, WO = WIPO, CN = China, EP = Europe, JP = Japan, GB = Great Britain, KR = Korea, SG = Singapore.

Country code	Document Count
US	67
WO	38
CN	17
EP	3
JP	3
GB	2
KR	2
SG	1

Table 1: Country codes showing the top countries and the number of relevant technology patent documents found in the top countries

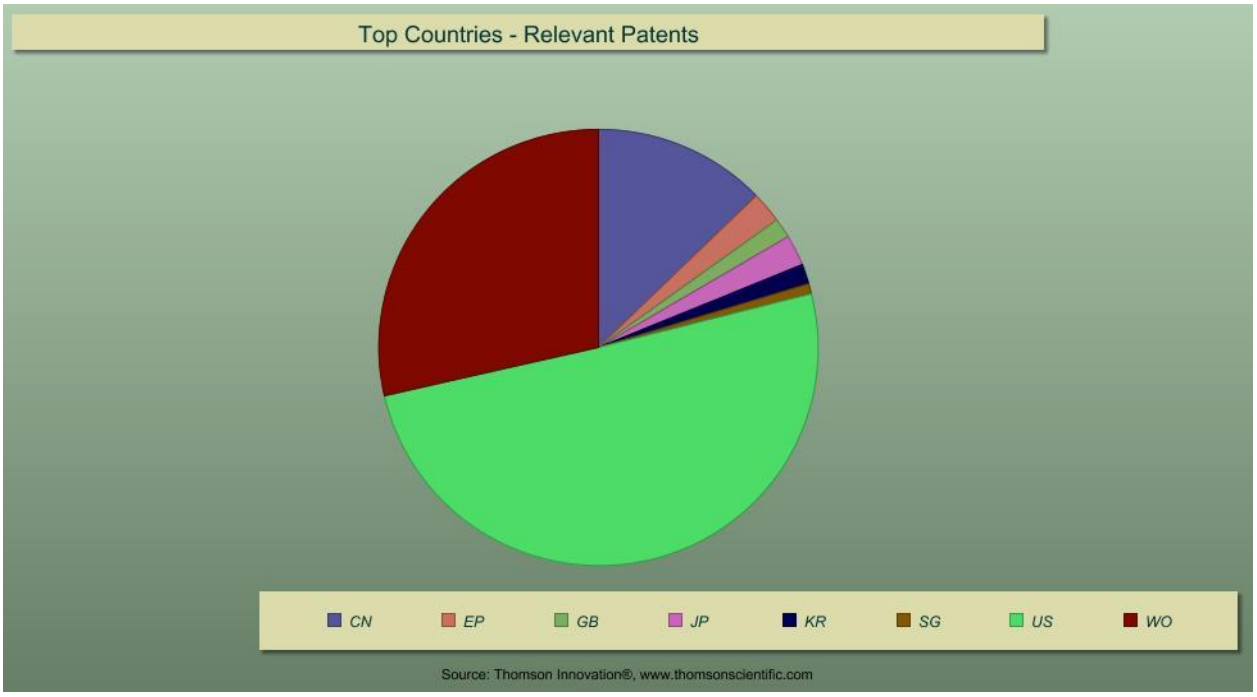


Figure 19: Pie chart showing the number of relevant technology patent documents present in the top countries

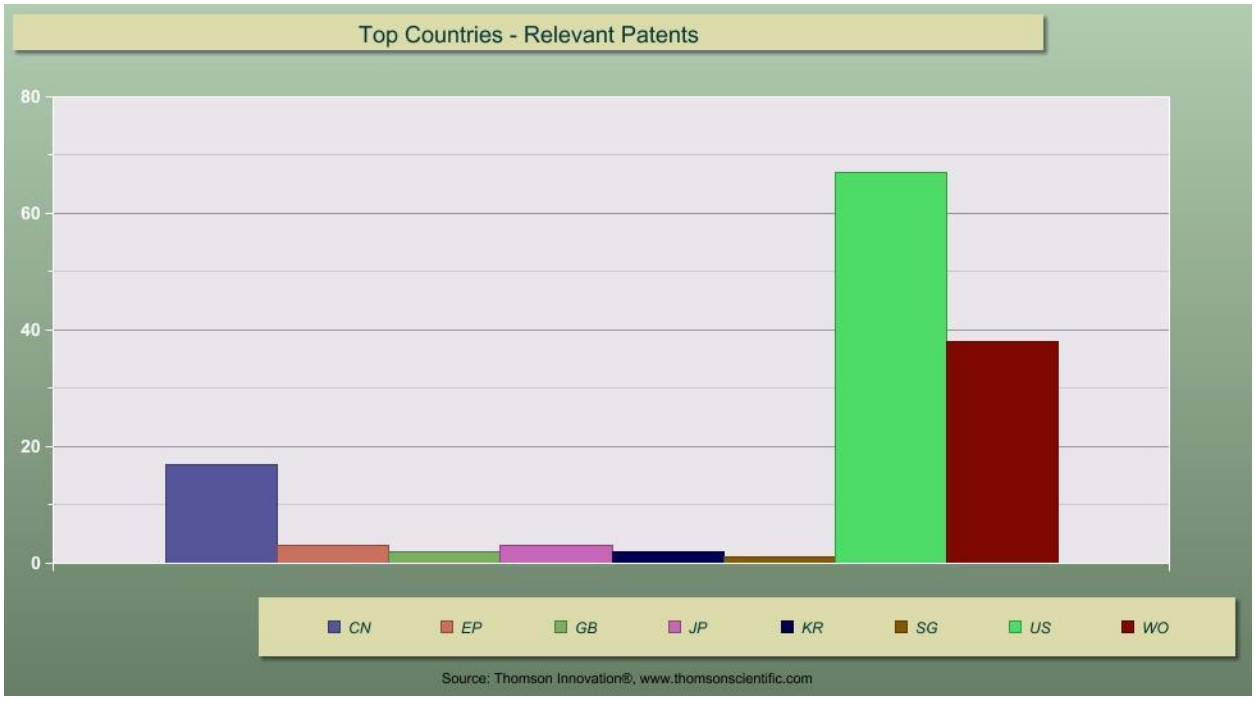


Figure 20: Bar graph showing the number of relevant technology patent documents present in by the top countries

4.A.2 Patent Count v. Publication Date

The following tables and graph show the publishing trends of patents documents worldwide that are relevant to dengue diagnostic. Analysis of relevant patent documents trends shows a steady increase in publication till 2005. Publication rate stayed nearly similar during 2005 – 2007 and then increased. This increase may be a result of more regions, countries, and people being affected by dengue. The reduction in publication in 2010 is a result of not having completed the year and having patent documents in the process of being published.

Publication Year	Document Count
2010	5
2009	23
2008	18
2007	11
2006	11
2005	12
2004	10
2003	9
2002	7
2001	5
2000	6
1999	6
1998	3
1997	1
1995	3
1993	1
1992	1
1989	1

Table 2: Publication trends of relevant technology patent documents worldwide for the last twenty years

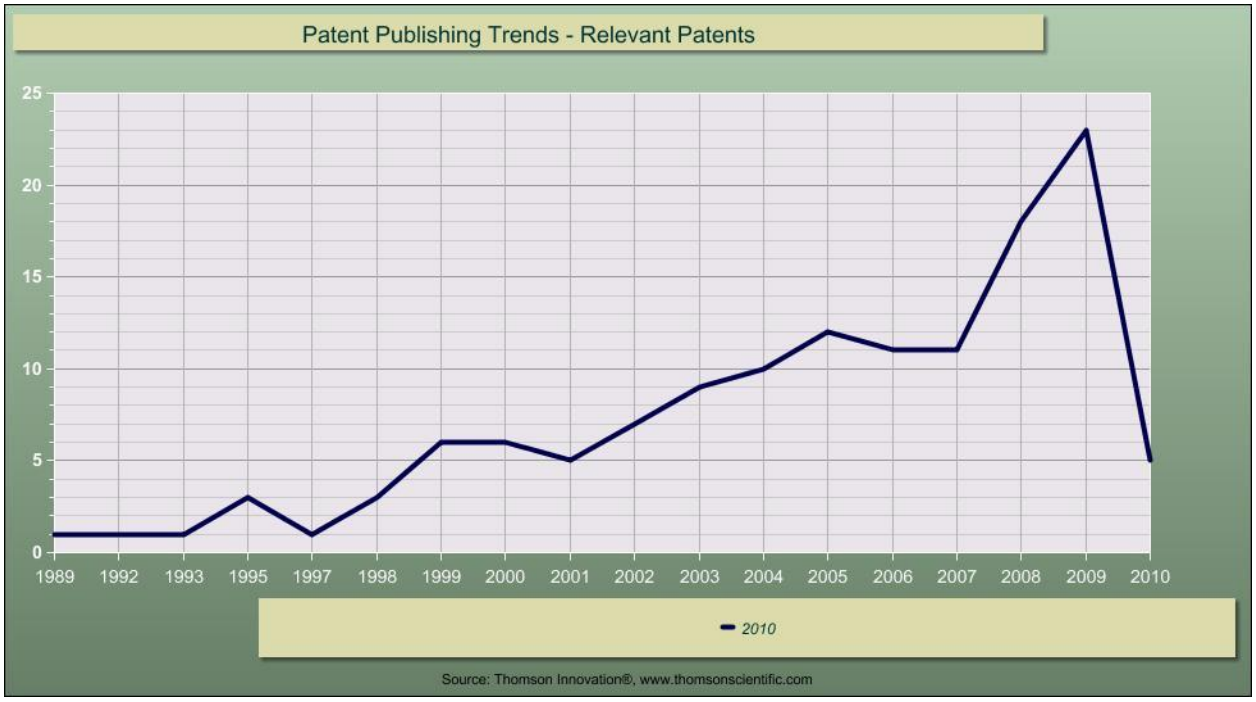


Figure 21: Line graph depicting publication trends of relevant technology patent documents worldwide for the last twenty years

4.A.3 Patent Count v. Application (Filing) Date

The following tables and graph show the publishing trends of patents documents worldwide that are relevant to dengue diagnostic. Analysis of relevant patent documents trends shows a steady increase in publication till 2005. Publication rate stayed nearly similar during 2005 – 2007 and then increased. This increase may be a result of more regions, countries, and people being affected by dengue. The reduction in publication in 2010 is a result of not having completed the year and having patent documents in the process of being published.

Application Year	Patent Documents
1986	1
1987	0
1988	0
1989	0
1990	0
1991	0
1992	1
1993	3
1994	4
1995	2
1996	1
1997	2
1998	9
1999	4
2000	6
2001	5
2002	8
2003	12
2004	12
2005	12
2006	10
2007	17
2008	9
2009	15
Total	133

Table 3: Filing dates of relevant technology patent documents worldwide for approximately twenty years

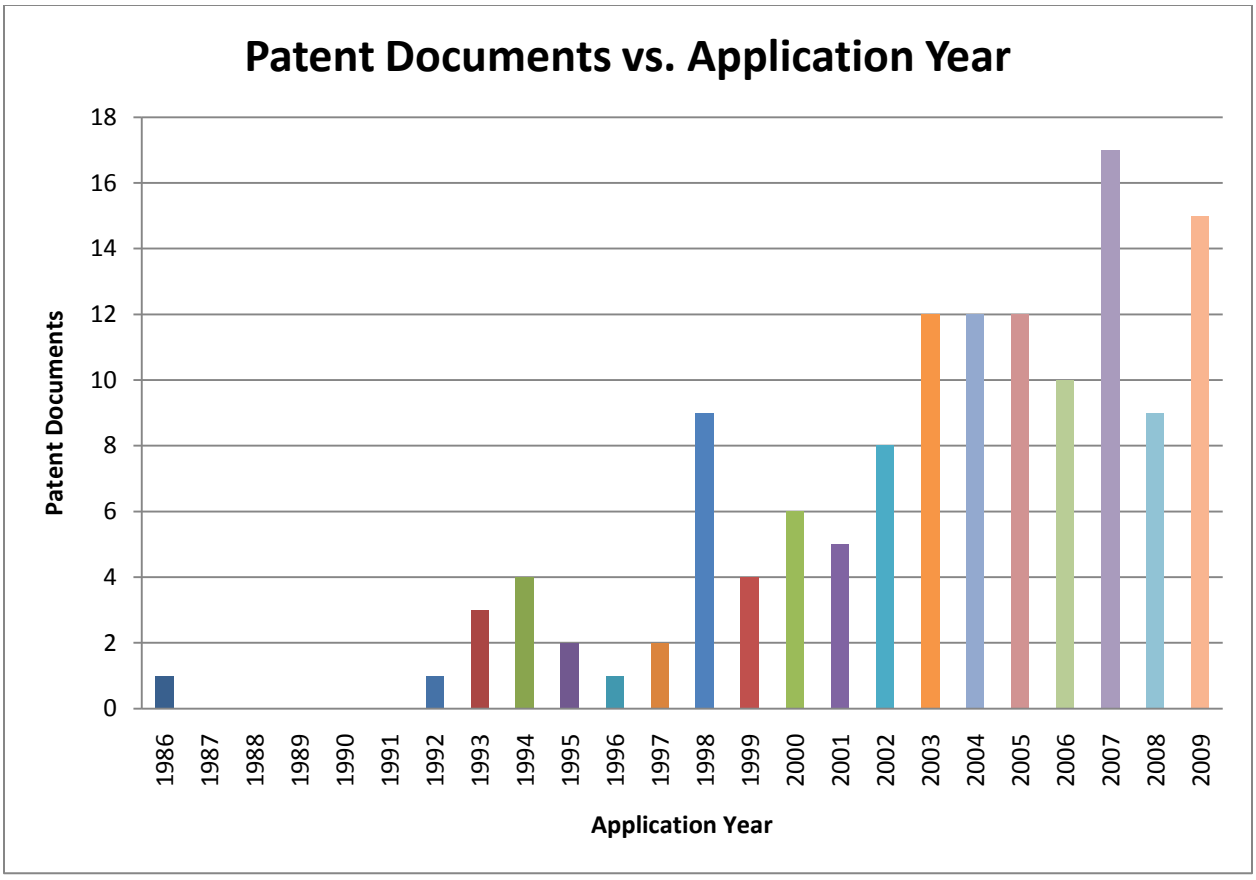


Figure 22: Bar graph depicting filing dates of relevant technology patent document for approximately twenty years.

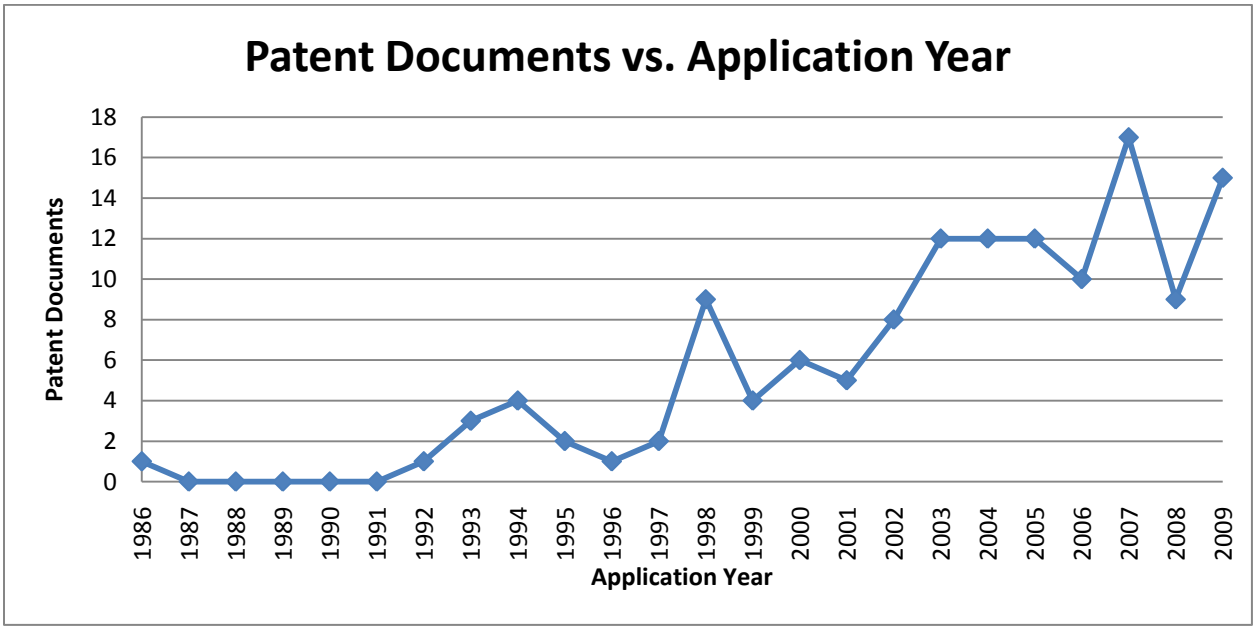


Figure 23: Line graph depicting filing dates of relevant technology patent documents for approximately twenty years.

4.A.4 Patent Count v. US Classification

U.S. classification information is only available for US issued patents and US patent applications. The following analytics are based on the 67 relevant technology US patent documents with 66 of the remaining relevant technology patent documents not analyzed as they are not categorized under this US classification system. The 67 US patent documents fall into 10 US classes with the top two US classes being Class 424 and Class 435. When further divided into US sub-classification, the top six sub-classifications belong to Class 424/218.1, Class 435 including 435/005, 435/006, 435/007.1, and 435/069.1, and Class 530/350. The definition of these US classifications and sub-classifications are shown in Appendix C. Table 4 and Figure 24, a bar graph, show the top 10 3-digit US classes of these 67 relevant technology patent documents from the United States. Table 5 and Figure 25, a bar graph, show the top 20 US classes/sub-classes of the 67 United States relevant technology patent documents.

US Class (3-digit)	Patent Count
435	62
424	26
536	21
530	17
514	8
436	7
356	3
422	1
433	1
977	1

Table 4: Top 10 US 3-digit classes for the 67 US relevant technology patent documents

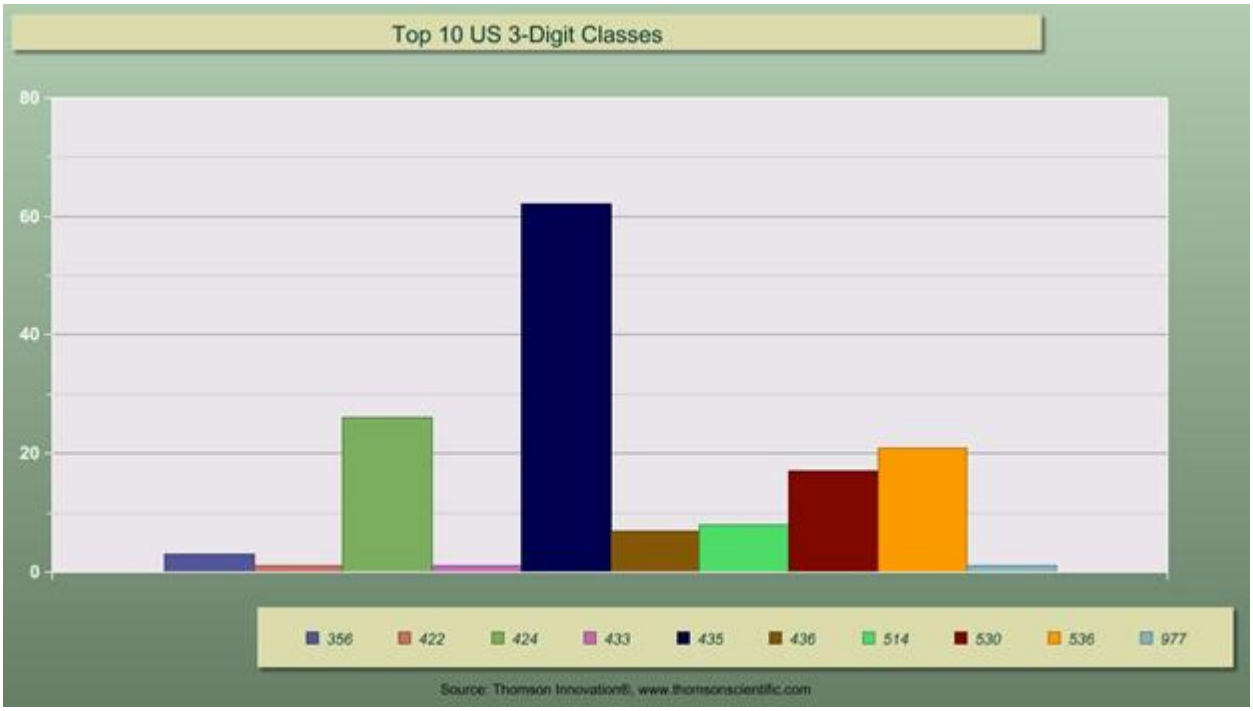


Figure 24: Bar graph of the top 10 US 3-digit classes of the 67 US relevant technology patent documents

US Class/Sub-Class	Patent Count
435/005	43
435/006	21
424/218.1	14
435/007.1	10
435/069.1	9
530/350	9
435/235.1	8
536/023.72	7
424/186.1	6
435/091.2	6
435/320.1	6
435/325	6
435/007.92	4
435/069.3	4
435/239	4
514/012	4
530/388.3	4
424/192.1	3
536/023.53	3
536/023.1	3

Table 5: Top 15 US classes/sub-classifications for the 67 US relevant technology patent documents

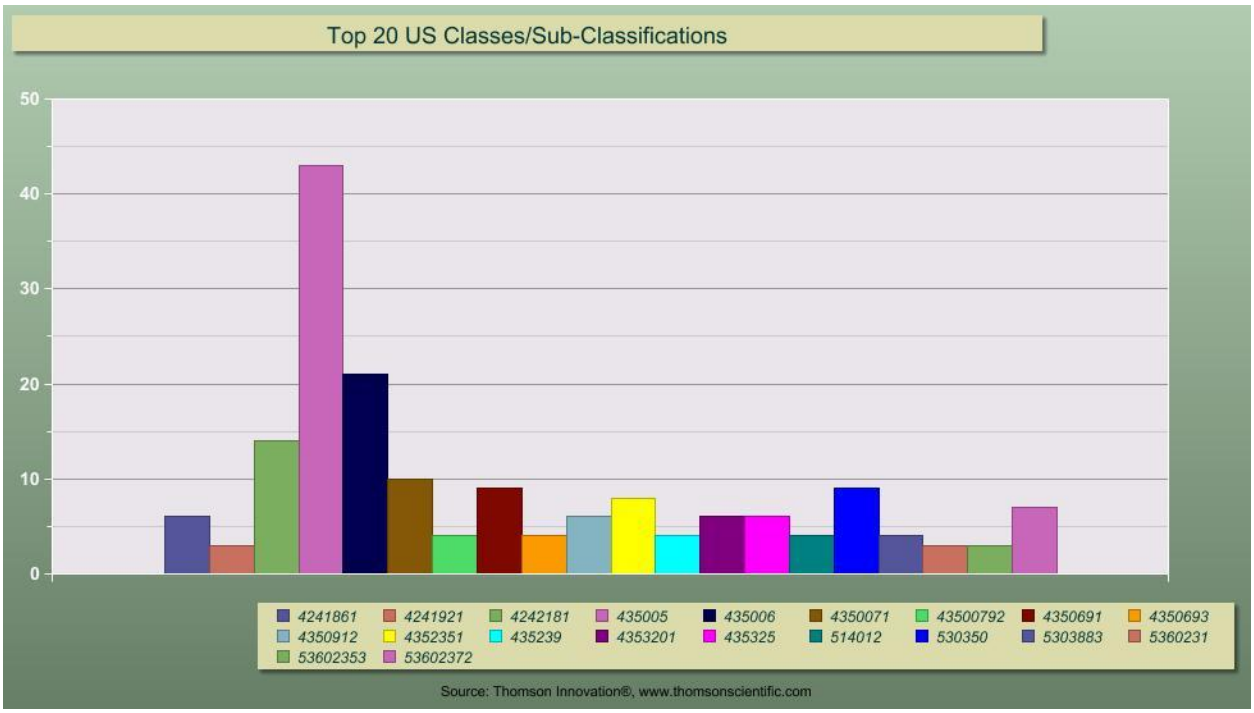


Figure 23: Bar Graph of the Top 20 US Classes/Sub-Classes of the 67 US Relevant Technology Patent Documents

4.A.5 Patent Count v. IPC Classification

IPC classification information is an international system from the World Intellectual Property Organization (WIPO) and is used in more than 100 countries. The following analytics are based on the 133 relevant technology patent documents. The 133 patent documents fall into more than 20 IPC classifications the top three IPC classes being Class C07K, Class C12Q and Class G01N. When further divided into IPC sub-classifications, the top five sub-classifications belong to Class C07K including C07K14/005 and C07K14/18, Class C07Q including C07Q1/68 and C07Q1/70, and Class G01N33/569. The definition of these US classifications and sub-classifications are shown in Appendix D. Table 6 and Figure 26, a bar graph, show the top 20 IPC classes of the relevant patent documents. Table 7 and Figure 27, a bar graph, show the top 20 IPC classes/sub-classes of the relevant technology patent documents.

IPC Class	Patent Count
C12Q	73
G01N	61
C07K	53
C12N	42
A61K	40
A61P	16
C12P	13
C07H	7
C12M	3
C12R	3
B01J	2
B01L	2
A01N	1
B01F	1
C07D	1
C07F	1
C07M	1
C08J	1
G01J	1
G05B	1

Table 6: Top 20 IPC classes for relevant technology patent documents

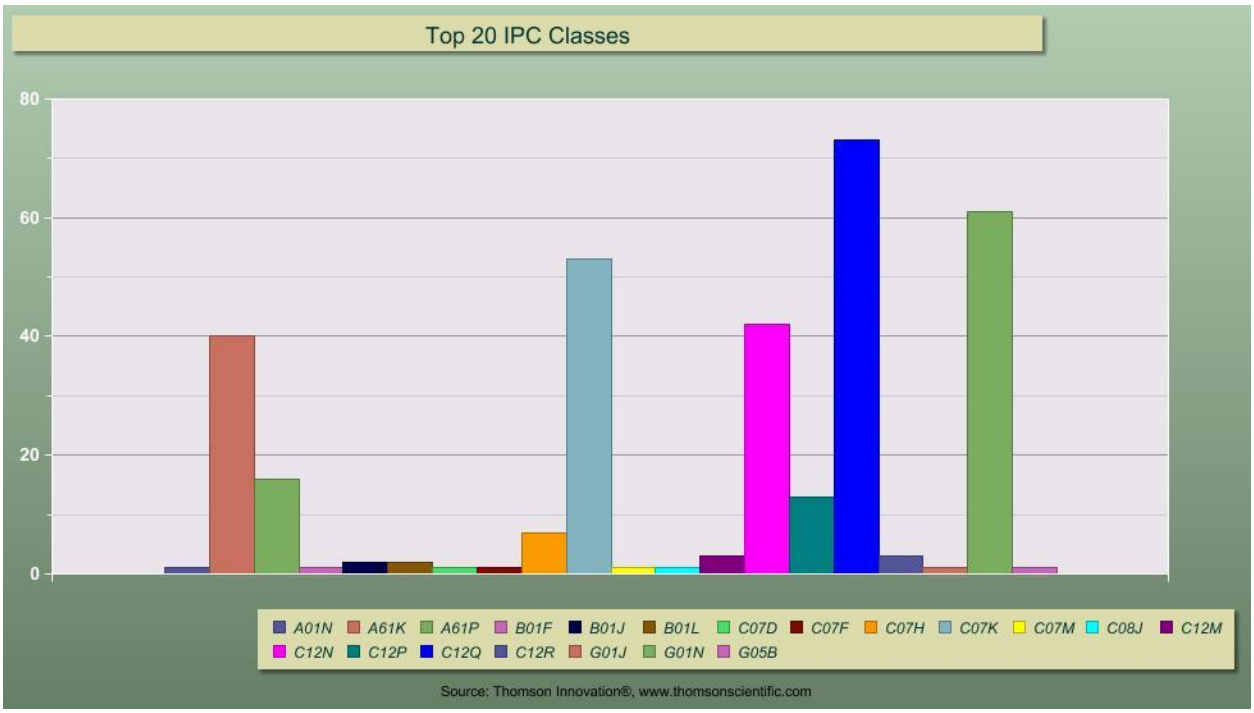


Figure 24: Bar graph of the top 20 IPC classes of relevant technology patent documents

IPC Class	Patent Count
C12Q0001/70	59
G01N0033/569	38
C07K0014/005	34
C07K0014/18	31
C12Q0001/68	31
A61K0039/00	21
C07K0016/08	17
A61P0031/00	16
A61K0039/12	15
C07K0016/10	13
G01N0033/53	13
C12N0005/10	11
C12N0015/09	11
C12N0015/40	11
G01N00335/43	11
A61K0038/00	9
A61P0031/12	9
C07K0016/18	8
A61P0031/14	7
C12N0007/00	7

Table 7: Top 20 IPC classes/sub-classes for relevant patent documents

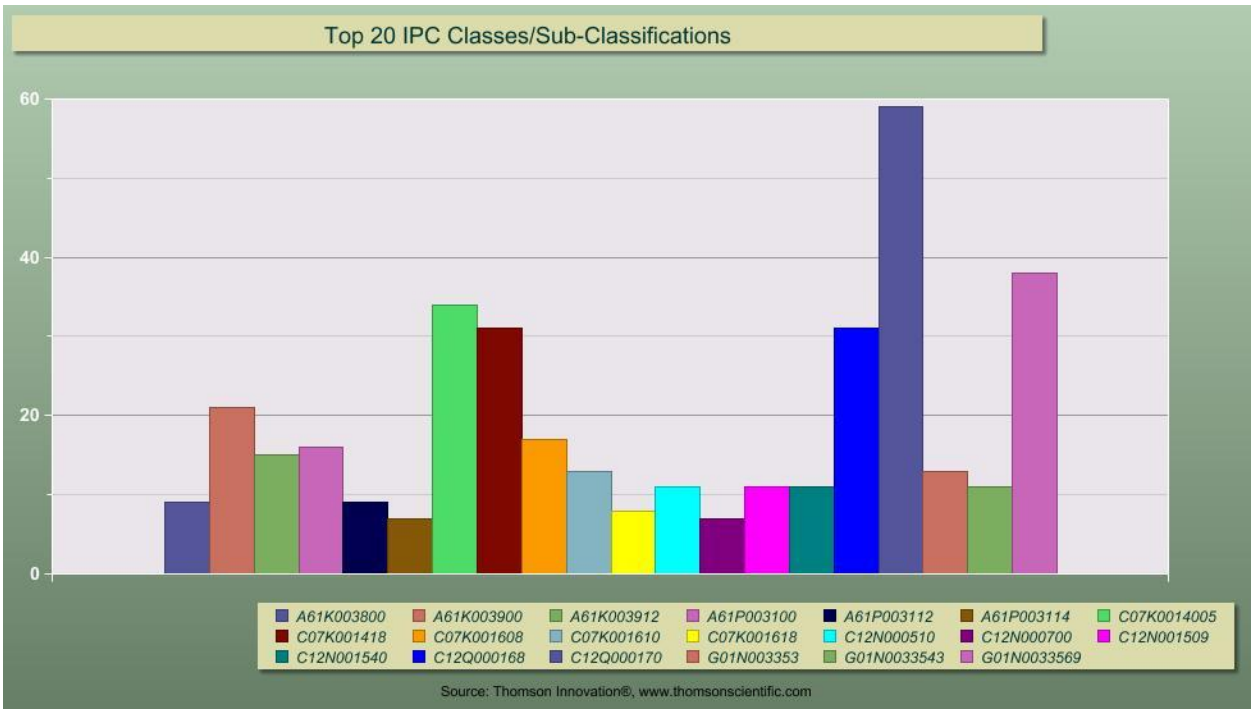


Figure 25: Bar graph of the Top 20 IPC classes/sub-Classes of relevant technology patent documents

4.A.6 Patent Count v. Derwent Class (DWPI Class)

DWPI classification information is available for all but one of the 133 relevant patents documents. As shown in Table 8, the patent documents fall into 6 DWPI classes, and the top two DWPI classes are Class B04 and Class A89. More than four fifths of the relevant documents belong to Class B04. One of the patent documents, WO2006025990A3, is labeled at "unspecified" because it does not have a DWPI class listed. The definitions of the Derwent classes listed in Table 8 below are shown and defined in Appendix E.

DWPI Class-Main	Patent Count	Percentage
A17	1	0.75%
A23	1	0.75%
A89	15	11.28%
A96	4	3.01%
B04	110	82.71%
B05	1	0.75%
unspecified	1	0.75%
Total	133	100.00%

Table 8: DWPI classes of relevant technology patent documents

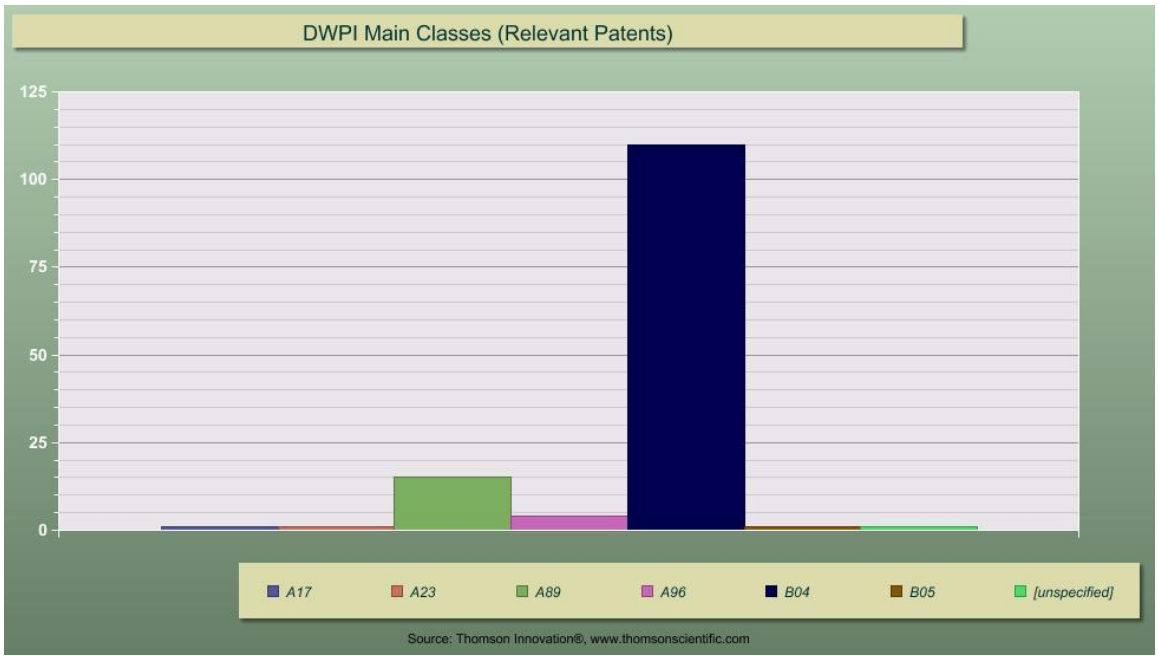


Figure 26: Bar chart - patent count v. DWPI classes of relevant technology patent documents

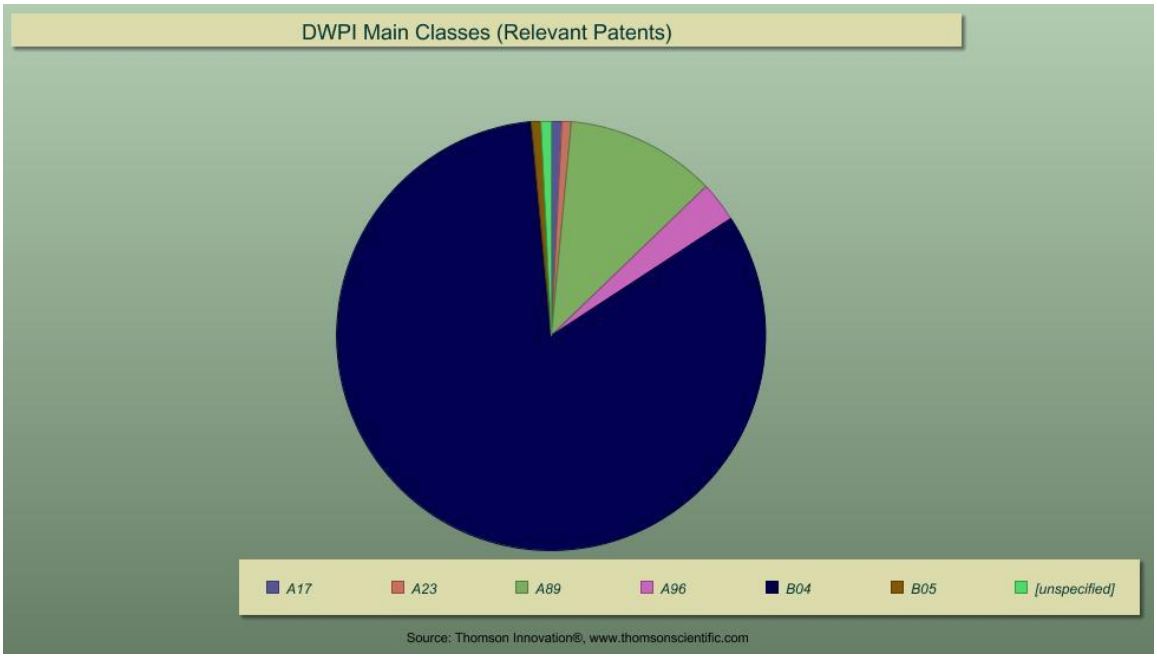


Figure 27: Pie chart - patent count v. DWPI classes of relevant technology patent documents

4.A.7 Patent Count v. Derwent Manual Code

DWPI manual codes are available for most of the patent in this study. As shown in Table 9, the patent documents fall into multiple DWPI manual codes, and the top two DWPI codes are D05-H09 and B12-K04A4. However, there is a 30 patent document drop off after D05-H09 and B12-K04A4. A Bar graph depicting this data is shown in Figure 30.

DWPI Code	Number of Documents
D05-H09	81
B12-K04A4	51
B11-C07A	47
B04-G08	40
B12-K04F	39
B12-K04A4A	38
D05-H06	37
B04-E05	35
D05-H06A	35
D05-H11	35
B04-F11	34
S03-E09F	34
B11-C08E5	33
B04-E01	31
D05-H07	30
S03-E14H	30
B04-B04C1	29
B04-G01	29
B04-F11B	26
D05-H12D1	26

Table 9: Top 20 derwent manual codes for relevant technology patent documents

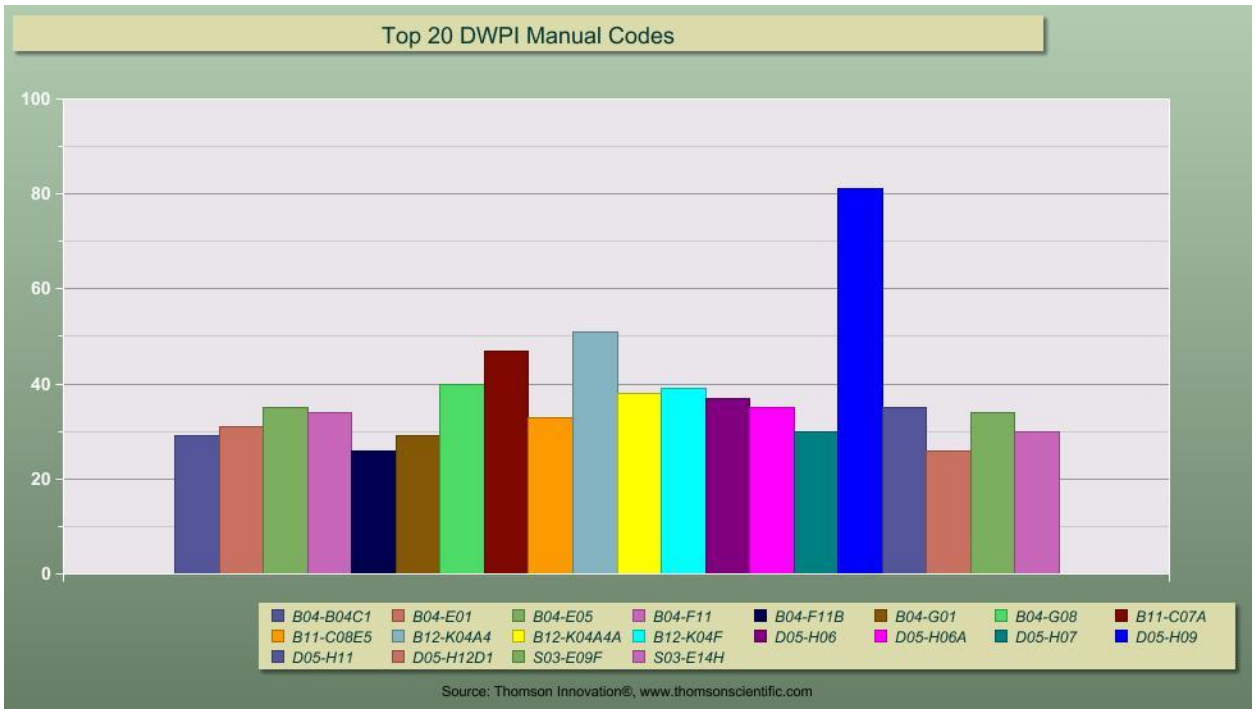


Figure 30: Bar graph depicting the Top 20 DWPI manual codes of relevant technology patent documents

4.A.8 Patent Count v. Assignees

Error! Reference source not found. Figure 31 shows the top ten assignees for the relevant patent documents based on original assignee data. The Top 10 Assignees based on Original Data account for 59 of the 133 relevant patent documents. This means that approximately 44% of the relevant patent documents are attributable to the Top 10 Assignees based on Original Data (see

Table 10). According to the original assignee information, the top three assignees are Pasteur Institute, Nat. Environment Agency, and Shenzhen Taitai Gene Engineering. The top assignee, Pasteur Institute, accounts for about 5.25% of the total patent documents. Based on original assignee data, there are twenty-six patents with the "unspecified" assignees. US patent applications are not required to include assignees for publication. Using and analyzing the information from Thomson Innovation®, it was verified that all twenty-six "unspecified" assignee documents are US patent applications. Further, all of the documents having unspecified assignees based on original data have DWPI assignees, which were also verified using Thomson Innovation®. Therefore, the "unspecified" assignee documents according to the original data are accounted for in the analytics for the Top 10 Assignees based on DWPI Data.

Figure 32 shows the top ten assignees according to the Derwent data. The Top 10 Assignees based on DWPI Data account for 51 of the 133 relevant patent documents. This means that approximately 38% of the relevant patent documents are attributable to the Top 10 Assignees based on DWPI Data. According to the DWPI data, the top three assignees are US Department of Health, Pasteur Institute, and the National Environment Agency. The top assignee, the US Department of Health, accounts for about 23.5% of the patent documents. There are Derwent assignees available for all but one patent document that were analyzed. The one record without a DWPI assignee available is WO2006025990A3. The original assignee of this document is listed as being the United States Department of Health and Human Services Center for Disease Control and Prevention.

Assignee (Original)	Patent Count	Percentage
AKZO NOBEL NV	3	2.26%
CENTRE NAT RECH SCIENT	3	2.26%
HAWAII BIOTECH GROUP	3	2.26%
NAT ENVIRONMENT AGENCY	5	3.76%
PASTEUR INSTITUT	7	5.26%
SHENZHEN TAITAI GENE ENGINEERING	4	3.01%
UNIV SINGAPORE	3	2.26%
UNIV SOUTHERN MEDICAL	3	2.26%
US HEALTH	2	1.50%
Unspecified	26	19.55%
Total documents from top 10 assignees	59	44.36%
Total documents	133	100.00%

Table 10: Top 10 assignee of original data in relevant technology patent documents

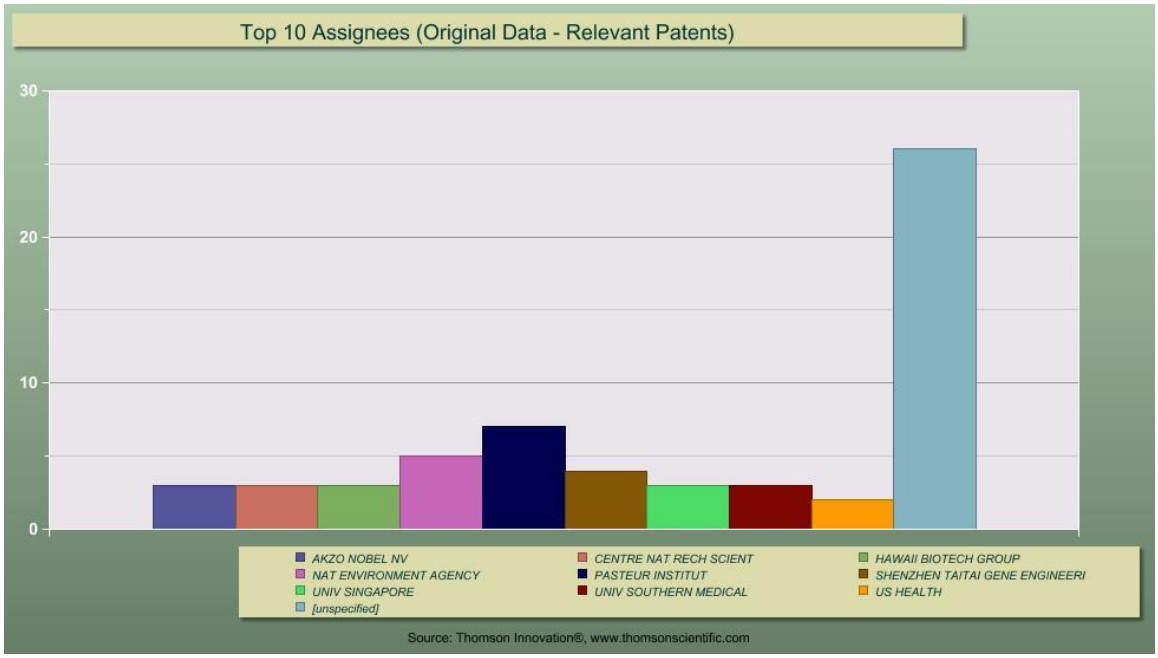


Figure 31: Bar chart - patent count v. top 10 assignees of original data in relevant technology patent documents

Assignee (DWPI)	Patent Count	Percentage
CENT NAT RECH	4	3.01%
HAWAII BIOTECH	3	2.26%
INST PASTEUR/I	8	6.02%
LAI C/LAIC-I	3	2.26%
NAT ENVIRONMEN	7	5.26%
NAT HEALTH RES	3	2.26%
PURCELL R H/PU	3	2.26%
UNIV SINGAPORE	4	3.01%
US DEPT HEALTH	12	9.02%
US SEC OF NAVY	4	3.01%
Total documents from top 10 assignees	51	38.35%
Total documents	133	100.00%

Table 11: Top 10 assignees of DWPI data in relevant technology patent documents

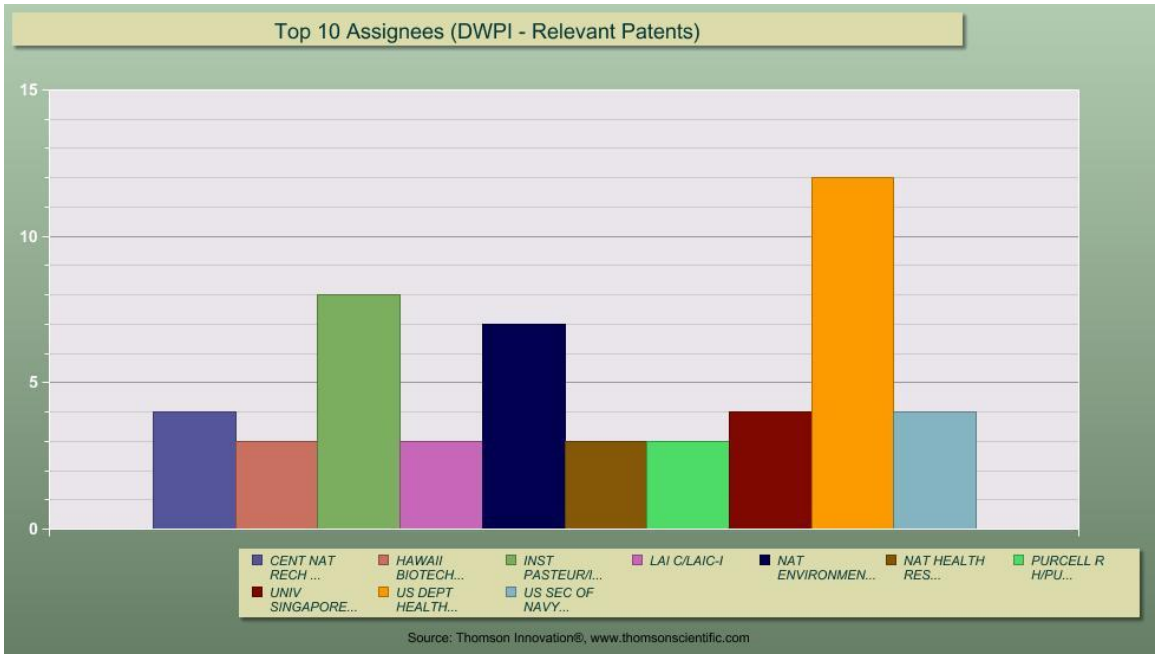


Figure 32: Bar chart - patent count v. top 10 assignees of DWPI data in relevant technology patent documents

4.A.9 Patent Count v. Inventors

Inventor	Number of Documents
Despres, Philippe	7
KUMARSIL BIJON	5
WU, Xin-wei	5
Chang, Gwong-Jen J.	4
McDonell, Michael	4
XIAO, Xing-long	4
ZHANG, Jing-wei	4
CHAN, Yow-Cheong	3
Ecker, David J.	3
FU, Jianlin	3
Hurteau, Gregory J.	3
Lai, Ching-Juh	3
Lee, Eun Mi	3
Olivo, Paul D.	3
Purcell, Robert H.	3
Romano, Joseph W.	3
TAN, Boon-Huan	3
TAN, Yin-Hwee	3
YAP, Eu-Hian	3
Yap, Siew Lian Grace	3

Table 12: The top inventors of the relevant technology patent documents

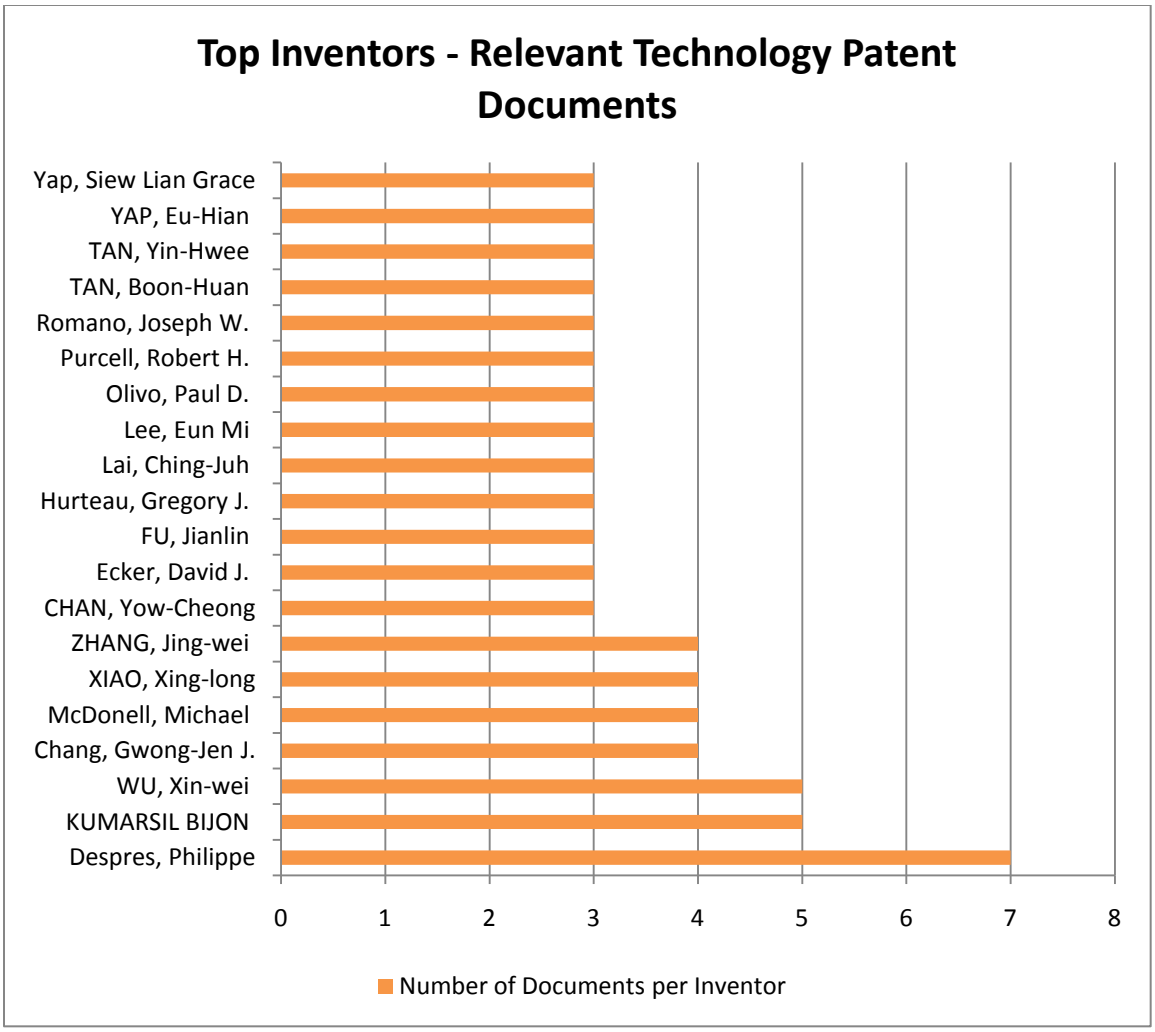


Figure 33: The top inventors of the relevant technology patent documents

4.A.10 Themescape Map

An added feature of Thomson Innovation, is the ability to create Themescape maps. Documents with similar content are near each other in the content map, forming peaks, and the number of documents in a region is indicated by the height of the peaks in the landscape. Tall peaks indicate many documents, while small peaks indicate fewer documents. The relationship between the topics in the documents is drawn as the distance between peaks. Peaks that are located near each other have more similar topics than peaks that are located farther away. A Themescape map summarizing the title, abstract and claims of the Relevant Technology patents are found in Figure 34 and a themescape map summarizing the derwent title and abstract of the Relevant Technology patents are found in Figure 35.

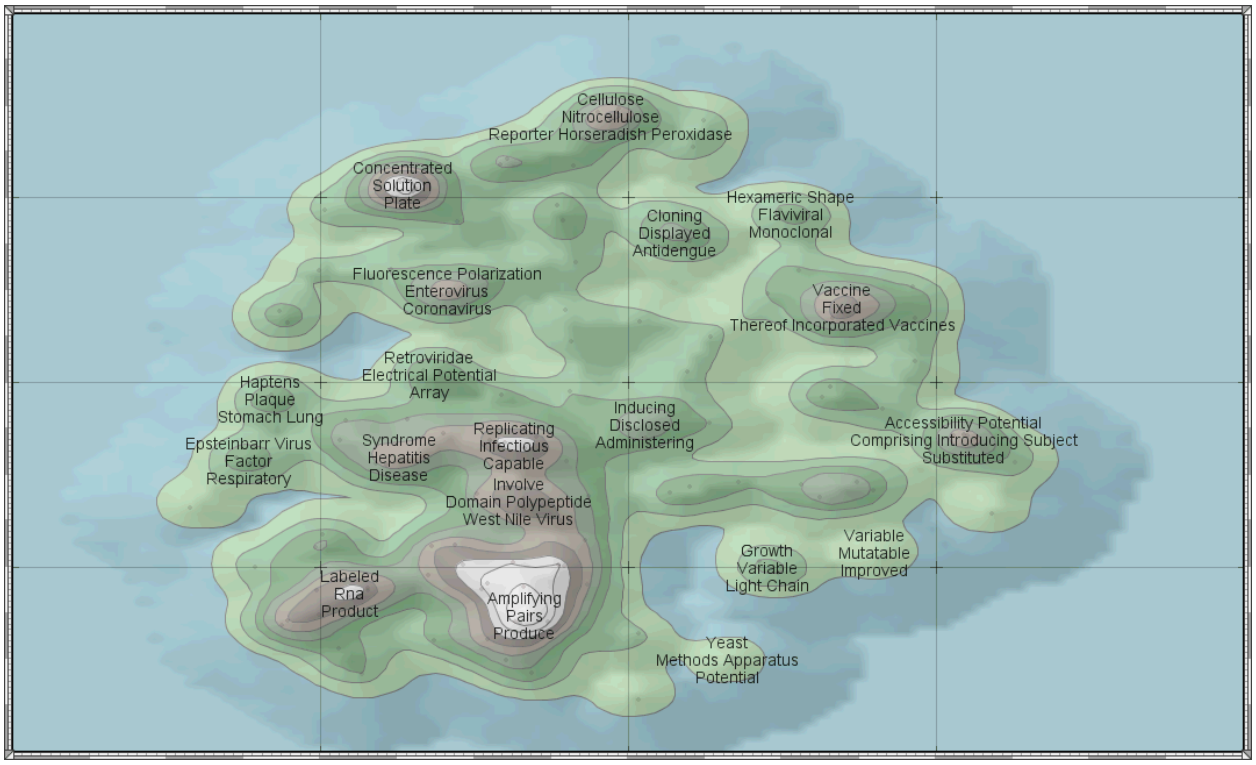


Figure 34: Themescape map of title, abstract, claims in relevant technology patent documents

Figure 35: Themescape map of derwent abstract and title in relevant technology patent documents

4.A.11 World Maps

The following figures depict world maps of coded relevant technology patent documents. Specifically, Table 13 and Figure 36 depict the world map of relevant technology of the coded patent applications. Table 14 and Figure 37 depict the world map of relevant technology of the coded granted patents. According to the Figure 37 there were not many relevant granted patents because many countries did not update their patent information and did not provide which stage of the filing process the patent was in.

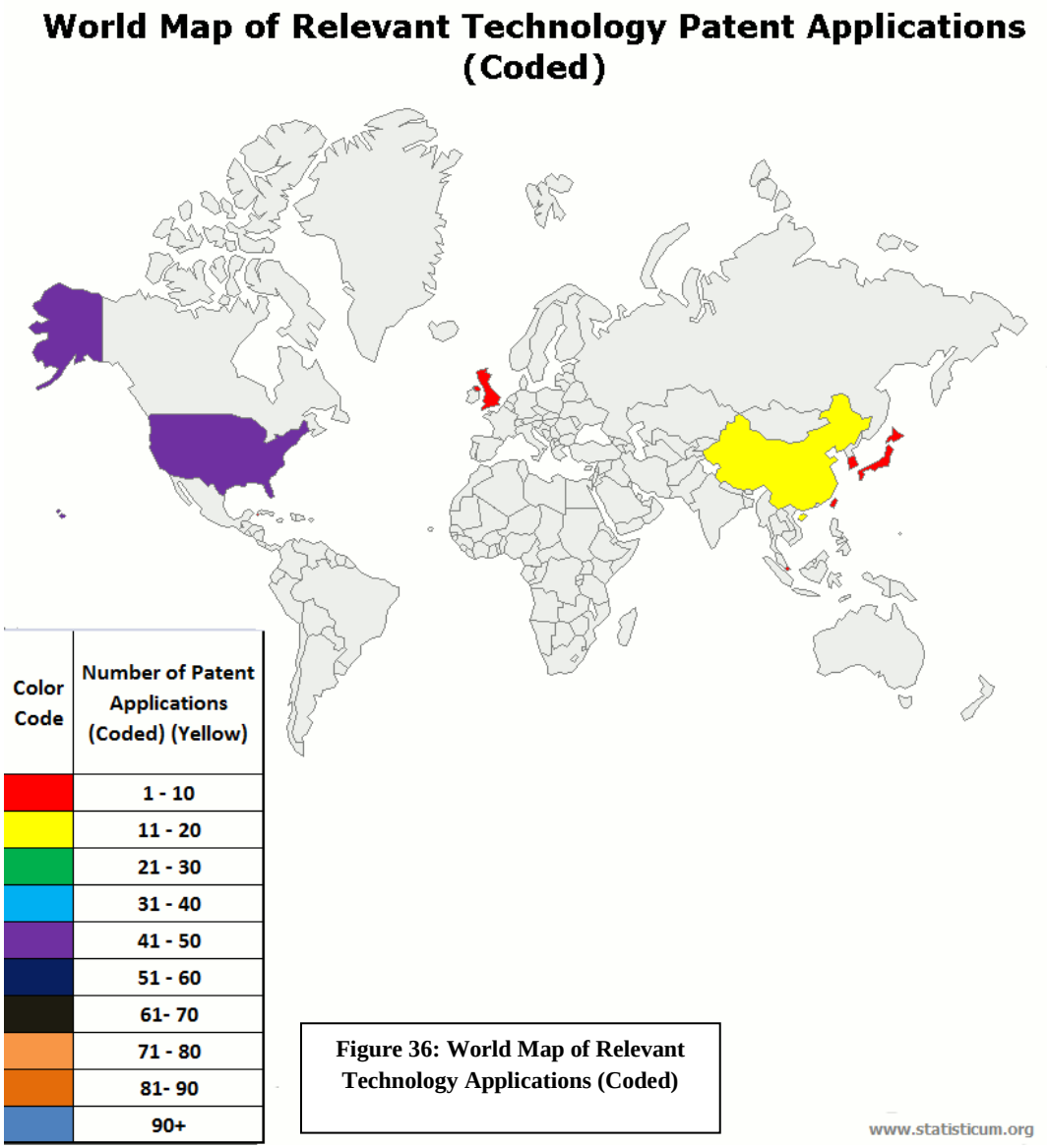


Figure 36: World Map of Relevant Technology Applications (Coded)

Relevant Technology Patent Applications	
Organizations	**Number of Patents Applications (Coded)**
United States (US)	42
WIPO (WO)*	38
China (CN)	17
European Patent (EP)*	3
Great Britain (GB)	2
Japan (JP)	2
Korea (South) (KR)	2
Singapore (SG)	1
*** Patents not shown in the World Map**	

Table 13: World Map of Relevant Technology Applications (Coded)

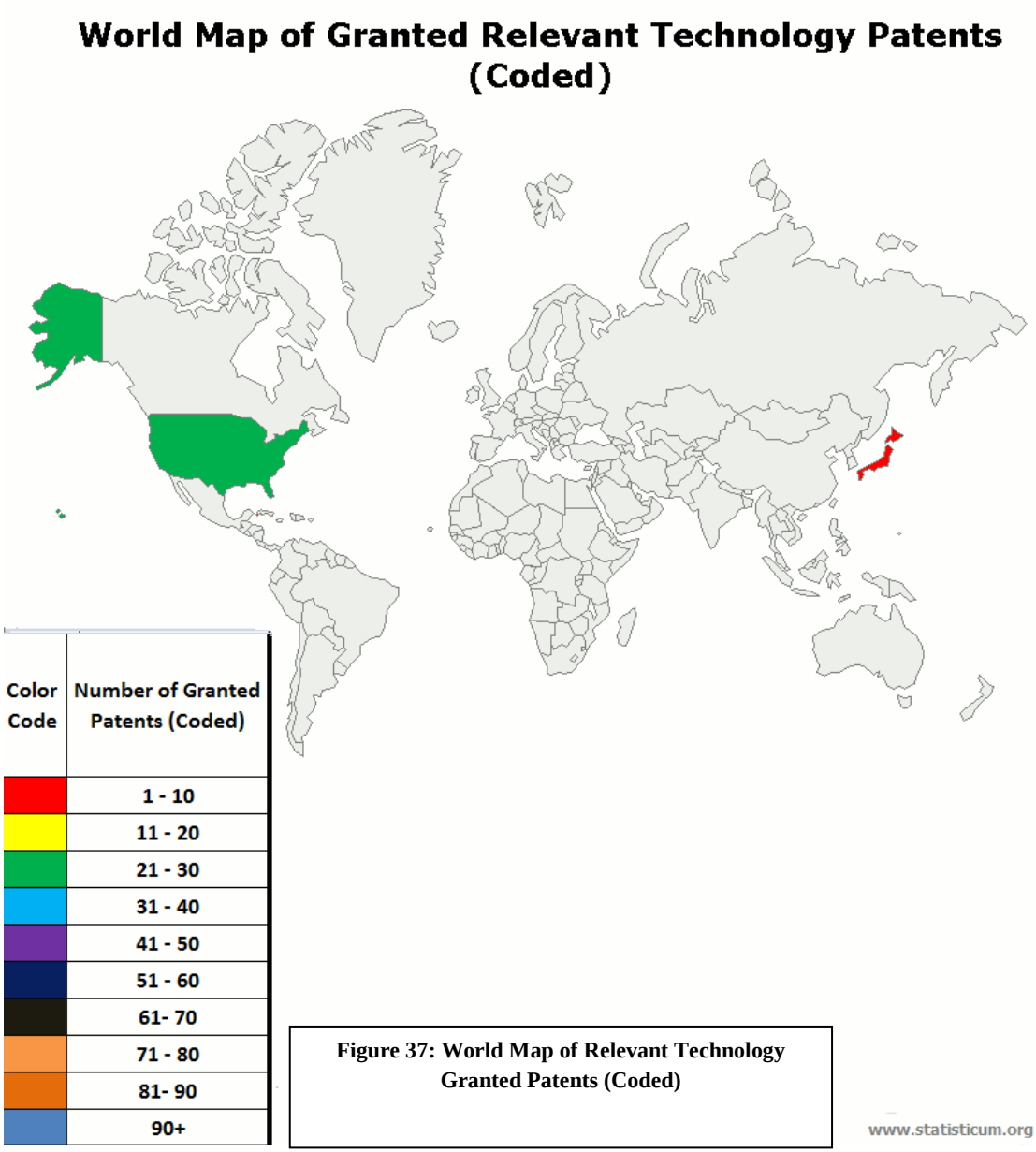


Figure 37: World Map of Relevant Technology Granted Patents (Coded)

Relevant Technology Granted Patent	
Organizations	**Number of Granted Patents (Coded)**
United States (US)	24
Japan (JP)	1

Table 14: World Map of Relevant Technology Granted Patents (Coded)

4.B. Emerging Technology Patent Documents

The following sections 4.B. indicate emerging technology patent documents. These patent documents were coded purple in our spread sheet (look at column label publication number). There were a total of 157 patent documents that were coded into the relevant technology category.

4.B.1 Patent Count v. Country

The following tables and graphs show the top countries and organizations with emerging Dengue diagnostic technology. This analysis is based on the number of published patent documents each country or organization has published or issued. The three countries/organizations having the most patent documents are WIPO, the United States, and Europe. Country Codes are as follows: WO = WIPO, US = United States, EP = Europe, IN = India, JP = Japan, FR = France, CN = China, KR = Korea, SU = Russia (Formally U.S.S.R.), CA = Canada, DE = Germany, TW = Taiwan.

Country code	Document Count
WO	71
US	45
EP	12
IN	7
JP	7
FR	4
CN	3
KR	3
SU	2
CA	1
DE	1
TW	1

Table 15: Country codes showing the top countries and the number of emerging technology patent documents found in the top countries

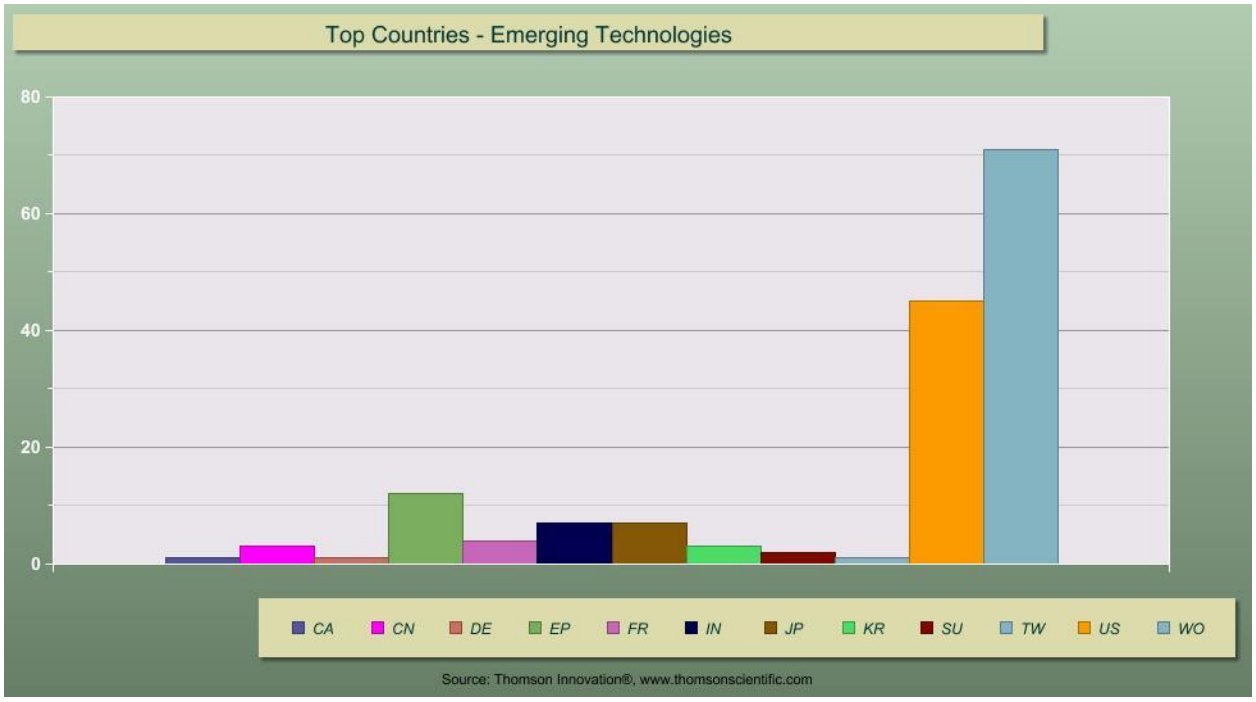


Figure 38: Bar graph showing the top countries of emerging technology patent documents

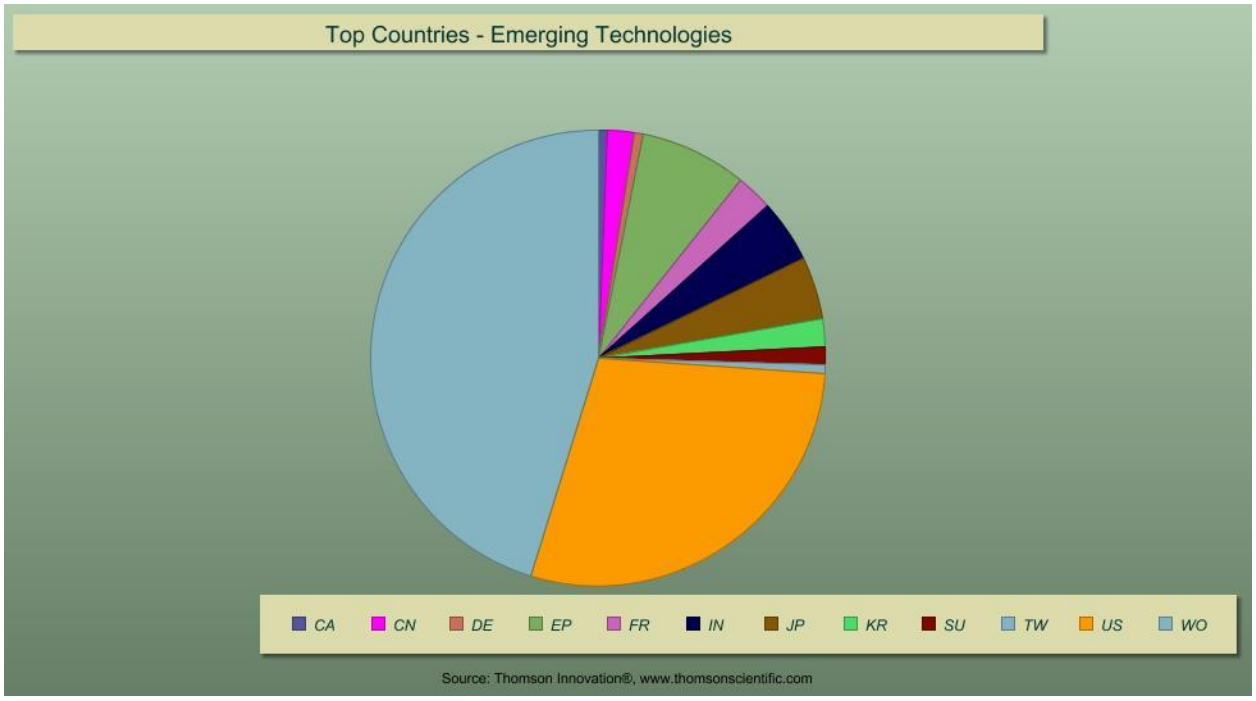


Figure 39: Pie chart showing the top countries of emerging technology patent documents

4.B.2 Patent Count v. Publication Date

The following tables and graphs show the publishing trends of patent documents worldwide that are emerging technology that could be used for Dengue diagnostics. Analysis of emerging technology publication trends shows increase of publication during the last 20 years with some slowing of publication numbers during the 2004 – 2007 time spans. The highest increase of publication was during 2009. This may be a result of the increased observation of dengue fever infection around the world. The reduction in publication in 2010 is a result of not having completed the year and having patent documents in the process of being published.

Publication Year	Document Count
2010	8
2009	36
2008	17
2007	10
2006	14
2005	8
2004	17
2003	7
2002	9
2001	6
2000	3
1999	4
1998	3
1997	2
1996	1
1995	2
1993	4
1991	2
1989	1
1987	1

Table 16: Publication trends of emerging technology patent documents worldwide for the last twenty years

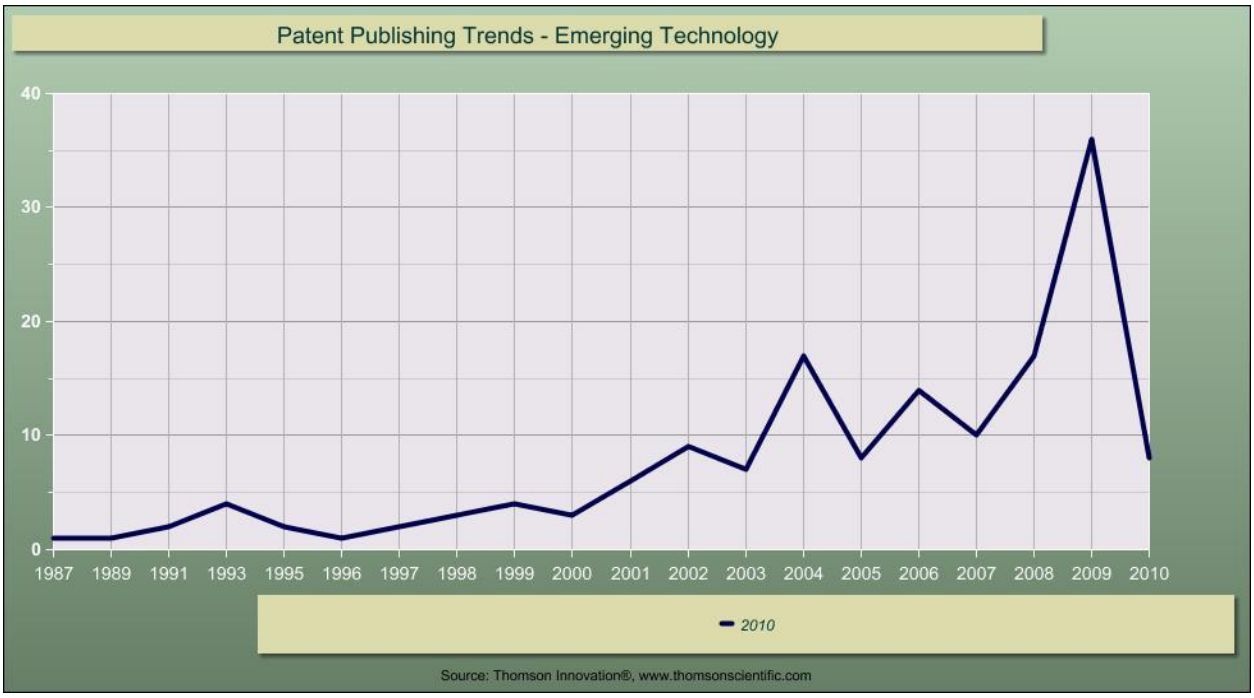


Figure 40: Line graph depicting publication trends of emerging technology patent documents worldwide for the last twenty years.

4.B.3 Patent Count v. Application (Filing) Date

The following table and graph show the application filing trends of patent documents worldwide that seem to cover emerging dengue diagnostic technologies. Analysis of these patent documents trends show a drastic increase in filing date during the years 2007 and 2008. This increase may be a result of more regions, countries, and people being affected by dengue.

Application Year	Patent Documents
1983	1
1984	0
1985	0
1986	0
1987	0
1988	0
1989	3
1990	0
1991	3
1992	1
1993	3
1994	0
1995	4
1996	2
1997	4
1998	6
1999	5
2000	5
2001	5
2002	5
2003	14
2004	12
2005	14
2006	14
2007	21
2008	20
2009	15
Total	157

Table 17: Filing dates of emerging technology patent documents worldwide for approximately twenty years

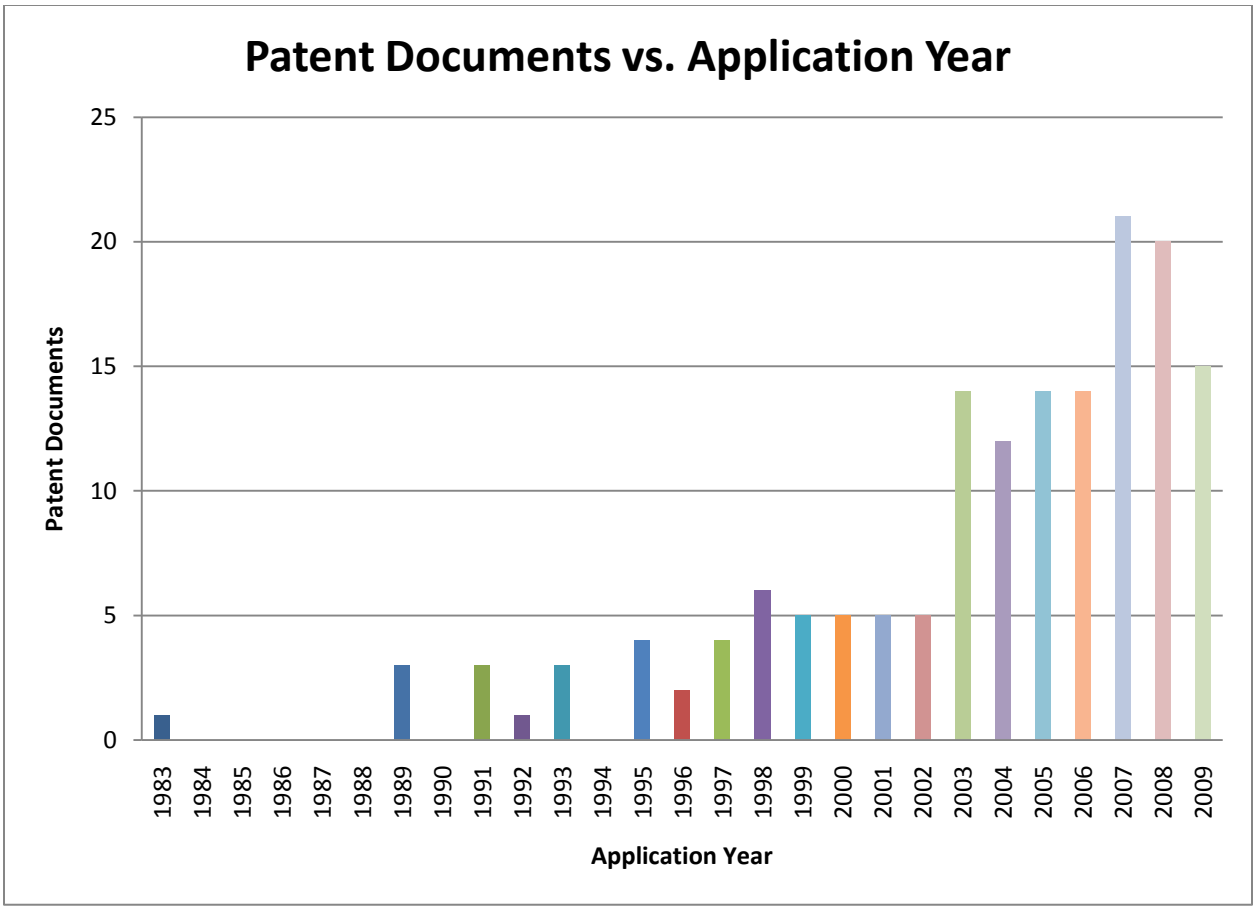


Figure 41: Bar graph depicting filing dates of emerging technology patent documents for approximately twenty years.

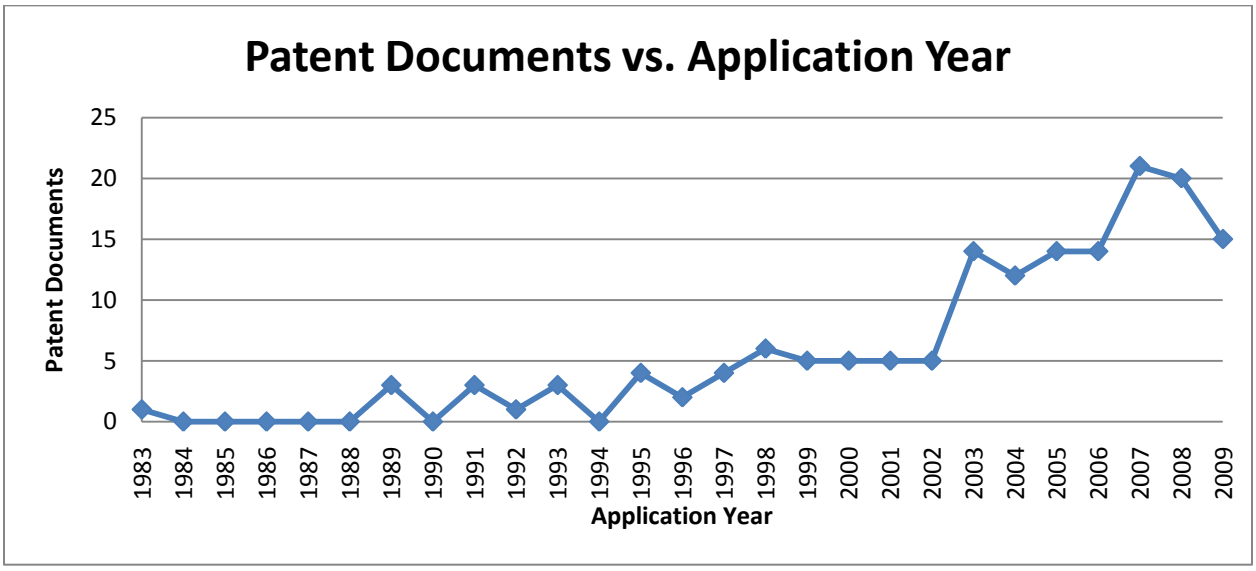


Figure 42: Line graph depicting filing dates of emerging technology patent documents for approximately twenty years.

4.B.4 Patent Count v. US Classification

US classification information is only available for US issued patents and US patent applications. The following analytics are based on the 45 emerging technology US patent documents with 112 of the remaining emerging technology patent documents not analyzed as they are not categorized under this US classification system. The 45 US patent documents fall into 14 US classes with the top two US classes being Class 424 and Class 435. When further divided into US sub-classification, the top six sub-classifications belong to Class 435 including 435/005, 435/006, 435/007.1, 435/287.2, Class 530/350 and Class 536/023.1. The definition of these US classifications and sub-classifications are shown in Appendix C. Table 18 and Figure 42, a bar graph, show the top 14 3-digit US classes of these 45 emerging technology patent documents from the United States. Table 19 and Figure 43, a bar graph, show the top 20 US classes/sub-classes of the 45 United States emerging technology patent documents.

US Class (3-digit)	Patent Count
435	34
424	10
530	9
436	7
536	7
514	5
702	2
800	2
252	1
422	1
427	1
506	1
522	1
534	1

Table 18: Top 14 US 3-digit classes for the 45 US emerging technology patent documents

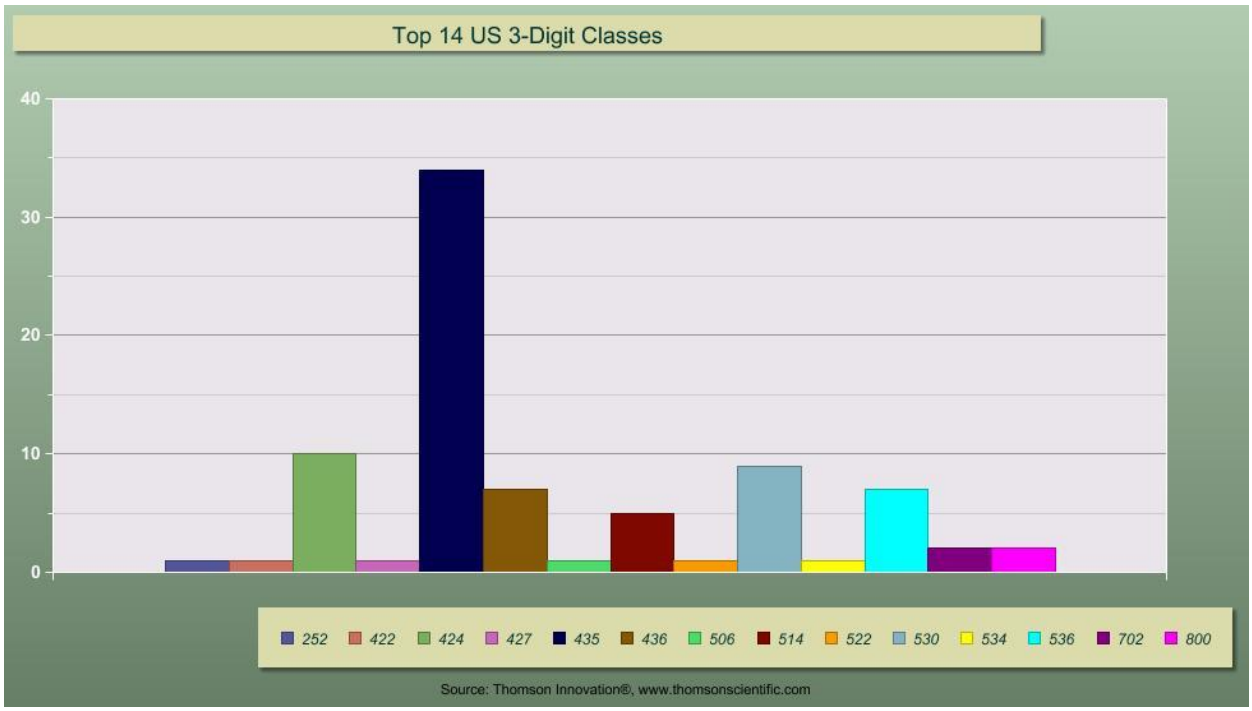


Figure 43: Bar graph of the top 14 US 3-digit classes of the 45 US emerging technology patent documents

US Class/Sub-Class	Patent Count
435/005	17
435/006	14
435/007.1	5
530/350	5
435/287.2	4
536/023.1	4
435/235.1	3
435/320.1	3
435/325	3
435/975	3
424/218.1	2
435/007.2	2
435/069.7	2
435/091.1	2
435/091.2	2
435/810	2
436/071	2
436/514	2
436/518	2
536/024.3	2

Table 19: Top 20 US classes/sub- classifications for the 45 US emerging technology patent documents

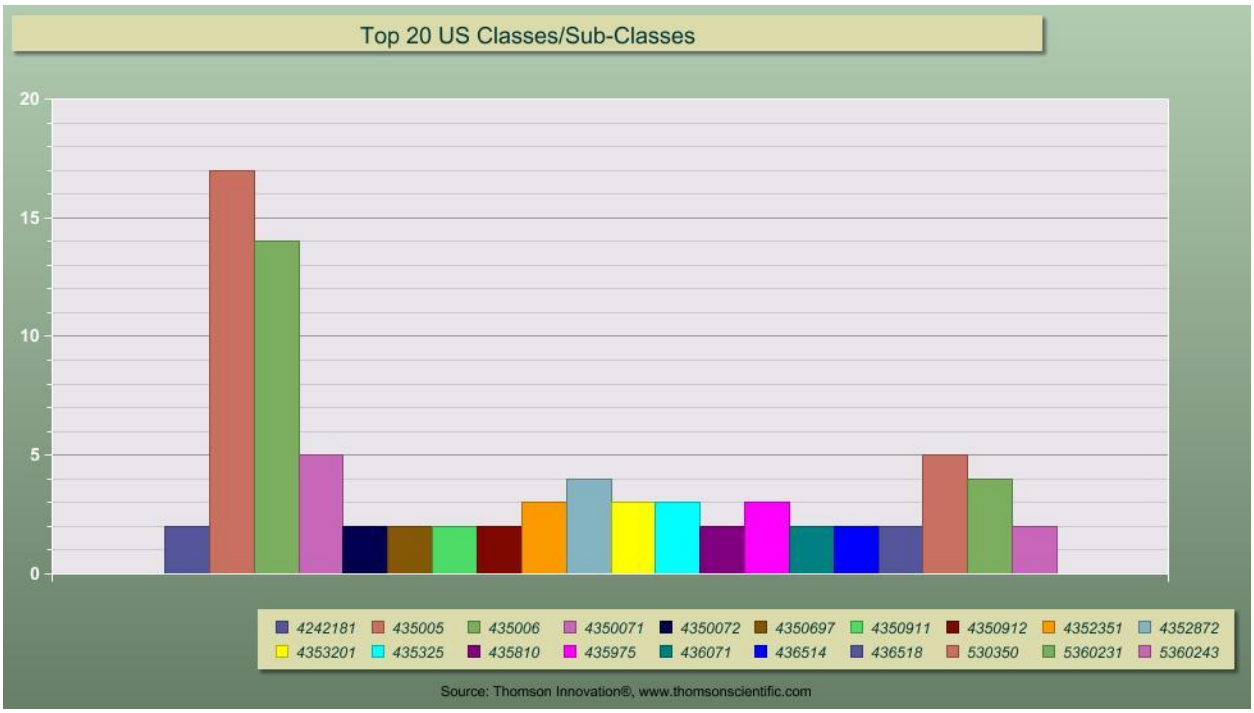


Figure 44: Bar graph of the Top 20 US classes/sub-classes of the 45 US emerging technology patent documents

4.B.5 Patent Count v. IPC Classification

IPC classification information is an international system from the World Intellectual Property Organization (WIPO) and is used in more than 100 countries. The following analytics are based on the 157 emerging technology patent documents. The 157 patent documents fall into more than 20 IPC classifications, the top three IPC classes being Class A61K, Class C12Q and Class G01N with 14 patent documents do not have an IPC classification. When further divided into IPC sub-classifications, the top three sub-classifications belong to Class C12Q including C12Q01/68 and C12Q01/70 and Class G01N33/569. The definition of these IPC classifications and sub-classifications are shown in Appendix D. Table 20 and Figure 5, a bar graph, show the top 20 IPC classes of the emerging technology patent documents. Table 6 and Figure 6, a bar graph, show the top 20 IPC classes/sub-classes of the emerging technology patent documents.

IPC Class	Patent Count
G01N	72
C12Q	56
A61K	40
C12N	36
C07K	35
No IPC	14
A61P	14
C07H	7
C12P	7
C12M	6
A01K	3
A61B	3
A01N	2
B01L	2
C12R	2
G06F	2
H04N	2
C07D	1
C40B	1
H01J	1

Table 20: Top 20 IPC classes for emerging technology patent documents

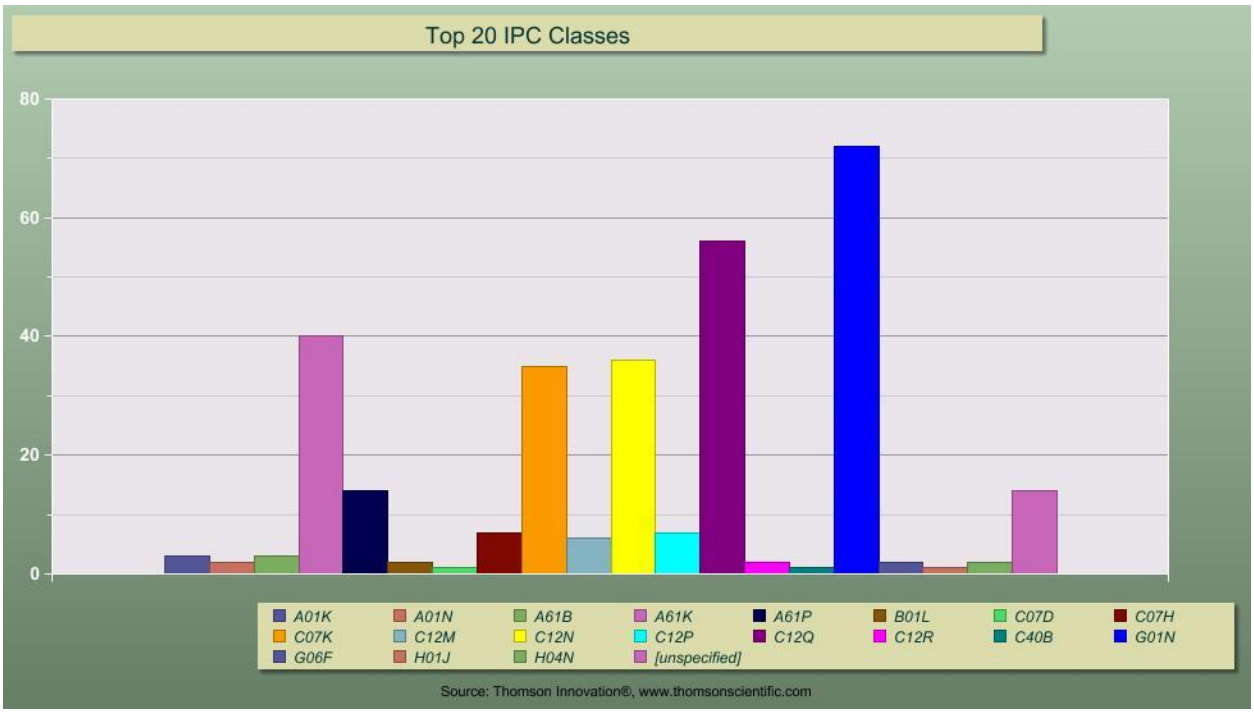


Figure 45: Bar graph of the top 20 IPC classes of emerging technology patent documents

IPC Class	Patent Count
C12Q0001/68	37
G01N0033/569	34
C12Q0001/70	28
C07K0014/005	17
No IPC	14
G01N0033/543	13
A61K0039/00	12
C07K0014/18	12
G01N0033/53	12
G01N0033/68	12
A61K0039/12	11
A61P0031/00	11
A61K0048/00	9
C07K0014/435	9
G01N0033/58	9
A61K0038/00	8
A61P0031/12	8
C12N0015/09	8
A61K0039/395	7
C12N0007/00	7

Table 21: Top 20 IPC classes/sub-classes for emerging technology patent documents

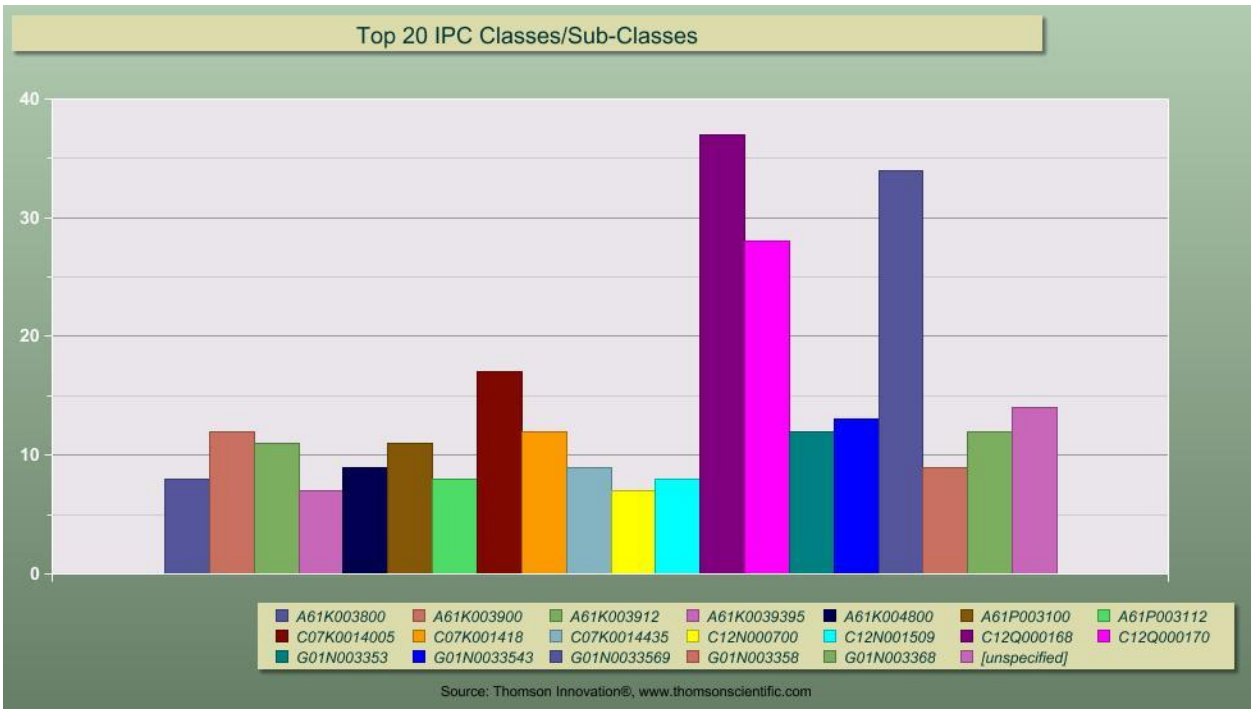


Figure 46: Bar graph of the top 20 IPC classes/sub-classes of emerging technology patent documents (unspecified = no IPC)

4.B.6 Patent Count v. Derwent Class (DWPI Class)

DWPI classification information is available for 147 of the 157 patent documents coded as emerging technology. As shown in Table 22, the documents fall into 17 DWPI classes, and the top two DWPI classes are Class B04, natural products and polymers, and Class A89, photographic, laboratory equipment, optical. These were the top two classes represented by the relevant patent documents as well (see Table 21). Almost 70% of the emerging technology patent documents belong to the Class B04. The 10 patent documents that are listed as "unspecified" are labeled as such because they have not been assigned a DWPI class based on the data available on Thomson®. The definitions of the Derwent classes listed in Table 22 below are shown and defined in Appendix E.

DWPI Class-Main	Patent Count	Percentage
A14	2	1.27%
A26	1	0.64%
A85	1	0.64%
A89	15	9.55%
A96	8	5.10%
B02	1	0.64%
B03	1	0.64%
B04	108	68.79%
C06	1	0.64%
C07	1	0.64%
D16	1	0.64%
P24	1	0.64%
P31	2	1.27%
P75	1	0.64%
P81	1	0.64%
S03	1	0.64%
T01	1	0.64%
unspecified	10	6.37%
Total	157	100.00%

Table 22: DWPI Classes of Emerging Technology Patent Documents

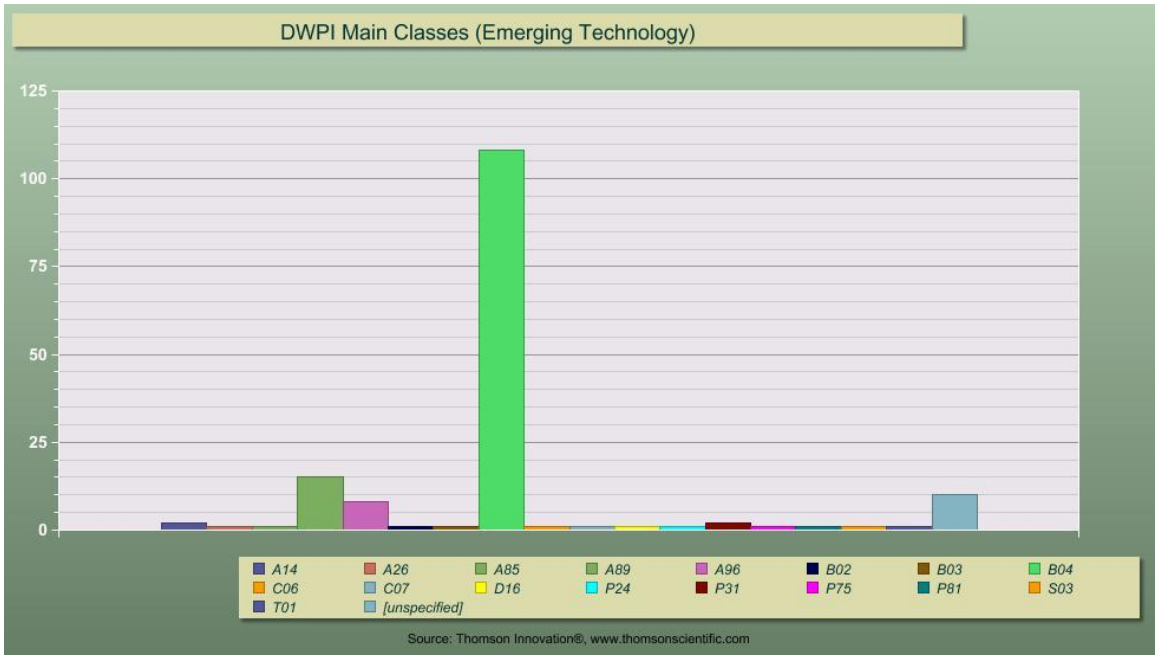


Figure 47: Bar chart - patent count v. DWPI class of emerging technology patent documents

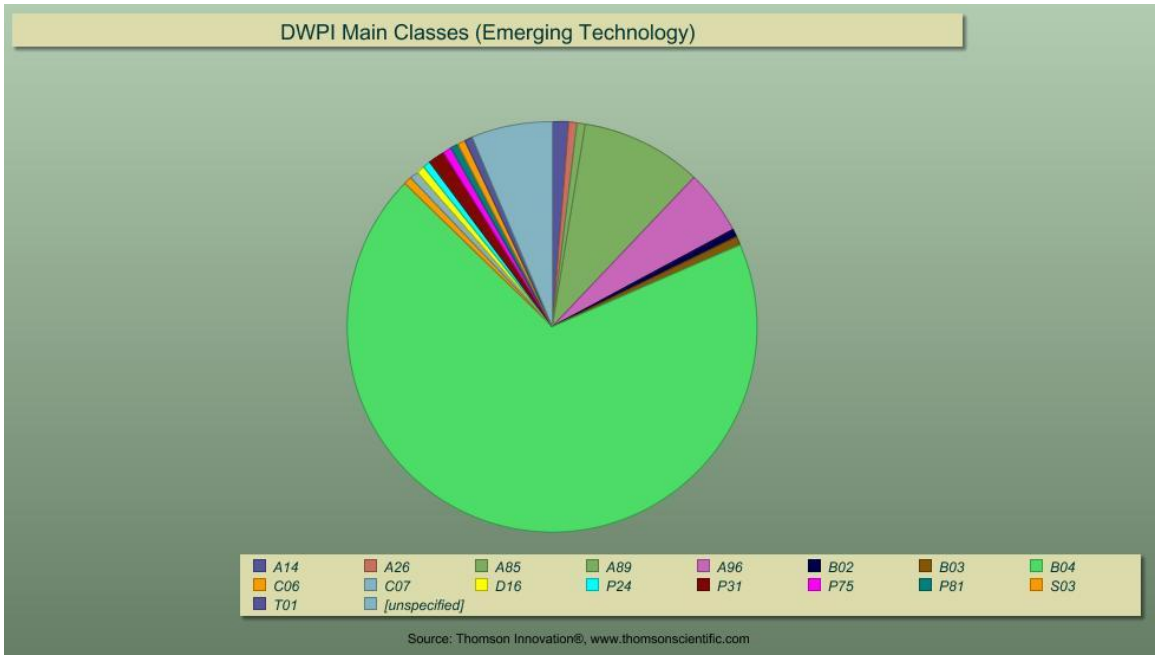


Figure 48: Pie chart - patent count v. DWPI class of emerging technology patent documents

4.B.7 Patent Count v. Derwent Manual Code

As shown in Table 23, D05-H09 is the DWPI Manual Code associated with the most amount of patent. There is a significant drop off to the next DWPI Manual Code. Table 23 depicts the Top 20 DWPI Manual Codes and Figure 49 depicts a bar chart of this data.

DWPI Code	Number of Documents
D05-H09	97
B04-F11	43
B04-G01	42
B11-C07A	38
S03-E14H	38
B12-K04F	35
B12-K04A	34
B04-E01	33
B12-K04A4	32
B12-K04A4A	30
D05-H06	29
D05-H11	29
S03-E09F	28
B11-C08E	27
D05-H06A	27
B04-E05	25
B11-C08E5	25
D05-H07	24
B04-B04C1	23
S03-E14H4	22

Table 23:Top 20 Derwent manual codes for emerging technology patent documents

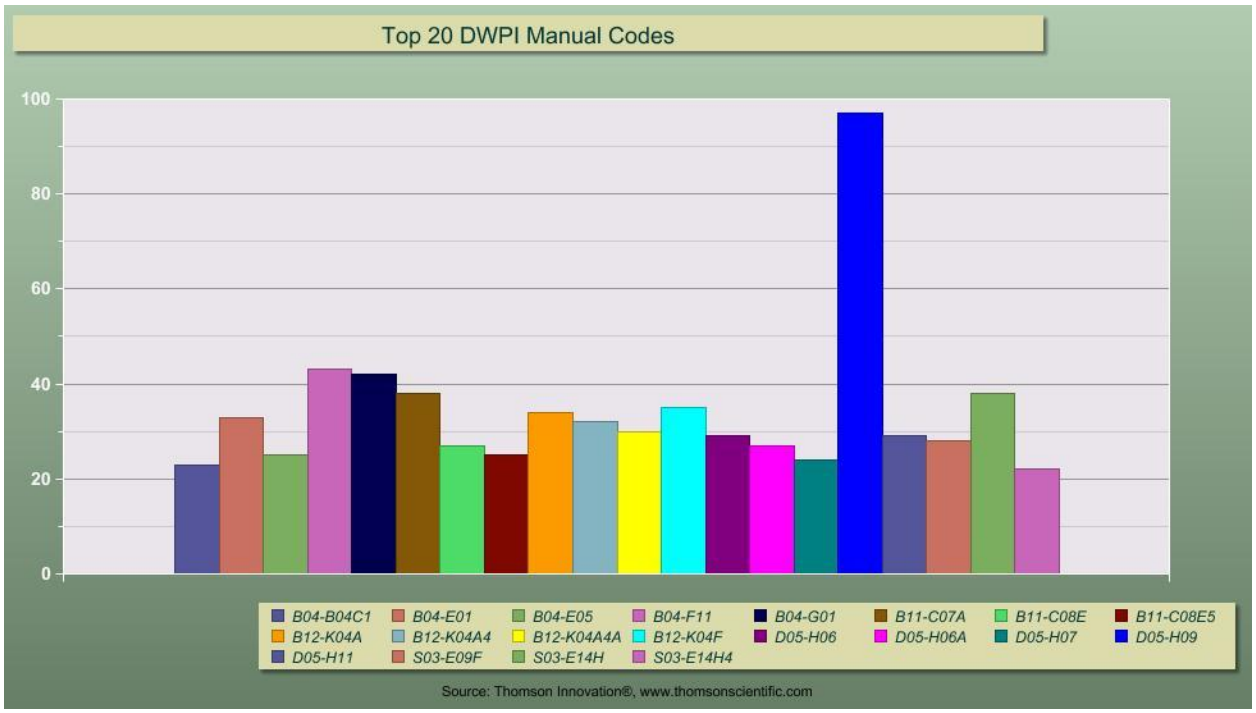


Figure 49: Bar chart DWPI manual codes v number of emerging technology patent documents

4.B.8 Patent Count v. Assignees

Table 24 shows the top ten assignees for the emerging technology patent documents based on original assignee data. The Top 10 Assignees based on Original Data account for 55 of the 157 emerging technology documents. This means that approximately 35% of the emerging technology patent documents are attributable to the Top 10 Assignees based on Original Data. According to the original assignee information the top assignee is Pasteur Institute and accounts for about 5% of the total emerging technology documents analyzed. Based on original assignee data, there are twenty-five patents with the "unspecified" assignees. US patent applications are not required to include assignees for publication. Using and analyzing the information from Thomson Innovation®, it was verified that some of the twenty-six "unspecified" assignee documents are US patent applications. Further, all of the documents having unspecified assignees based on original data have DWPI assignees, which was also verified using Thomson Innovation®. Therefore, the "unspecified" assignee documents according to the original data are accounted for in the analytics for the Top 10 Assignees based on DWPI Data as shown in Table 24.

Table 25 below shows the top ten assignees according to the Derwent data. The Top 10 Assignees based on DWPI Data account for 42 of the 157 emerging technology documents. This means that approximately 26.75% of the emerging technology patent documents are attributable to the Top 10 Assignees based on DWPI Data. According to the DWPI data, the top assignee is Pasteur Institute and accounts for about 5.75% of the total emerging technology documents analyzed. There are 10 patent documents that fall into the "unspecified" category because they do not have DWPI Assignees/Applicants. However, these 10 documents do have original data Assignees/Applicants, which was verified using Thomson Innovation®. Therefore, the unspecified documents for the DWPI assignees are accounted for in the analytics for the Top 10 Assignees based on Original Data, seen in Table 25.

Assignee (Original)	Patent Count	Percentage
AMSON ROBERT	3	1.91%
CENTRE NAT RECH SCIENT	2	1.27%
IMMUNOMEDICS INC	3	1.91%
ISIS PHARMACEUTICALS INC	2	1.27%
MOLECULAR ENGINES LAB	3	1.91%
PASTEUR INSTITUT	8	5.10%
TELERMAN ADAM	3	1.91%
TUIJNDER MARIUS	3	1.91%
US GOVERNMENT	3	1.91%
unspecified	25	15.92%
Total documents from top 10 assignees	55	35.03%
Total documents	157	100.00%

Table 24: Top 10 assignees of original data in emerging technology patent documents

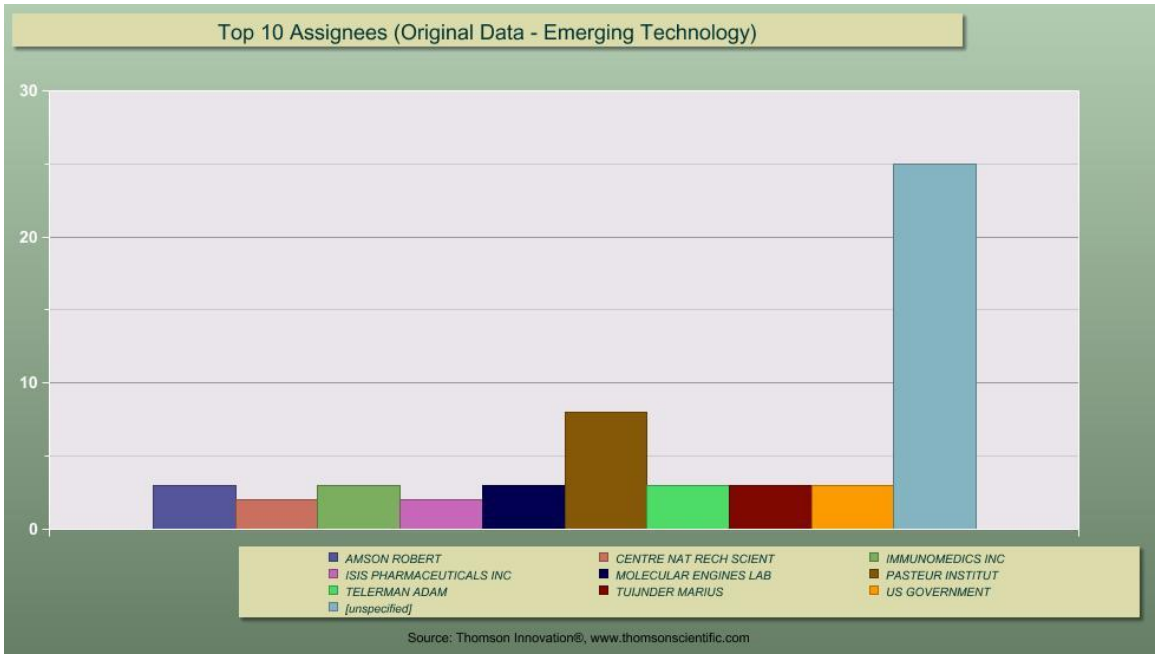


Figure 50: Bar chart – patent count v. top 10 assignees of original data in emerging technology patent documents

Assignee (DWPI)	Patent Count	Percentage
AGENCY SCI TEC	3	1.91%
CENT NAT RECH	3	1.91%
CNRS CENT NAT	2	1.27%
GILEAD SCI INC	2	1.27%
IMMUNOMEDICS INC	4	2.55%
INST PASTEUR	9	5.73%
ISIS PHARM INC	2	1.27%
MAHAJAN L	4	2.55%
US DEPT HEALTH	3	1.91%
unspecified	10	6.37%
Total documents from top 10 assignees	42	26.75%
Total documents	157	100.00%

Table 25: Top 10 Assignees of DWPI Data in Emerging Technology Patent Documents

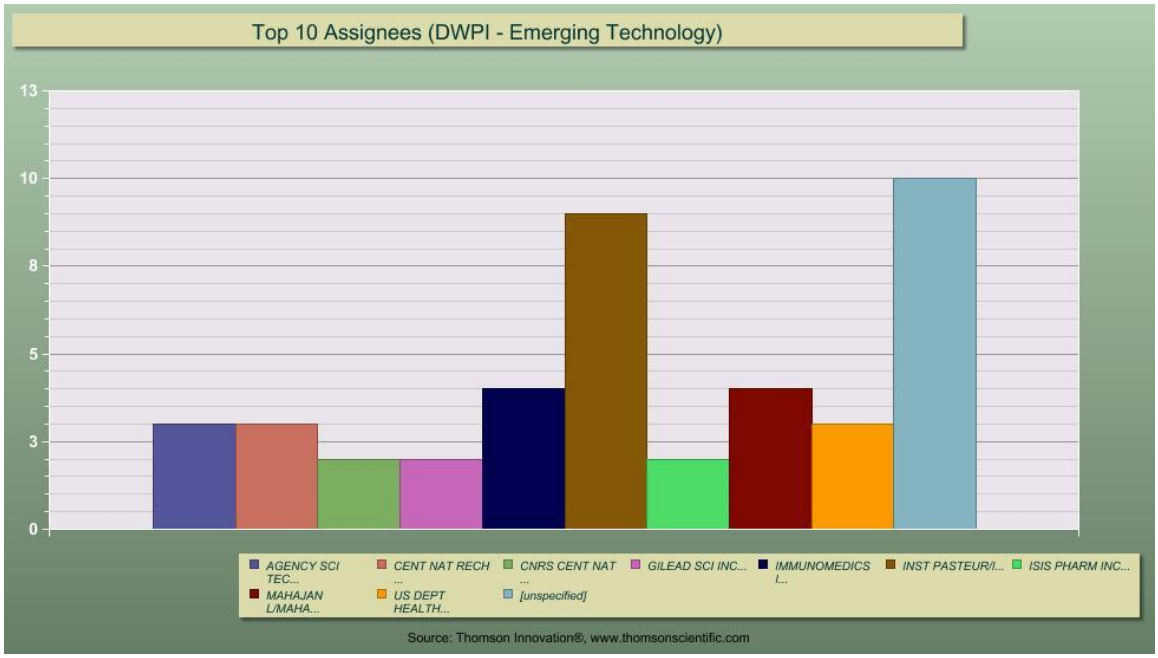


Figure 51: Bar chart - patent count v. top 10 assignees of DWPI data in emerging technology patent documents

4.B.9 Patent Count v. Inventors

Inventor	Number of Documents
Despres, Philippe	5
TELERMAN, Adam	3
TUIJNDER, Marius	3
AMSON, Robert	3
Alcon, Sophie	2
Chan, Warren Che Wor	2
Chen, Shuqi	2
Dave, Kirti	2
Deubel, Vincent	2
Emmerich, Eva	2
Flamand, Marie	2
Frenkiel, Marie Pascale	2
Froehler, Brian	2
Goldenberg, David, M.	2
Greenberg, Michael Mordinson	2
Kain, Kevin Charles	2
McBride, William, J.	2
Ryan, Jeffrey	2
Wirtz, Robert, A.	2
HIBBERD, Martin, Lloyd	2

Table 26: The top inventors of the emerging technology patent documents

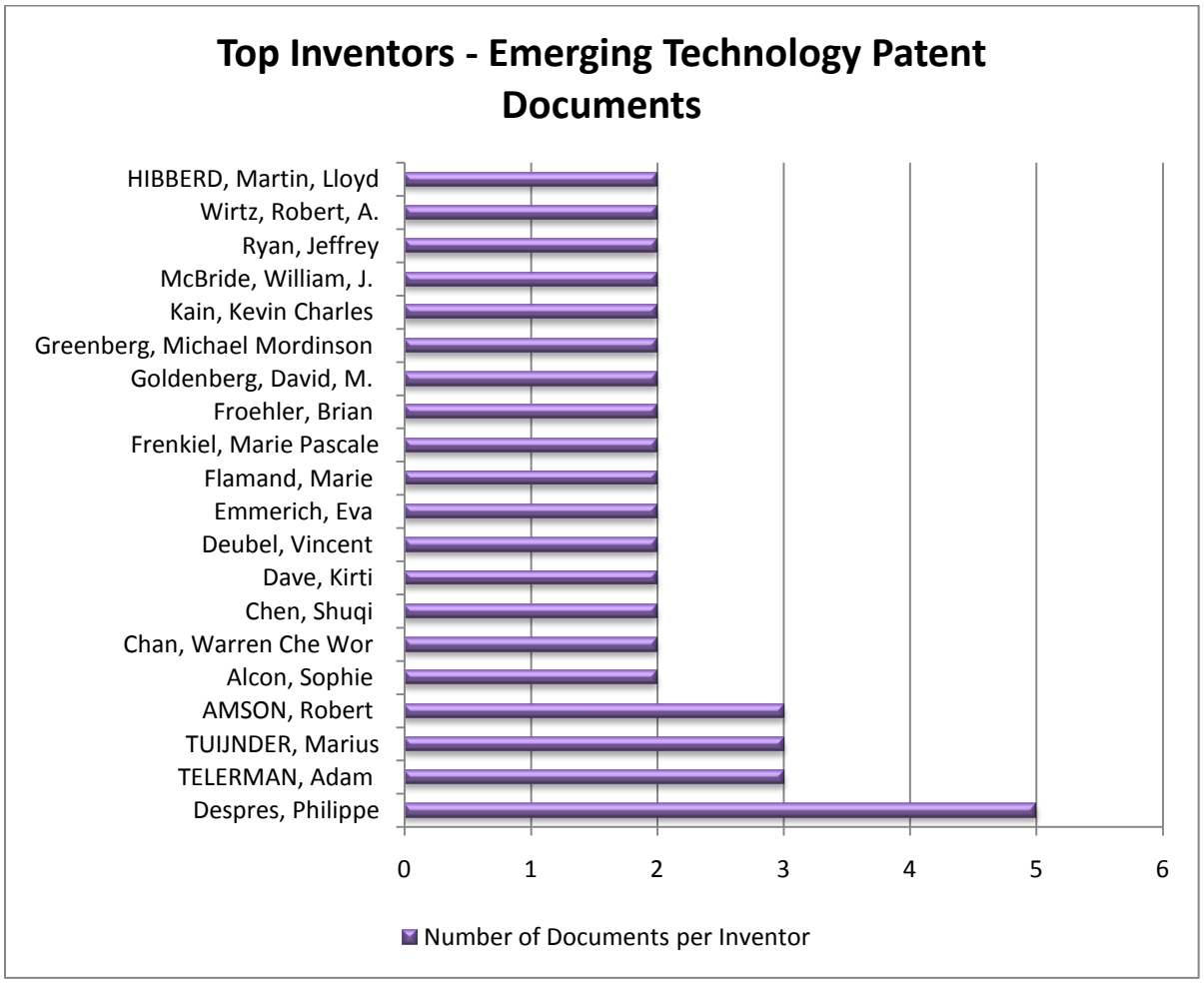


Figure 52: The top inventors of the emerging technology patent documents

4.B.9 Themescape Maps

Documents with similar content are near each other in the content map, forming peaks, and the number of documents in a region is indicated by the height of the peaks in the landscape. Tall peaks indicate many documents, while small peaks indicate fewer documents. The relationship between the topics in the documents is drawn as the distance between peaks. Peaks that are located near each other have more similar topics than peaks that are located farther away. A Themescape map summarizing the title, abstract and claims of the Emerging Technology patents are found in Figure 53 and a themescape map summarizing the derwent title and abstract of the Emerging Technology patents are found in Figure 54.

Figure 53: Themescape map of title, abstract, claims in emerging technology patent documents

Figure 54: Themescape map of derwent abstract and title in emerging technology patent documents

4.B.10 World Maps

The following figures depict world maps of coded relevant technology patent documents. Specifically, Table 27 and Figure 55 depict the world map of relevant technology of the coded patent applications. Table 18 and Figure 56 depict the world map of relevant technology of the coded granted patents. According to the Figure 56 there were not many relevant granted patents because many countries did not update their patent information and did not provide which stage of the filing process the patent was in.

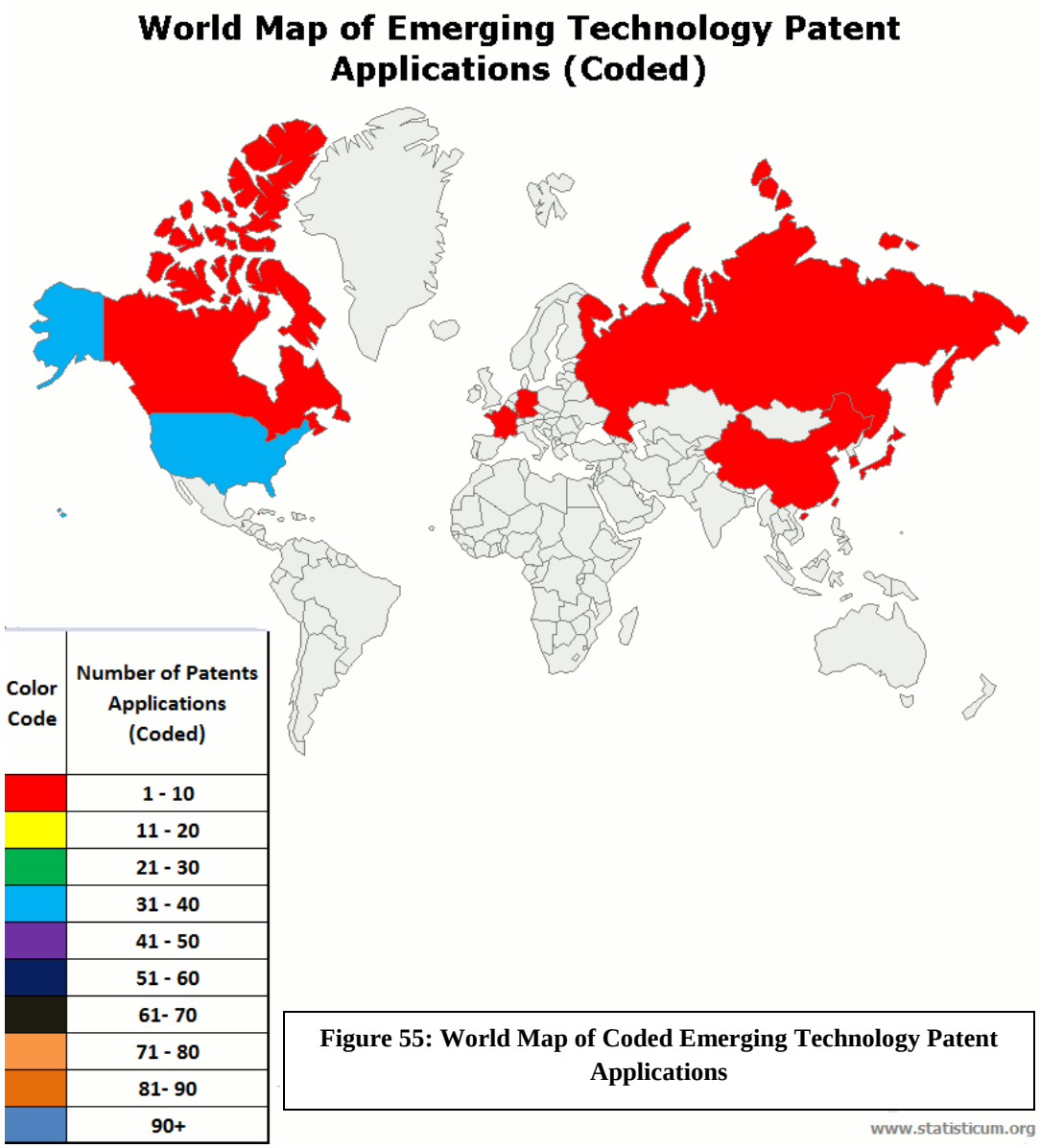


Figure 55: World Map of Coded Emerging Technology Patent Applications

Emerging Technology Patent Applications (Coded)	
Organizations	**Number of Patent Applications (Coded)**
WIPO (WO)*	71
United States (US)	30
European Patent (EP)*	12
Japan (JP)	7
France (FR)	4
China (CN)	3
Korea (South) (KR)	3
USSR (former) (SU)**	2
Canada (CA)	1
Germany (DE)	1
Taiwan (TW)	1
*** Patents not shown in the World Map**	
**** USSR (former) includes Russian Federation (RU)**	

Table 27: Organization and Country Allocation of Coded Emerging Technology Patent Applications

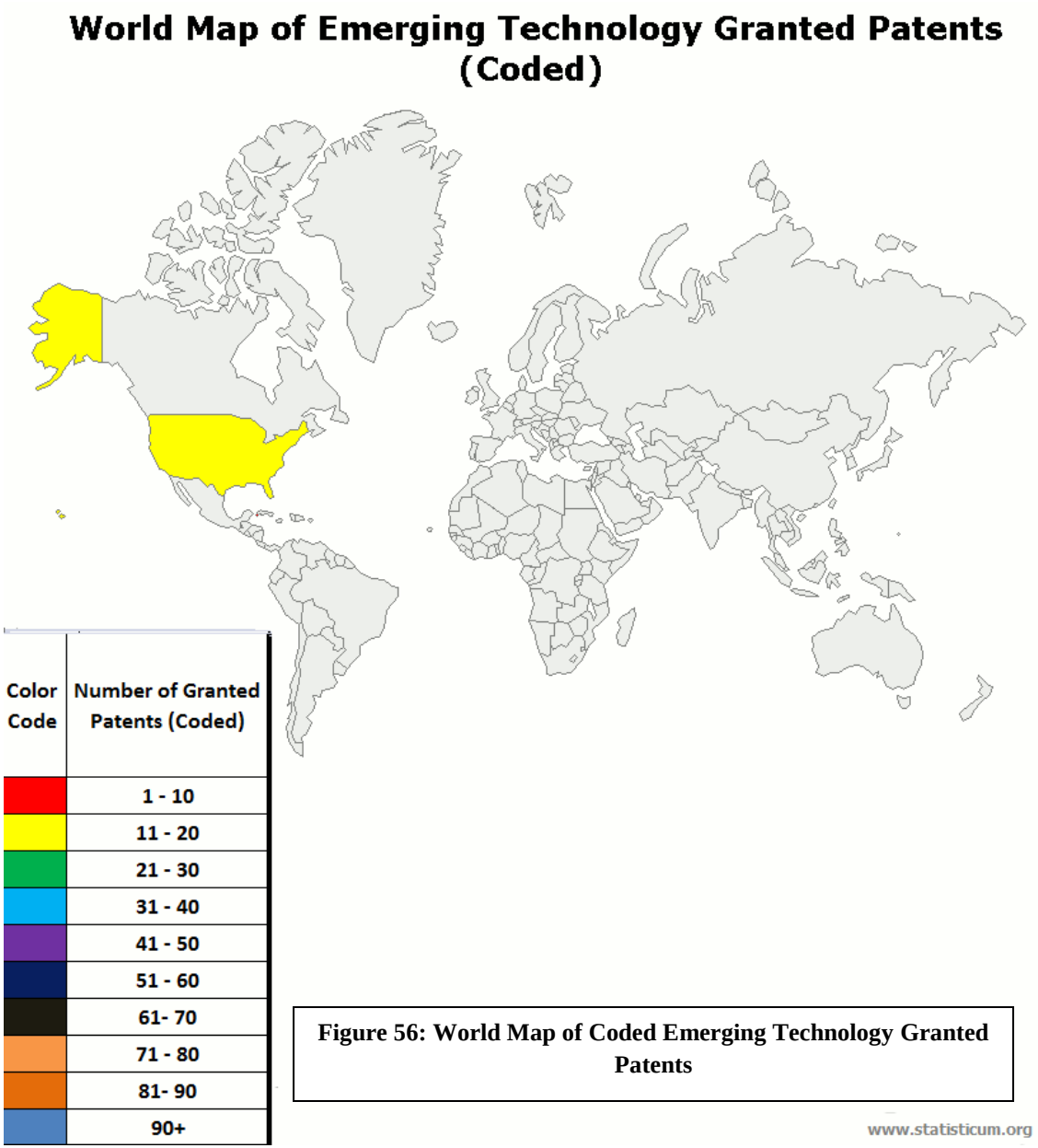


Figure 56: World Map of Coded Emerging Technology Granted Patents

Emerging Technology Granted Patent (Coded)	
Organizations	**Number of Granted Patents (Coded)**
United States (US)	15

Table 28: Organization and Country Allocation of Coded Emerging Technology Granted Patents

4.C Relevant / Emerging Technology Patent Documents

The following sections 4.C. indicate the combination of relevant technology patent documents and emerging technology patent documents. There were a total of 290 patent documents that were coded into the relevant technology category.

4.C.1 Patent Count v. Country

The following tables and graphs represent the combination of Relevant and Emerging Technology related to Dengue diagnosis in the top countries. This analysis is based on the number of published patent documents each country or organization has published or issued. The three countries/organizations having the most patent documents are the United States, WIPO, and China. Country Codes are as follows: US = United States, WO = WIPO, CN = China, EP = Europe, JP = Japan, IN = India, KR = Korea, FR = France, GB = Great Britain, SU = Russia (Formally U.S.S.R.), CA = Canada, DE = Germany, SG = Singapore and TW = Taiwan.

Country code	Document Count
US	112
WO	109
CN	20
EP	15
JP	10
IN	7
KR	5
FR	4
GB	2
SU	2
CA	1
DE	1
SG	1
TW	1

Table 29: Country codes showing the top countries and the number of relevant and emerging technology patent documents found in the top countries

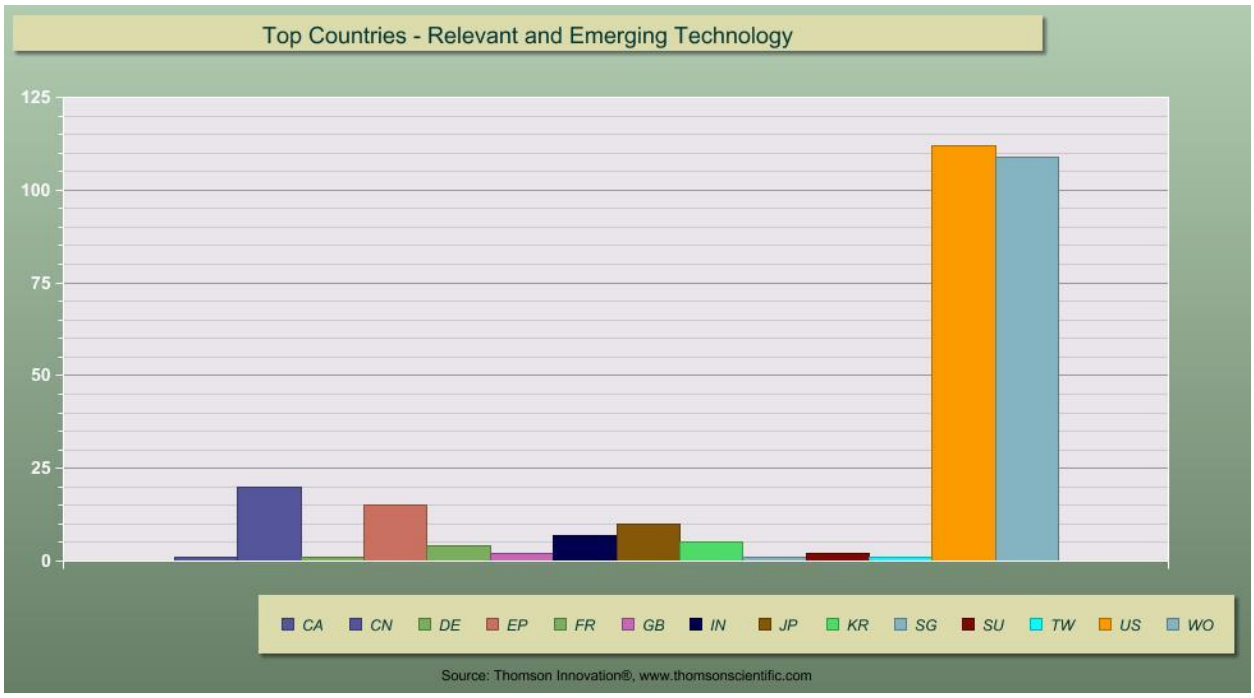


Figure 57: Bar graph showing the number of relevant and emerging technology patent documents present in the top countries

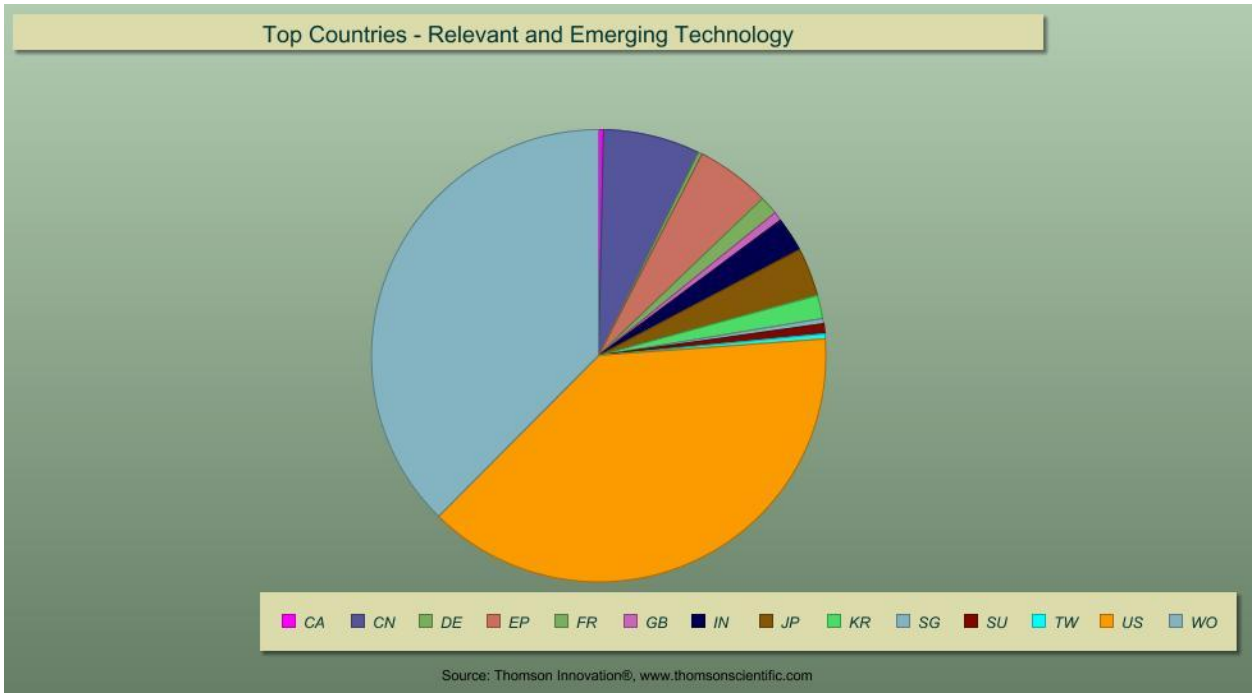


Figure 58: Pie chart showing the number of relevant and emerging technology patent documents present in the top countries

4.C.2 Patent Count v. Publication Date

The following table and graph show the publishing trends of patents and patent applications worldwide that are relevant to Dengue diagnostic. Analysis of relevant patent and patent application trends shows a steady increase in publication till 2005. Publication rate stayed nearly similar during 2005 – 2007 and then increased. This increase may be a result of more regions, countries, and people being affected by dengue fever. The reduction in publication in 2010 is a result of not having completed the year and having patent documents in the process of being published.

Publication Year	Document Count
2010	13
2009	59
2008	35
2007	21
2006	25
2005	20
2004	27
2003	16
2002	16
2001	11
2000	9
1999	10
1998	6
1997	3
1995	5
1993	5
1992	2
1991	2
1989	2
1987	1

Table 30: Publication trends of relevant and emerging technology patent documents worldwide for the last twenty years

Figure 59: Line graph depicting publication trends of relevant and emerging patent documents worldwide for the last twenty years

4.C.3 Patent Count v. Application (Filing) Date

The following tables and graph show the application filing trends of patent documents worldwide that seem to cover relevant and emerging technologies. Analysis of these patent documents trends show a drastic increase in filing date during the years 2003 onwards. This increase may be a result of more regions, countries, and people being affected by dengue.

Application Year	Patent Documents
1983	1
1984	0
1985	0
1986	1
1987	0
1988	0
1989	3
1990	0
1991	3
1992	2
1993	6
1994	4
1995	6
1996	3
1997	6
1998	15
1999	9
2000	11
2001	10
2002	13
2003	26
2004	24
2005	26
2006	24
2007	38
2008	35
2009	24
Total	290

Table 31: Filing dates of relevant and emerging technology patent documents through approximately the last twenty years

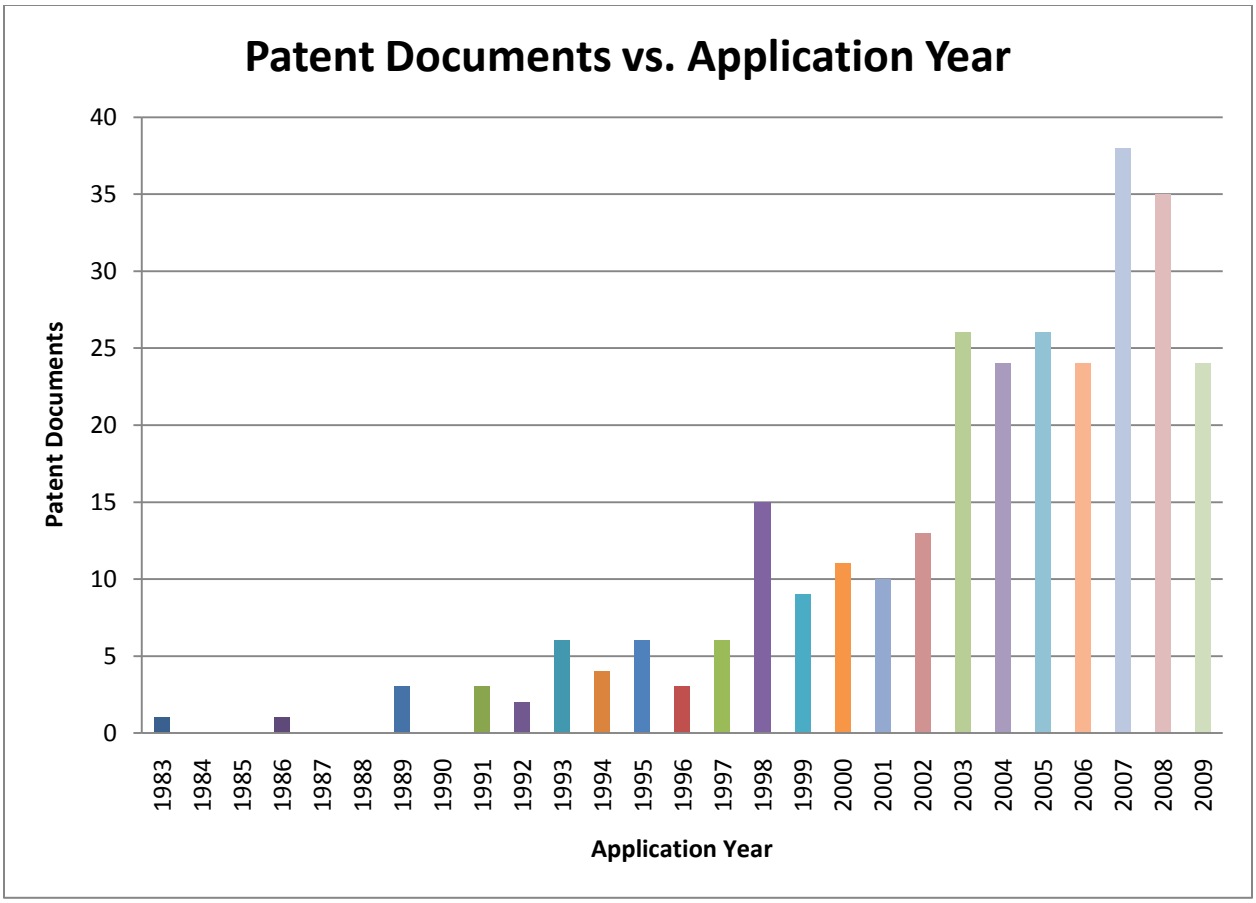


Figure 60: Bar graph depicting filing dates of relevant and emerging technology patent documents

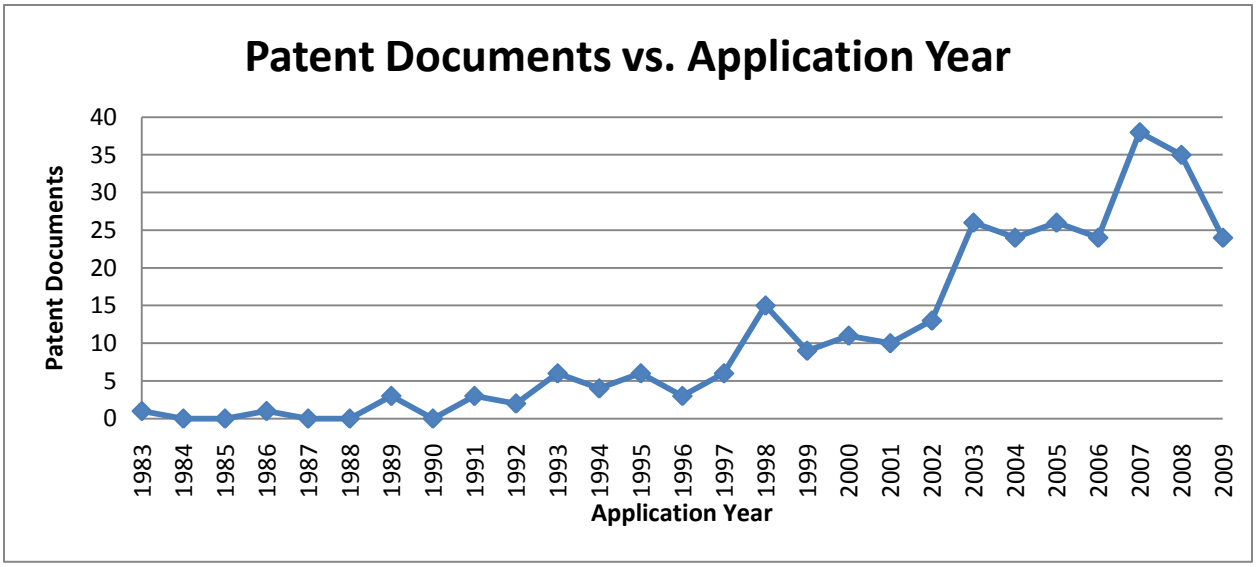


Figure 61: Line graph depicting filing dates of relevant and emerging technology patent documents

4.C.4 Patent Count v. US Classification

US classification information is only available for US issued patents and US patent applications. The following analytics are based on the 112 relevant and emerging technology US patents documents with 178 of the remaining relevant and emerging technology patent documents not analyzed as they are not categorized under this US classification system. The 112 US patent documents fall into 17 US classes with the top two US classes being Class 424 and Class 435. When further divided into US sub-classification, the top five sub-classifications belong to Class 424/218.1, Class 435 including 435/005, 435/006, 435/007.1, and Class 530/350. The definition of these US classifications and sub-classifications are shown in Appendix C. Table 30 and Figure 59, a bar graph, show the top 17 3-digit US classes of these 102 relevant and emerging technology patent documents from the United States. Table 31 and Figure 60, a bar graph, show the top 20 US classes/sub-classes of the 112 United States relevant and emerging technology patents documents.

US Class (3-digit)	Patent Count
435	96
424	36
536	28
530	26
436	14
514	13
356	3
422	2
702	2
800	2
252	1
427	1
433	1
506	1
522	1
534	1
977	1

Table 32: Top 17 US 3-digit classes for the 112 US relevant and emerging technology patent documents

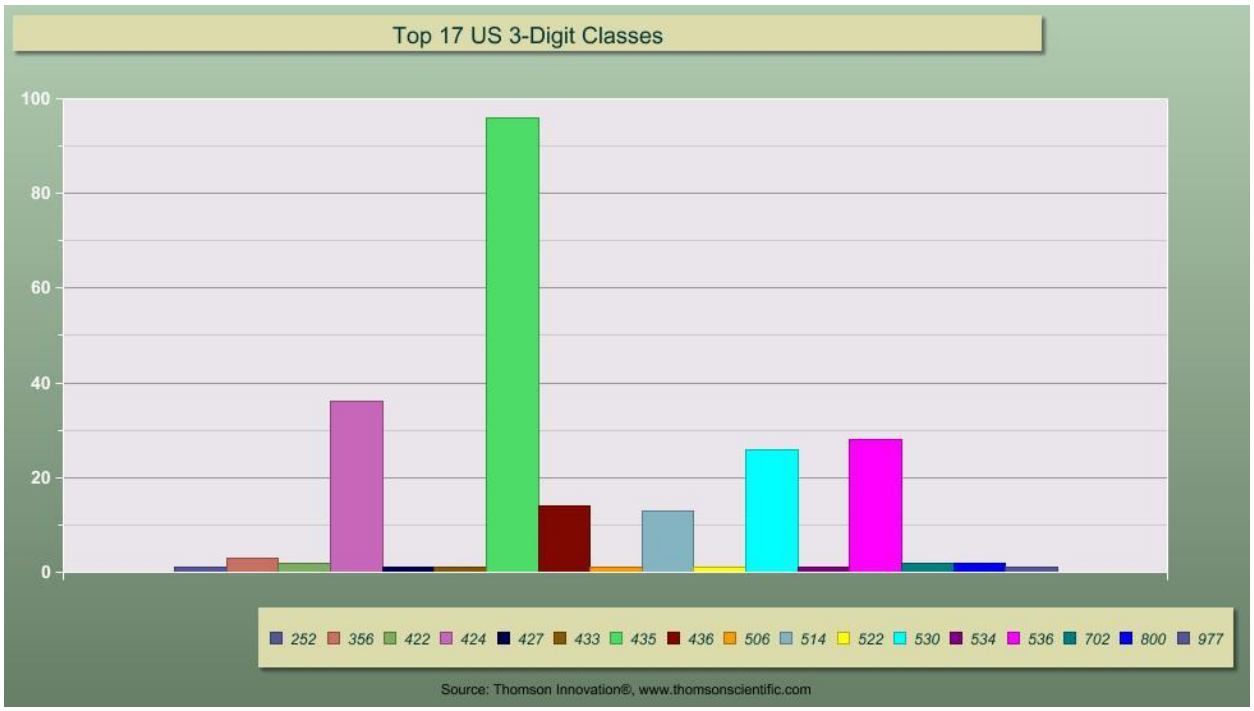


Figure 62: Bar graph of the top 17 US 3-digit classes of the 112 US relevant and emerging technology patent documents

US Class/Sub-Class	Patent Count
435/005	60
435/006	35
424/218.1	16
435/007.1	15
530/350	14
435/235.1	11
435/069.1	10
435/320.1	9
435/325	9
536/023.72	9
435/091.2	8
424/186.1	7
435/287.2	7
536/023.1	7
435/975	6
435/007.32	5
435/007.92	5
435/239	5
514/012	5
536/024.3	5

Table 33: Top 20 US classes/sub- classifications for the 112 US relevant and emerging technology patent documents

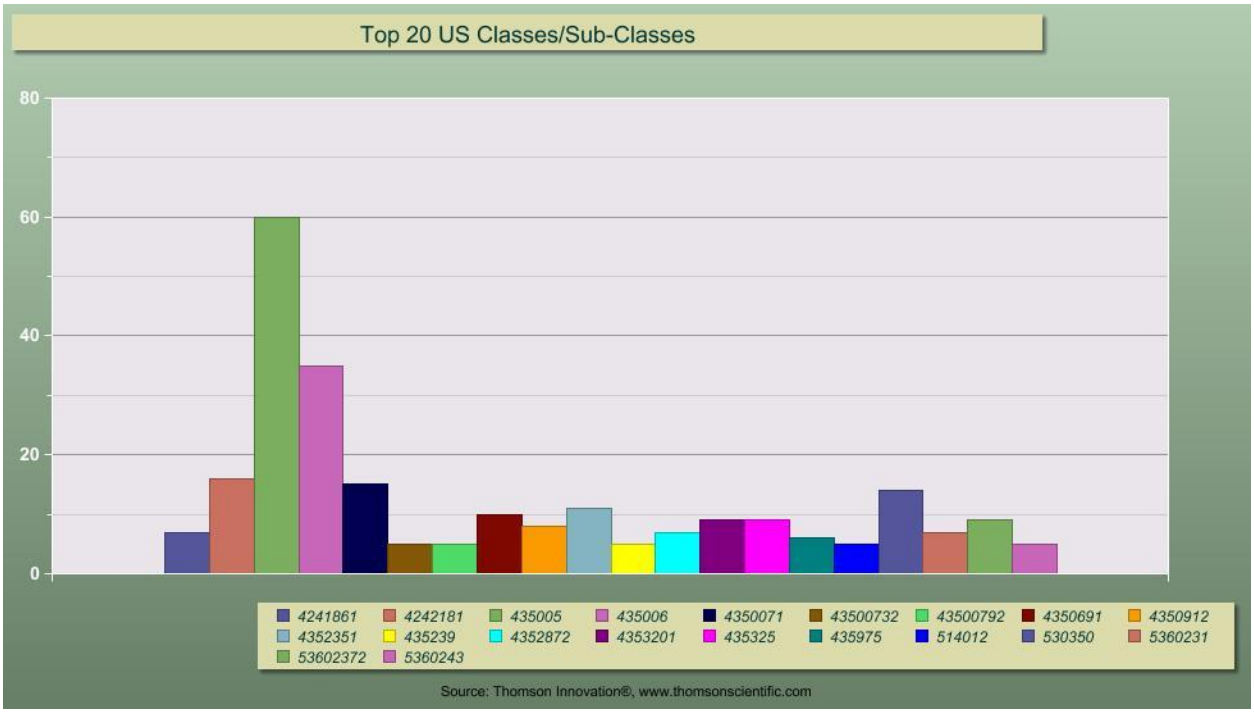


Figure 63: Bar graph of the top 20 US classes/sub-classes of the 112 US relevant and emerging technology patent documents

4.C.5 Patent Count v. IPC Classification

IPC classification information is an international system from the World Intellectual Property Organization (WIPO) and is used in more than 100 countries. The following analytics are based on the 290 relevant and emerging technology patent documents. The 290 patent documents fall into more than 20 IPC classifications the top three IPC classes being Class C07K, Class C12Q and Class G01N and 15 patent documents have no IPC classification. When further divided into IPC sub-classifications, the top five sub-classifications belong to Class C07K including C07K14/005 and C07K14/18, Class C07Q including C07Q1/68 and C07Q1/70, and Class G01N33/569. The definition of these IPC classifications and sub-classifications are shown in Appendix D. Table 32 and Figure 62, a bar graph, show the top 20 IPC classes of the relevant and emerging technology patent documents. Table 33 and Figure 63, a bar graph, show the top 20 IPC classes/sub-classes of the relevant and emerging technology patent documents.

IPC Class	Patent Count
G01N	133
C12Q	129
C07K	88
A61K	80
C12N	78
A61P	30
C12P	20
No IPC	15
C07H	14
C12M	9
C12R	5
B01L	4
A01K	3
A01N	3
A61B	3
G06F	3
B01J	2
C07D	2
H04N	2
C07M	1

Table 34: Top 20 IPC classes for relevant and emerging technology patent documents

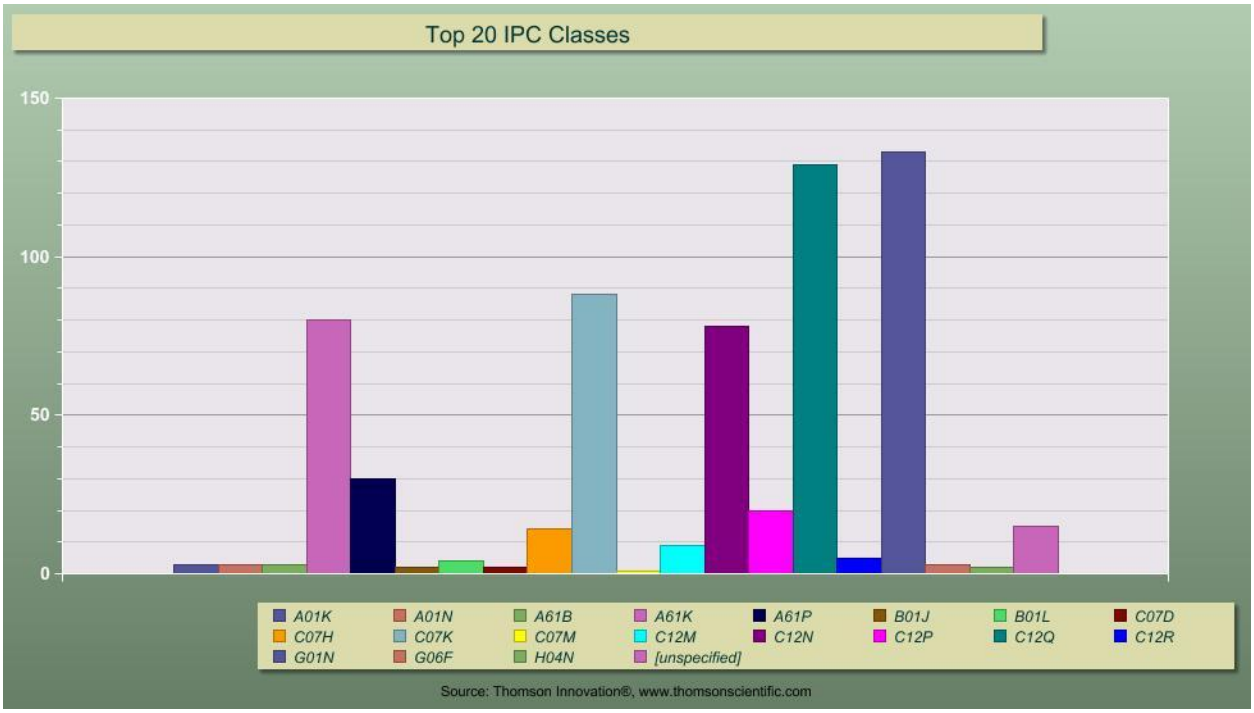


Figure 64: Bar graph of the top 20 IPC classes of relevant and emerging technology patent documents

IPC Class	Patent Count
C12Q0001/70	87
G01N0033/569	72
C12Q0001/68	68
C07K0014/005	51
C07K0014/18	43
A61K0039/00	33
A61P0031/00	27
A61K0039/12	26
G01N0033/53	25
G01N0033/543	24
C07K0016/08	21
C12N0015/09	19
A61K0038/00	17
A61P0031/12	17
C12N0015/40	17
A61K0048/00	16
C07K0016/10	16
G01N0033/68	15
No IPC	15
C12N0007/00	14

Table 35: Top 20 IPC classes/sub-classes for relevant and emerging technology patent documents

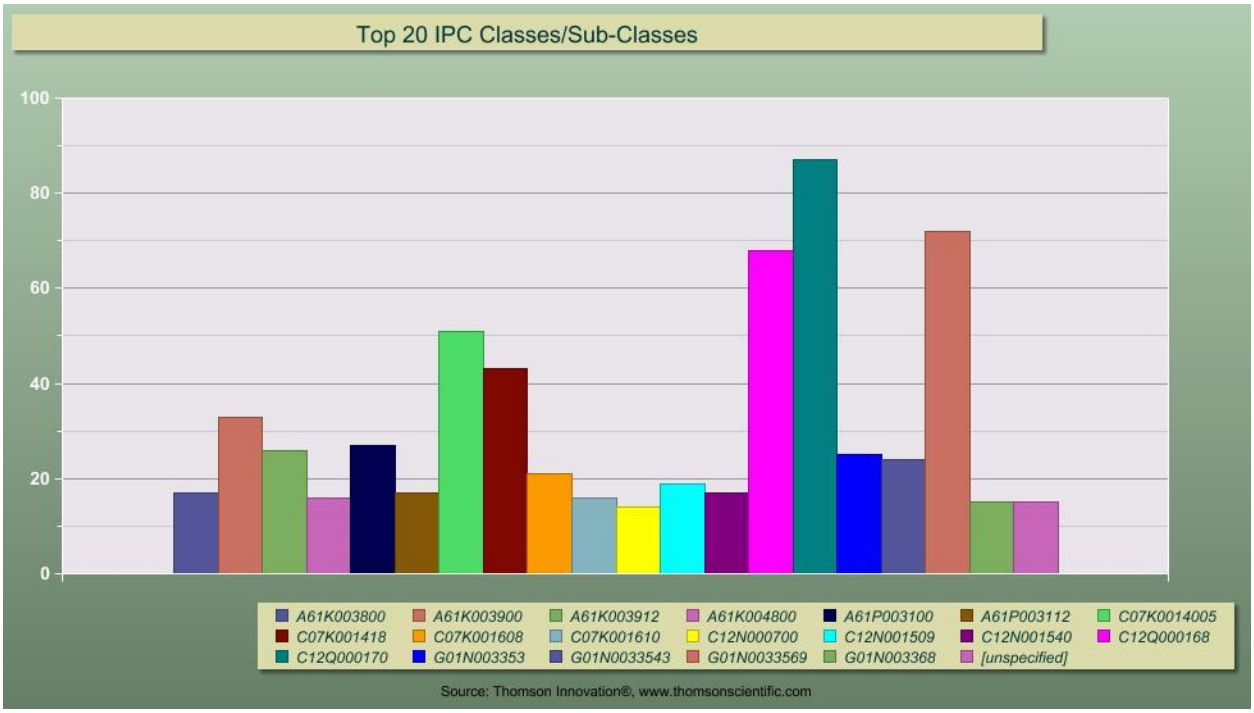


Figure 65: Bar graph of the top 20 IPC classes/sub-classes of relevant and emerging technology patent documents (unspecified = no IPC)

4.C.6 Patent Count v. Derwent Class (DWPI Class)

The DWPI analytics on Thomson Innovation can only show data for the top 20 classes. This leads to the program creating graphs based on 289 of the 290 total patent documents. Consequently, one DWPI class is missing from the data set. By looking through the data on Thomson Innovation®, it was determined that the missing class is P75, typewriters, stamps, duplicators.

DWPI classification information is unavailable for 11 of the 290 total patent documents analyzed in this report. As shown in Table 36 plus the addition of the one missing DWPI class as previously discussed, the patent documents fall into 20 DWPI classes. The top three DWPI classes are Class B04, Class A89, and Class A96 (natural products and polymers; photographic, laboratory equipment; and medical, dental, veterinary, cosmetic, respectively). Over 75% of the total documents belong to Class B04. Of the 290 total patent documents, 11 are classified as "unspecified" in regards to DWPI classification, as they have not been assigned a DWPI classification per Thomson Innovation®. The definitions of the Derwent classes listed in Table 36 below are shown in Appendix E.

DWPI Class-Main	Patent Count	Percentage
A14	2	0.69%
A17	1	0.35%
A23	1	0.35%
A26	1	0.35%
A85	1	0.35%
A89	30	10.38%
A96	12	4.15%
B02	1	0.35%
B03	1	0.35%
B04	218	75.43%
B05	1	0.35%
C06	1	0.35%
C07	1	0.35%
D16	1	0.35%
P24	1	0.35%
P31	2	0.69%
P81	1	0.35%
S03	1	0.35%
T01	1	0.35%
unspecified	11	3.81%
Total	289	100.00%

Table 36: DWPI classes on relevant and emerging technology patent documents

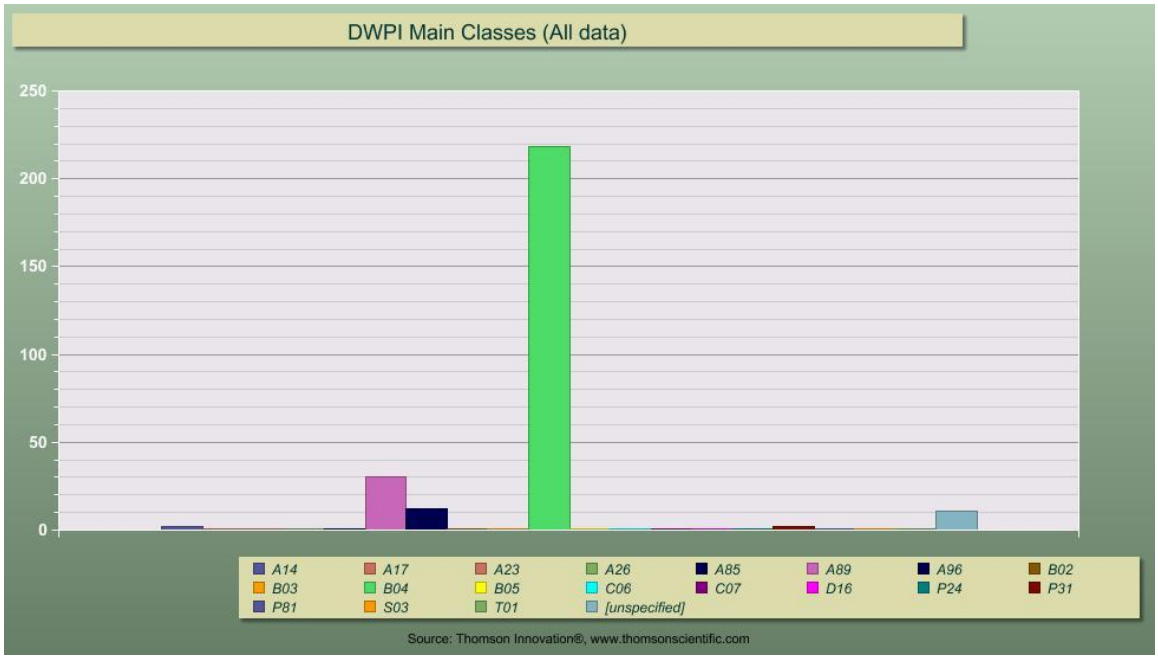


Figure 66: Bar chart - patent count v. DWPI class on relevant and emerging technology patent documents

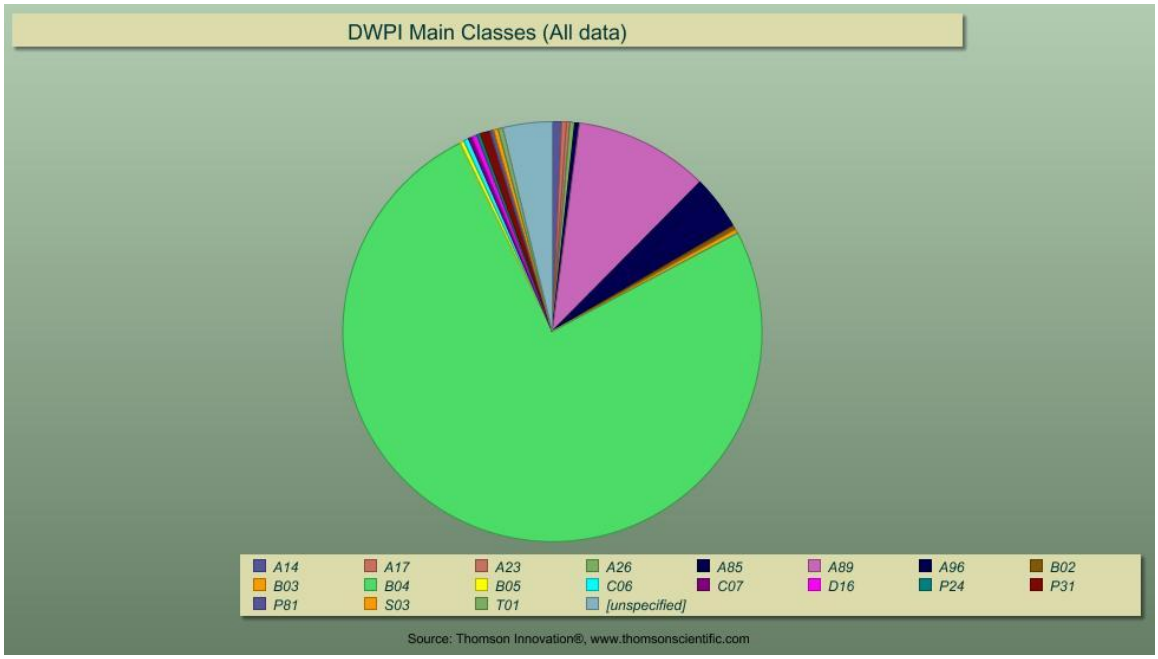


Figure 67: Pie chart - patent count v. DWPI class on relevant and emerging technology patent documents

4.C.7 Patent Count v. Derwent Manual Code

D05-H09 is the most prominent Derwent Manual Code of the coded patent documents. Table 37 depicts the top twenty DWPI manual codes and Figure 68 depicts a bar graph of this data.

DWPI Code	Number of Documents
D05-H09	178
B11-C07A	85
B12-K04A4	83
B04-F11	77
B12-K04F	74
B04-G01	71
B12-K04A4A	68
S03-E14H	68
D05-H06	66
B04-E01	64
D05-H11	64
D05-H06A	62
S03-E09F	62
B04-G08	61
B04-E05	60
B11-C08E5	58
D05-H07	54
B04-B04C1	52
B12-K04A	47
D05-H10	45

Table 37: Top 20 derwent manual codes for relevant and emerging technology patent documents

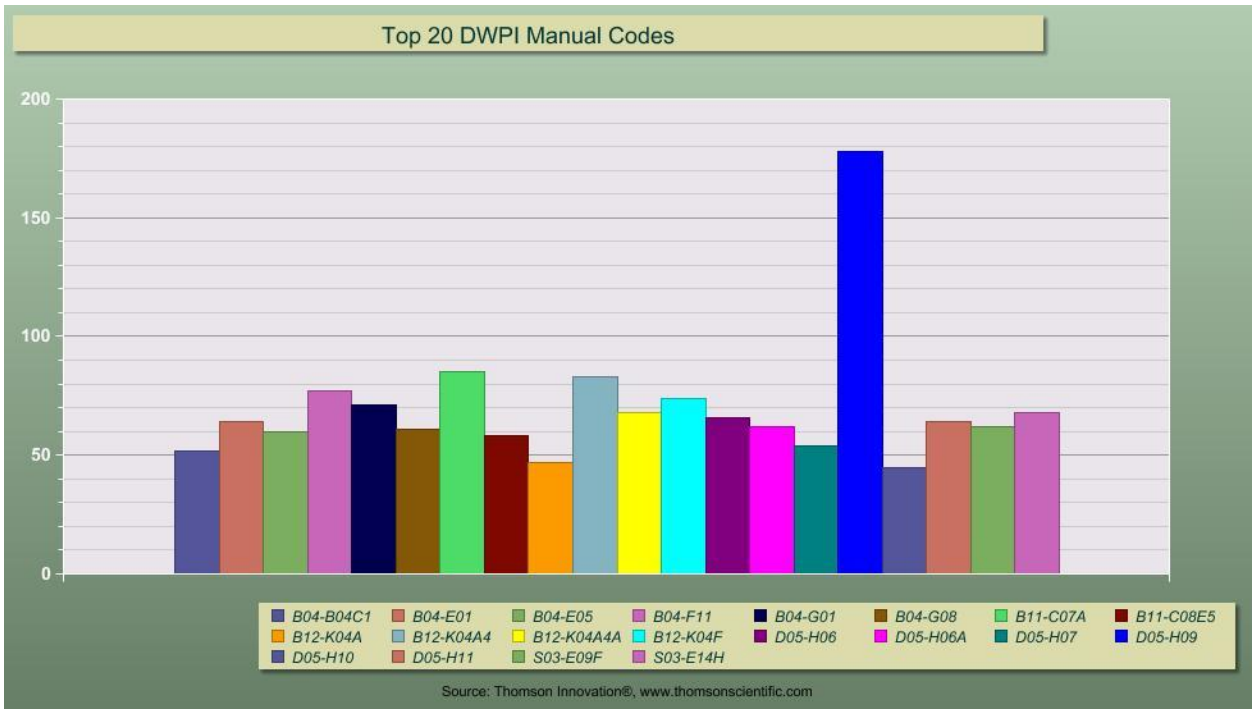


Figure 68: Top 20 DWPI manual codes on relevant and emerging technology patent documents

4.C.8 Patent Count v. Assignees

Table 38 shows the top ten assignees for all of patent documents based on original assignee data. The Top 10 Assignees based on Original Data account for 99 of the 290 total patent documents. This means that approximately 34% of the total patent documents are attributable to the Top 10 Assignees based on Original Data. According to the original assignee information, the top assignee is the Pasteur Institute, which accounts for about 5% of the total patent documents. Based on original assignee data, there are 51 documents with an "unspecified" assignee. US patent applications are not requires to include assignees for publication. Using and analyzing the information available on Thomson Innovation ®, it was verified that some of the "unspecified" assignee documents are US patent applications. Furthermore it was verified using Thomson Innovation® that all of the documents having unspecified assignees based on original data do have DWPI assignees. Therefore, the "unspecified" assignee documents according to the original data are accounted for in the analytics for the Top 10 Assignees based on DWPI Data shown in Table 38.

Table 39 shows the Top 10 Assignees according to the Derwent Data. The Top 10 Assignees based on DWPI Data account for 80 of the 290 total patent documents. This means that approximately 28% of the total patent documents are attributable to the Top 10 Assignees based on DWPI Data. According to the DWPI data, the top assignee is Pasteur Institute, which accounts for almost 6% of the total patent documents. There are 11 patents documents that fall into the "unspecified" category because they do not have DWPI Assignees/Applicants. These 11 documents do, however, have original data assignees/applicants, which was verified using Thomson Innovation®. Therefore, the unspecified documents for the DWPI assignees are accounted for in the analytics for the Top 10 Assignees based on Original Data, seen in Table 39.

Assignee (Original)	Patent Count	Percentage
AKZO NOBEL NV	3	1.03%
CENTRE NAT RECH SCIENT	5	1.72%
HAWAII BIOTECH GROUP	4	1.38%
ISIS PHARMACEUTICALS INC	3	1.03%
NAT ENVIRONMENT AGENCY	5	1.72%
PASTEUR INSTITUT	15	5.17%
SHENZHEN TAITAI GENE ENGINEERING	5	1.72%
UNIV TEXAS	4	1.38%
US GOVERNMENT	4	1.38%
unspecified	51	17.59%
Total documents from top 10 assignees	99	34.14%
Total documents	290	100.00%

Table 38: Top 10 assignees (original data) – relevant and emerging technology patent documents

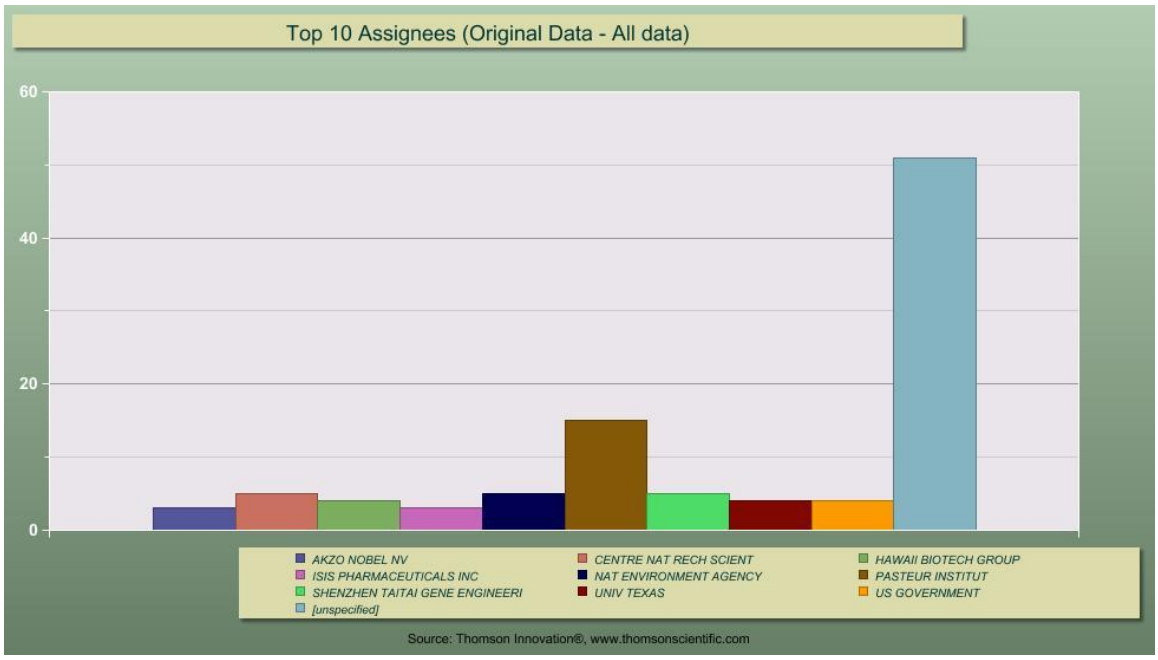


Figure 69: Bar chart - patent count v. top 10 assignees (original data) relevant and emerging technology patent documents

Assignee (DWPI)	Patent Count	Percentage
CENT NAT RECH	7	2.41%
CNRS CENT NAT	4	1.38%
IMMUNOMEDICS INC	6	2.07%
INST PASTEUR	17	5.86%
INT CENT GENET	5	1.72%
ISIS PHARM INC	4	1.38%
NAT ENVIRONMENT	7	2.41%
US DEPT HEALTH	15	5.17%
US SEC OF NAVY	4	1.38%
unspecified	11	3.79%
Total documents from top 10 assignees	80	27.59%
Total documents	290	100.00%

Table 39: Top 10 assignees (DWPI) relevant and emerging technology patent documents

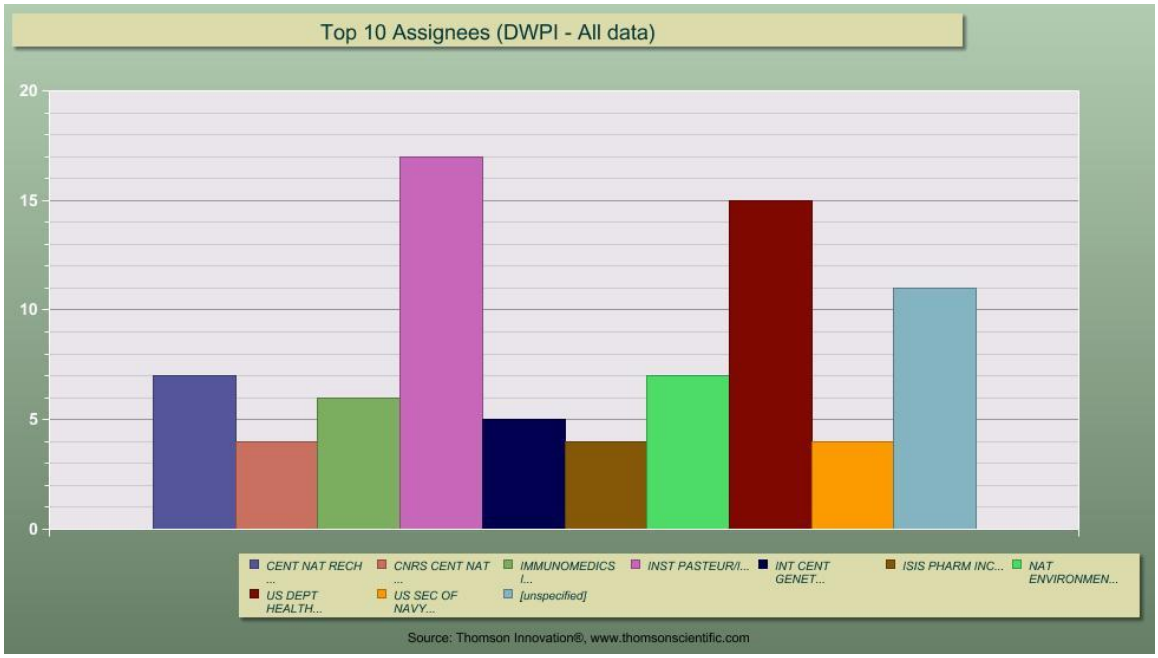


Figure 70: Bar chart - top 10 assignees (DWPI) relevant and emerging technology patent documents

4.C.9 Patent Count v. Inventors

(Composed with Microsoft Excel®)

The patent counts according to the top 20 inventors are shown in the tables and graphs below. The data was exported from Thomson Innovation into Microsoft Excel. The patent counts according to inventors are broken up into three groups. The first group, as seen in Table 35 and Figure 69, shows the Top Inventors of the Documents of the Emerging Technology and Relevant Technology Patent Documents combined.

Inventor	Number of Documents
Despres, Philippe	12
KUMARSIL BIJON	5
McDonell, Michael	5
SAMPATH, Rangarajan	5
WU, Xin-wei	5
XIAO, Xing-long	5
ZHANG, Jing-wei	5
Alcon, Sophie	4
Chang, Gwong	4
Deubel, Vincent	4
ECKER, David, J.	4
Flamand, Marie	4
Frenkiel, Marie Pascale	4
Goldenberg, David, M.	4
Olivo, Paul D.	4
Lai, Ching-Juh	3
Megret, Françoise	3
Purcell, Robert H.	3
Talarmin, Antoine	3
Tangy, Frédéric	3

Table 40 : The top inventors of the relevant technology and emerging technology patent documents

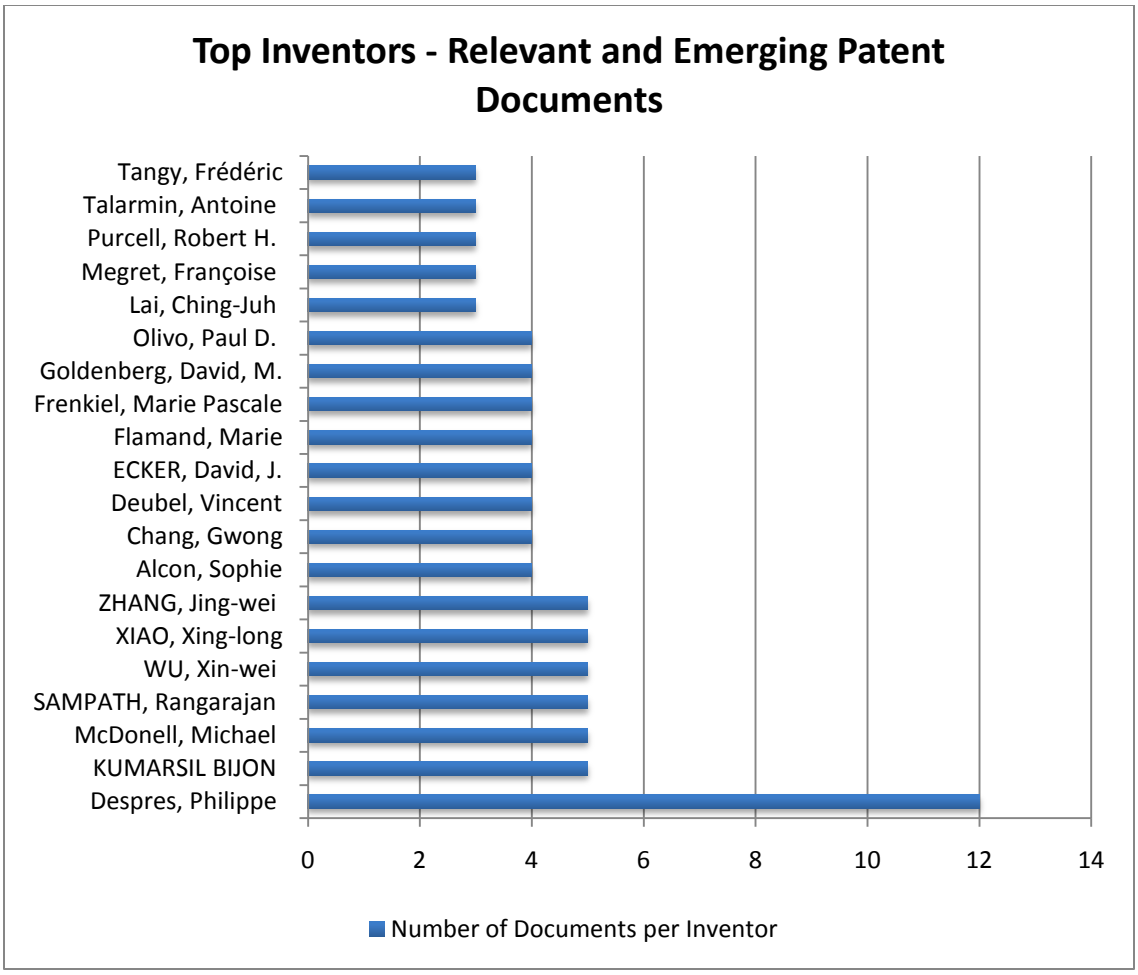


Figure 71: The top inventors of the relevant and emerging technology patent documents

4.C.10 Themescape Map

Documents with similar content are near each other in the content map, forming peaks, and the number of documents in a region is indicated by the height of the peaks in the landscape. Tall peaks indicate many documents, while small peaks indicate fewer documents. The relationship between the topics in the documents is drawn as the distance between peaks. Peaks that are located near each other have more similar topics than peaks that are located farther away. A Themescape map summarizing the title, abstract and claims of the Relevant and Emerging Technology patent documents are found in Figure 72 and a themescape map summarizing the derwent title and abstract of the Relevant and Emerging Technology patent documents are found in Figure 73.

Figure 72: Themescape map of title, abstract, claims in relevant and emerging technology patent documents

Figure 73: Themescape map of derwent abstract and title in relevant and emerging technology patent documents

4.C.11 Patent Insight Pro – Filing Date over Time

The following Table 41 and Figure 74 represent the countries where patent documents were filed. Table 41 only shows year 2009 but the Figure 74 depicts the filing years of patent documents over the time period of 18 years. There is an exponential growth in patent filing of dengue diagnostic technologies after the year 1992. These Figures represent both relevant and emerging technologies.

Countries/Publication Year	2009	Percentage of total patents(%)
US - United States	112	39.96
WO - W.I.P.O.	104	35.41
EP - Europe	15	9.36
CN - China	20	3.38
JP - Japan	10	2.85
SU - U.S.S.R	2	2.06
GB - Great Brittain	2	1.74
FR - France	4	1.64
KR - Korea	5	1.53
IN - India	7	1.11
SG - Singapore	1	0.32
CA - Canada	1	0.26
DE - Germany	1	0.21
TW - Taiwan	1	0.16

Table 41: Countries filing dates over time (only year 2009 depicted)

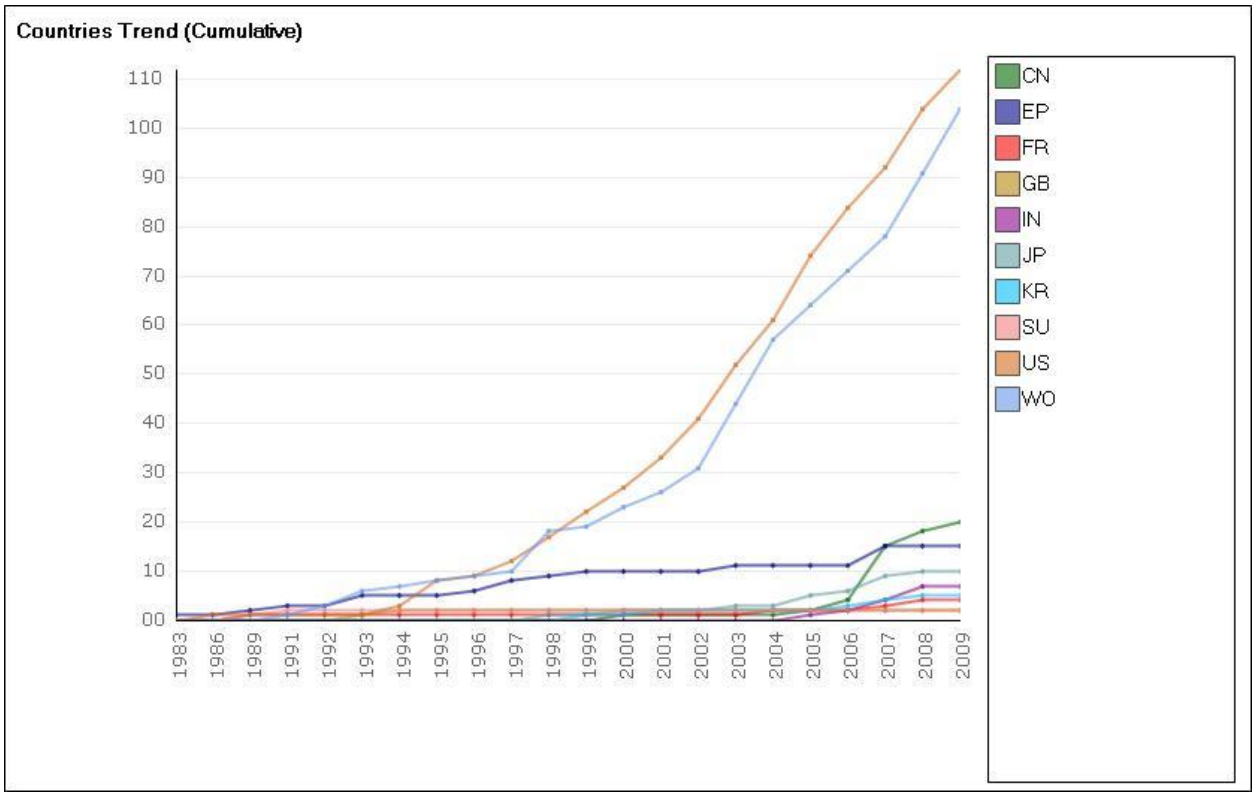


Figure 74: A line graph depicting filing dates of patent documents in relevant and emerging technology in various countries

4.C.12 World Maps

The following figures depict world maps of all the coded patents (both relevant and emerging technology). Specifically, Table 42 and Figure 75 depict the relevant and emerging technology of the coded patent applications. Table 43 and Figure 76 depicts the relevant and emerging technology of the coded granted patents. The final Table 44 and Figure 77 depict the world map of coded and INPADOC families of the coded patent in both the relevant and emerging technology of patent documents. Unfortunately due to time constraints not all INPADOC family members were coded but were assume relevant for the purposes of this study.

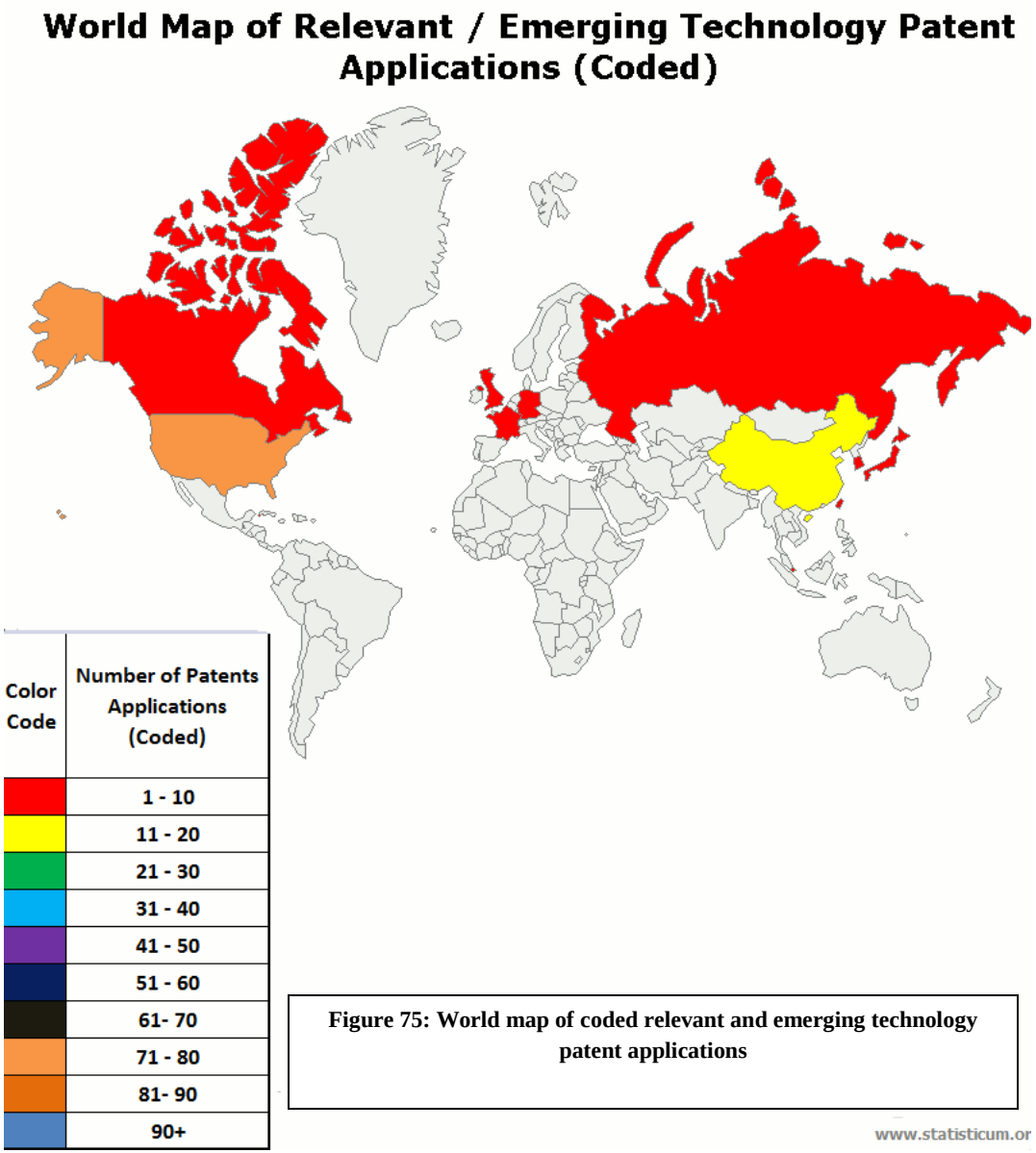


Figure 75: World map of coded relevant and emerging technology patent applications

Relevant / Emerging Technology Patent Applications (Coded)	
Organizations	**Number of Patents Applications (Coded)**
WIPO (WO) *	108
United States (US)	72
China (CN)	20
European Patent (EP) *	15
Japan (JP)	9
Korea (South) (KR)	5
France (FR)	4
Great Britain (GB)	2
USSR (former) (SU)**	2
Canada (CA)	1
Germany (DE)	1
Singapore (SG)	1
Taiwan (TW)	1
*** Patents not shown in the World Map**	
**** USSR (former) includes Russian Federation (RU)**	

Table 42: Organizations of coded relevant and emerging technology patent applications

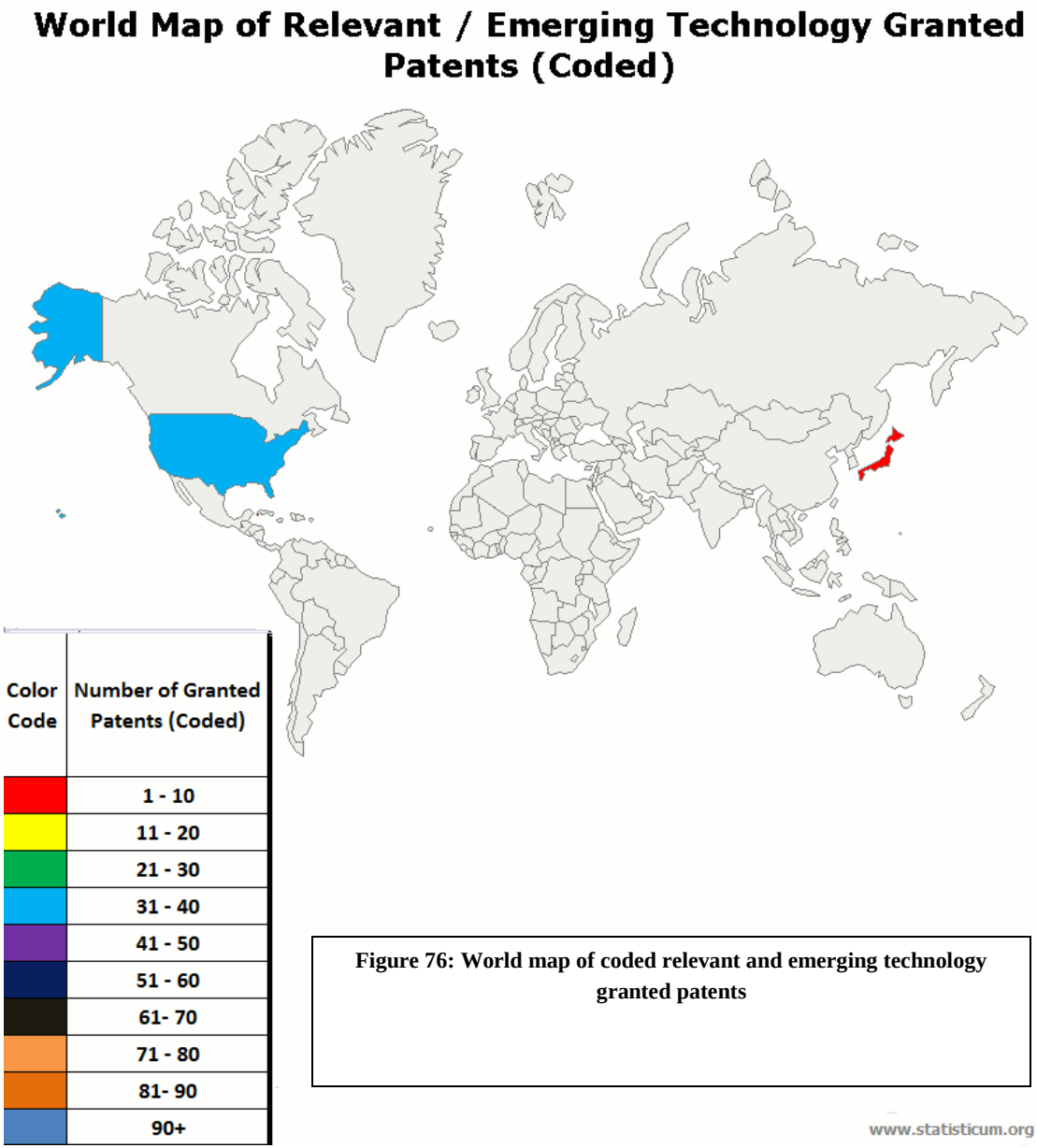


Figure 76: World map of coded relevant and emerging technology granted patents

Relevant / Emerging Technology Granted Patents (Coded)	
Organizations	**Number of Granted Patents (Coded)**
United States (US)	39
Japan (JP)	1

Table 43: Organizations of coded relevant and emerging technology granted patents

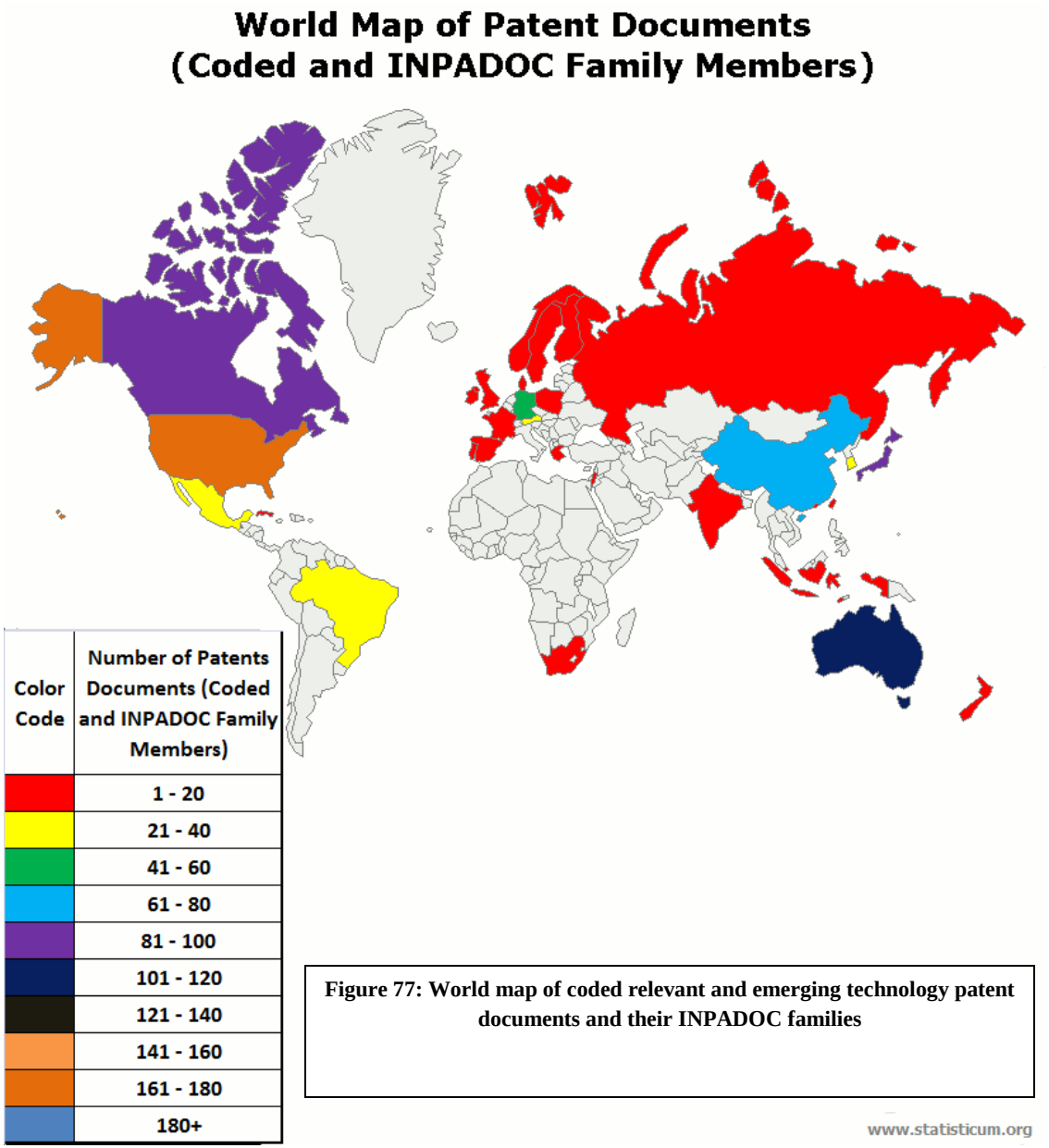


Figure 77: World map of coded relevant and emerging technology patent documents and their INPADOC families

Relevant / Emerging Technology Patent Documents (Coded and INPADOC Family Members)	
Organizations	**Number of Patents Documents**
WIPO (WO)*	215
United States (US)	172
European Patent (EP)*	137
Australia (AU)	119
Canada (CA)	97
Japan (JP)	97
China (CN)	63
Germany (DE)	47
Austria (AT)	35
Korea (South) (KR)	26
Brazil (BR)	25
Mexico (MX)	24
Spain (ES)	20
South Africa (ZA)	19
Singapore (SG)	18
Great Britain (GB)	17
France (FR)	16
Denmark (DK)	13
Israel (IL)	11
USSR (former) (SU) **	9
Portugal (PT)	8
Hong Kong (HK)	7
India (IN) ++	7
Norway (NO)	7
New Zealand (Aotearoa) (NZ)	4
Finland (FI)	2
Greece (GR)	2
Poland (PL)	2
Sweden (SE)	2
Taiwan (TW)	2
Cuba (CU)	1
Indonesia (ID)	1
Ireland (IE)	1
* Patent Documents not illustrated in the World Map	
** USSR (former) includes Russian Federation (RU)	
++ No Kind Codes for Indian Patents	

Table 44: Organizations of coded relevant and emerging technology patent documents and their INPADOC families

VIII. Appendices

APPENDIX A: Scientific Papers

(http://www.ncbi.nlm.nih.gov/sites/entrez)
1**.** Curr Mol Med. **2009 Mar;9(2):152-73**

Dengue: recent advances in biology and current status of translational research.
Swaminathan S, Khanna N.
Recombinant Gene Products Group, International Centre for Genetic Engineering & Biotechnology, P.O. Box 10504, Aruna Asaf Ali Marg, New Delhi-110067, India. swami@icgeb.res.in
Dengue is a very rapidly growing public health problem being currently faced by approximately 40% of the global population living in more than a hundred tropical and sub-tropical countries. It is a viral disease, caused by four types of dengue viruses, transmitted by mosquitoes, to an estimated 50 million people each year. Vector control methods to contain transmission have not been successful and there is currently no useful diagnostic test, drug or vaccine to combat dengue disease. However, as a result of the heightened awareness of its magnitude and its potential to spread beyond the tropical world, dengue has begun to emerge out of the list of neglected diseases in recent years. New interest in this disease has drawn scientists from multiple disciplines into the dengue arena. This has resulted in novel insights into several aspects of dengue virus biology and identified potential drug targets. Several tetravalent vaccines are being developed. Newer animal models that mirror some of the salient features of dengue disease are becoming available to investigate the mechanism of pathogenesis and to aid in drug and vaccine discovery efforts. The realization that therapeutic and prophylactic intervention can be cost-effective has resulted in vigorous industry-driven translational initiatives to develop drugs and vaccines. Dengue research is at a critical juncture and the implementation of existing knowledge supplemented by a better understanding of pathogenesis promises to make a tangible impact in the combat against dengue in the coming years.
PMID: 19275624 [PubMed - indexed for MEDLINE]

2. Laboratory Tests for the Diagnosis of Dengue Virus Infection

Working paper for the Scientific Working Group on Dengue Research, convened by the Special Programme for Research and Training in Tropical Diseases, Geneva, 1-5 October 2006

Philippe Buchy1, Sutee Yoksan2, Rosanna W. Peeling3, Elizabeth Hunsperger4

1 Institut Pasteur in Cambodia, Virology Unit, 5 Monivong boulevard, PO Box 983, Phnom Penh, Cambodia. **2** Mahidol University, Centre for Vaccine Development, Bangkok, Thailand. **3**
UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR), World Health Organization, Geneva, Switzerland. **4** Centers for Disease Control and Prevention (CDC), Dengue Branch, San Juan, Puerto Rico

Dengue, a mosquito-transmitted viral disease that produces variable symptoms, ranging from asymptomatic infection to life-threatening disease, is present in about 110 tropical and subtropical countries. As dengue is increasing in incidence, improved diagnosis, early detection of severe cases, and efficient medical management are of primary importance in all areas where dengue is endemic. Traditionally, dengue has been diagnosed by virus isolation or serological methods, but with recent advances in molecular techniques and in rapid detection technology, a range of novel diagnostic tests will soon be commercially available that will improve case management and aid disease control efforts. The goal of this paper is to review the diagnostic tools that are currently available or in development and their potential role in case detection, identification of prognostic markers of severe disease, surveillance and outbreak investigations.

3. Int J Infect Dis. **2004 Mar;8(2):69-80.**

Dengue diagnosis, advances and challenges.

Guzmán MG, Kourí G.
Virology Department, PAHO/WHO Collaborating Center for Viral Diseases, 'Pedro Kouri;' Tropical Medicine Institute, Autopista Novia del Mediodi;a, Km 6, Ciudad Habana, Cuba. lupe@ipk.sld.cu
Dengue diagnosis was one of the topics discussed at the symposium 'The Global Threat of Dengue - Desperately Seeking Solutions' organized during the 10th International Congress of Infectious Diseases held in Singapore in 2002. In this paper, a review is presented focusing on the main advances, problems and challenges of dengue diagnosis.IgM capture ELISA, virus isolation in mosquito cell lines and live mosquitoes, dengue specific monoclonal antibodies and PCR have all represented major advances in dengue diagnosis. However, an appropriate rapid, early and accessible diagnostic method useful both for epidemiological surveillance and clinical diagnosis is still needed. Also, tools that suggest a prognosis allowing for better management are also needed. Finally, laboratory infrastructure, technical expertise and research capacity must be improved in endemic countries in order to positively influence dengue surveillance, clinical case management and the development of new approaches to dengue control.
PMID: 14732325 [PubMed - indexed for MEDLINE]

4. Rev Med Virol. **2005 Sep-Oct;15(5):287-302.**

Trends in dengue diagnosis.

Teles FR, Prazeres DM, Lima-Filho JL.
Laboratório de Imunopatologia Keizo-Asami (LIKA), Universidade Federal de Pernambuco, Av. Prof. Moraes Rego 1235, Campus Universitário, Cidade Universitária, Recife, PE-CEP: 50670-901, Brazil.
The conventional diagnosis of dengue virus infections includes the detection of the virus in serum or tissue samples, both by isolation in culture or through detection of specific viral molecules (genome RNA or dengue antigens) and detection of specific anti-dengue antibodies (serology). Isolation of dengue virus provides the most direct and conclusive approach to diagnosis, despite the demand for high-level equipment, technical skills and manpower. However, it is useless in early diagnosis because several days are required to isolate and classify the virus. Serology, despite being simpler, is not able to afford an accurate early diagnosis in primary infections because 4-5 days are required for the immune system to produce a sufficient amount of antibodies. Moreover, it leads to misleading results in secondary infections owing to cross-reactivity among serotype-specific antibodies and with other *Flavivirus* antibodies. The RT-PCR and other PCR-based techniques are fast, serotype-discriminating, more sensitive and easier to carry out than conventional nucleic-acid hybridisation, but are handicapped by easy sample contamination and high technological demands. Recently, advances in bioelectronics have generated commercial kits and new techniques for detection of dengue antibodies and RNA, based on biosensor technology. Most of them are rapid, easy to operate, reusable, cheap, sensitive and serotype-specific. Nevertheless, their accuracy is still questionable because most still lack validation and standardisation. This review summarizes and describes the techniques currently employed and anticipated in the near future for diagnosis of dengue disease.
PMID: 15672450 [PubMed - indexed for MEDLINE]

APPENDIX B: Description of Patent Databases & Platforms used in this report

Platform Name- Innovation

General Information

a. Innovation is a Thomson Reuters product

b. Data Coverage:

i. US Grants & Applications
ii. European Grants & Applications
iii. German Grants & Applications
iv. German Utility Models
v. WIPO/PCT Applications
vi. British Applications
vii. French Applications
viii. Japanese Grants & Applications
ix. Chinese Utility Models & Applications
x. Korean Grants & Applications
xi. INPADOC
xii. Derwent World Patents Index
xiii. Non-Patent Literature
xiv. Business Information and News

Searches and Views

c. Quick/Number searching and Boolean searching are available

d. Corporate tree shows you how an Assignee name fits into a corporate hierarchy that takes into account mergers and acquisitions — and then lets you search for patents by selecting Assignee names from that corporate hierarchy

e. Cross Search enables you to search the Patent, Literature, and Business content sets in a single search

f. Patent images can be viewed in both high and low resolution.

g. Saved Searches saves queries for frequently used searches. Searches can be saved directly from a result set. Two or more existing Saved Searches can be merged.

h. Users can create Alerts for later automated searches.

i. Work Files save, organize, annotate and share personalized lists of patents. Work files can save up to 20,000 patents. Users can share Work Files with coworkers or clients

j. Data Extract exports key bibliographic fields in common formats

Analysis and Mapping

k. Charts & Graphs

l. Thomson Innovation provides a collection of standard templates, each one designed to illustrate a different aspect of your list of records.

m. Citation Maps

i. Using citation mapping, you analyze your own patent and choose to look at forward only citations to focus just on other patents citing yours

ii. To support the patent's validity, you use citation mapping to review the references cited in your client's patent, as well as the references cited by those, to establish the state of the art at the time of the invention

n. Text Clustering

i. Clustering organizes results in a hierarchical format for easy drill-down to enable refinement of search strategies and identification of new links between subject matter and assignees.

o. Themescape Maps

i. Themescape creates content maps from Thomson Innovation full text patent data, enhanced patent data from DWPI, and scientific literature content.

ii. Common conceptual terms are displayed in a two-dimensional map, with peaks representing a concentration of documents and showing the relative relationship of one record to another.

iii. The thematic topographical map enables “at a glance” assessments and is searchable.

Platform Name– Patent Insight Pro

General information

- Supports US, EP, WIPO, JP, GB, CA and other countries patents
- Users can submit a list of patent numbers in an Excel or CSV file; the software will download them one-by-one
- Full Claims section can be separately captured in original PDF format and exported to Word documents
- The Tabular Word/Excel Export function allows the export of patent summaries with images to Excel and Word documents
- Automatic language detection of patents with preset nine languages stop-word lists for segmentation according to the detected language
- Includes Automated Patent term cleanup using Thesaurus

Analysis and mapping

- Offers patent mapping, patent alerts, text clustering and auto-categorization, natural language searching, similarity searching, patent landscaping, and concurrency analysis

Platform Name- Westlaw

General Information

- Westlaw is a Thomson Company product.
- Flexible pricing plans (i.e., large company or single attorney)
- The Westlaw database contains full text information of patents before 1972, whereas other services just have bibliographic information.

Searching

- The value-added services can be accessed from the "Patent Practitioner" tab of the user's account after login. This tab includes links useful to facilitate research in patent literature, cases, statutes, and regulations, court records and litigation tracking. It also provides information on recent developments, litigation practice guides, prosecution practice guides, and forms.
- "KeyCite" covers all patents granted by the USPTO since 1976. "KeyCite" also offers access to reissued patents, defensive publications, and statutory invention registrations. To view KeyCite information for a document, users can click a status flag on the document or click "Full History" or "Citing References" links on the "Links" tab
- Citing references provide relevant previous patent literatures
- Citing references are available for U.S. patents only
- Provides access to the Derwent World Patent Index as well as relevant sources, including cases and statutes, patents and patent treatises, and post issuance information, such as KeyCite for patents.
- Includes a link to Delphion which provides access to the full text of US and European patents and patent applications, PCT applications, and abstracts from Japanese patents and patent applications
- Has ability to search full-text patent documents, each has a link to display the full original patent, including drawings in PDF format.
- U.S. patent file histories are available in PDF format, with handwritten comments and time stamps intact.
- Using certain truncations and connectors is difficult when using the Westlaw database
- Hybrid searches often generate a large number of irrelevant results

APPENDIX C: Definitions of U.S. Classifications

United States Patent Classification System

- A Patent Classification is a code which provides a method for categorizing the invention.
- There are about 450 Classes of invention and about 150,000 subclasses of invention in the USPC.
- Classifications are typically expressed as "482/1".
    - The first number, 482, represents the class of invention.
    - The number following the slash is the subclass of invention within the class.
- Patents are always classified at the subclass level.
- A Subclass definition is a complete description of the subclass. The Subclass Definition can incorporate an explanation of the class, a glossary, search notes, references to subclasses within the class, and references to other classes and subclasses.
- Classes and subclasses have titles which provide a short description of the class or subclass.
- Classes and subclasses also have definitions which provide a more detailed explanation.
- Many Classes and subclasses have explicitly defined relationships to one another.
- One or more classifications (i.e., class/subclass designations) are assigned to each granted patent and each published application.
- A patent classification also represents a searchable collection of patents grouped together according to similarly claimed subject matter.
- A classification is used both as a tool for finding patents (patentability searches) and for assisting in the assignment of patent applications to examiners for examination purposes.
- Available at: http://www.uspto.gov/go/classification/

Classification Codes applicable for this report

The most frequently found classes are underlined.

- **Class 424: Drug, Bio-Affecting and Body Treating Compositions**
    - Class 424/186.1: Disclosed amino acid sequence derived from virus
    - Class 424/192.1: Fusion protein or fusion polypeptide (i.e., expression product of gene fusion)
    - Class 424/218.1: Togaviridae or *Flaviviridae*, except hepatitis C virus (e.g., yellow fever virus, bovine viral diarrhea virus, dengue virus, equine viral arteritis virus, equine encephalitis virus, Japanese B encephalitis virus, Sindbis virus, *Flavivirus*, etc.)

- **Class 435: Chemistry: Molecular Biology and Microbiology**
    - Class 435/005: Involving virus or bacteriophage
    - Class 435/006: Involving nucleic acid
    - Class 435/007.1: Involving antigen-antibody binding, specific binding protein assay or specific ligand-receptor binding assay
    - Class 435/007.92: Heterogeneous or solid phase assay system (e.g., ELISA, etc.)
    - Class 435/069.1: Recombinant DNA technique included in method of making a protein or polypeptide
    - Class 435/069.3: Antigens
    - Class 435/091.2: Acellular exponential or geometric amplification (e.g., PCR, etc.)
    - Class 435/235.1: Virus or bacteriophage, except for viral vector or bacteriophage vector; composition thereof; preparation or purification thereof; production of viral subunits; media for propagating
    - Class 435/239: Recovery or purification
    - Class 435/320.1: Vector, per se (e.g., plasmid, hybrid plasmid, cosmid, viral vector, bacteriophage vector, etc.)
    - Class 435/325: Animal cell, per se (e.g., cell lines, etc.); composition thereof; process of propagating, maintaining or preserving an animal cell or composition thereof; process of isolating or separating an animal cell or composition thereof; process of preparing a composition containing an animal cell; culture media therefore

- **Class 514: Drug, Bio-Affecting and Body Treating Compositions**
    - Class 514/012: 25 or more peptide repeating units in known peptide chain structure

- **Class 530: Chemistry: Natural Resins or Derivatives; Peptides or Proteins; Lignins or Reaction Products Thereof**
    - Class 530/350: Proteins, i.e., more than 100 amino acid residues
    - Class 530/388.3: Binds virus or component or product thereof (e.g., virus-associated antigen, etc.)

- **Class 536: Organic Compounds—Part of the Class 532-570 Series**
    - Class 536/023.1: DNA or RNA fragments or modified forms thereof (e.g., genes, etc.)
    - Class 536/023.53: Immunoglobulin
    - Class 536/023.72: Viral protein

APPENDIX D: Definitions of I.P.C Classifications

International Patent Classification System

- An International Patent Classification (IPC) is administered by the World Intellectual Property Organization (WIPO).
- The IPC consists of several hierarchical levels; it divides technology into eight sections (A through G) with approximately 70,000 subdivisions.
- The IPCs are typically expressed as "A63C 11/14."
    - A represents a Section.
    - The number following a Section, 63, is a Class.
    - C represents a Subclass.
    - 11 is a Main group.
    - The number following the slash, 14, is a Subgroup.
- The authentic version of the IPC is published in English and French languages. Chinese, Croatian, Czech, Dutch German, Hungarian, Japanese, Korean, Polish, Romanian, Russian, Serbian, and Spanish versions are also available.
- The IPC is used in more than 100 countries. Thus, the IPC is used as a tool for finding, for example, both US and JP documents.
- Available at: http://www.wipo.int/classifications/fulltext/new_ipc/ipcen.html

Classification Codes applicable for this report

The most frequently found codes are underlined.

- **Section A: Human Necessities**
    - A01N: Preservation of Bodies of Humans or Animals or Plants or Parts Thereof; Biocides; Pest Repellant or Attractants; Plant Growth Regulators e20100101;a2010 f A01N
    - A61K: Preparations for Medical, Dental, or Toilet Purposes
    - A61P: Therapeutic Activity of Chemical Compounds or Medical Preparations

- **Section B: Performing Operation; Transporting**
    - B01F: Mixing, e.g. Dissolving, Emulsifying, Dispersing
    - B01J: Chemical or Physical Process, e.g. Catalysis, Colloid Chemistry; Their Relevant Apparatus

- **Section C: Chemistry; Metallurgy**
    - C07D: Heterocyclic Compounds
    - C07F: Acyclic, Carbocyclic, or Heterocyclic Compounds Containing Elements Other Than Carbon, Hydrogen, Halogen, Oxygen, Nitrogen, Sulfur, Selenium, or Tellurium
    - C07H: Organic Chemistry
    - C07K: Peptides
        - 14/005: From viruses
        - 14/18: Togaviridae, e.g. *Flavivirus*, pestivirus, yellow fever virus, hepatitis C virus, japanese encephalitis virus
    - C08J: Working-up; General Processes of Compounding; After-Treatment Not Covered by Subclasses C08B, C08C, C08F, C08G or C08H
    - C12M: Apparatus for Enzymology or Microbiology
    - C12N: Micro-Organisms or Enzymes; Compositions Thereof; Propagating, Preserving, or Maintaining Micro-Organisms; Mutation or Genetic Engineering; Culture Media
    - C12P: Fermentation of Enzyme-Using Process to Synthesize a Desired Chemical Compound or Composition or to Separate Optical Isomers from a Racemic Mixture
    - C12Q: Measuring or Testing Processes Involving Enzymes or Micro-Organisms; Compositions or Test Papers Therefor; Processes of Preparing Such Compositions; Condition-Responsive Control in Microbiological or Enzymological Processes
        - 1/68: Involving nucleic acids
        - 1/70: Involving virus or bacteriophage

- C12R: Indexing Scheme Associated with Subclasses C12C-C12Q or C12S, Relating to Micro-Organisms

- **Section G: Physics**
  - G01J: Measurement of Intensity, Velocity, Spectral Content, Polarization, Phase or Pulse Characteristics of Infra-red, Visible or Ultra-Violet Light; Colorimetry, Radiation Pyrometry
  - G01N: Investigation or Analyzing Materials by Determining Their Chemical or Physical Properties
    - 0033/569: For micro-organisms, e.g. protozoa, bacteria, viruses
  - G05B: Control or Regulating System in General; Functional Elements of Such Systems; Monitoring or Testing Arrangements for Such Systems or Elements

APPENDIX E: Derwent Classifications[135]

Description of Derwent Patent Classifications

- Categorizes patent documents using a simple classification system for all technologies; consistently applied to all patents by Thomson Scientific subject experts, enabling effective and precise searching in a particular area of technology.
- International Patent Classification (IPC) is an internationally recognized classification system, which is controlled by the World Intellectual Property Organization (WIPO) and assigned to patent documents by Patent Offices.
- Where possible Thomson indicated next to the Class the equivalent IPC in an abbreviated form (e.g. A47, F23-5). However, this should only be taken as a guide, since there are areas where the DWPI Classes are assigned intellectually by Thomson's subject experts, and no strict correspondence is claimed.

Classification Codes (applicable for this report)

- **Class A14** – Polymers of other substituted mono-olefins; including PVC, PTFE
  - This is a subclass of A1 – Addition and Natural Polymers
- **Class A17** – Polymers of unsubstituted aliphatic mono-olefins; including polyethylene
  - This is a subclass of A1 – Addition and Natural Polymers
- **Class A23** – Polyamides; polyesters (*including polycarbonates, polyesteramides*); alkyds; other unsaturated polymers
  - This is a subclass of A2 – Condensation Polymers
- **Class A26** – Other condensation polymers including silicone polymers and polymides (*mineral silicates and similar materials would not usually appear in Section A*)
  - This is a subclass of A2 – Condensation Polymers
- **Class A85** – Electrical applications
  - This is a subclass of A8/9 - Applications
- **Class A89** – Photographic, laboratory equipment, optical – including electrophotographic, thermographic uses
  - This is a subclass of A8/9 - Applications
- **Class A96** – Medical, dental, veterinary, cosmetic
  - This is a subclass of A8/9 - Applications
- **Class B02** – Fused ring heterocyclics
  - This is a subclass of B - Pharmaceuticals
- **Class B03** – Other heterocyclics
  - This is a subclass of B - Pharmaceuticals
- **Class B04** – Natural products and polymers. Including testing of bodily fluids (other than blood typing or cell counting), pharmaceuticals or veterinary compounds of unknown structure, testing of microorganisms for pathogenicity, testing of chemicals for mutagenicity or human toxicity and fermentative production of DNA or RNA. General compositions.
  - This is a subclass of B - Pharmaceuticals
- **Class B05** – Other organics – aromatics, aliphatic, organo-metallics, compounds whose substituents vary such that they would be classified in several of B01-B05.
  - This is a subclass of B – Pharmaceuticals
- **Class C06** – Biological control – excluding veterinary medicine, but including use of microorganisms, predators and natural products
  - This is a subclass of C – Agricultural Chemicals
- **Class C07** – Apparatus, formulation, general. Including veterinary syringes, general formulations where the active compound is not central to the invention (e.g. wettable powders) and analysis
  - This is a subclass of C – Agricultural Chemicals

[135] Thomson Corporation, *Derwent World Patent Index*, http://science.thomsonreuters.com/m/pdfs/mgr/derwentclass.pdf

- **Class D16** – Fermentation industry – including fermentation equipment, brewing, yeast production, production of pharmaceuticals and other chemicals by fermentation, microbiology, production of vaccines and antibodies, cell and tissue culture and genetic engineering
    - This is a subclass of D – Food, Detergents, Water Treatment and Biotechnology
- **Class P24** – Hand, travelling articles, brushes (A45, A46)
    - This is a subclass of P2 – Personal, Domestic
    - A45 and A46 are the corresponding IPCs
- **Class P31** – Diagnosis, surgery (A61B)
    - This is a subclass of P3 – Health Amusement
    - A61B is the corresponding IPC
- **Class P75** – Typewriters, stamps, duplicators (B41J-N)
    - This is a subclass of P7 – Pressing, Printing
    - B41J-N are the corresponding IPCs
- **Class P81** – Optics (G02)
    - This is a subclass of P8 – Optics, Photography, General
    - G02 is the corresponding IPC
- **Class S03** – Scientific Instrumentation – Photometry, calorimetry. Thermometeres. Meteorology, geophysics, measurement of nuclear or X-radiation. Investigating chemical or physical properties. (G01J, K, N, T-W)
    - This is a subclass of S – Instrumentation, Measuring and Testing
    - G01J, K, N, T-W are the corresponding IPCs
- **Class T01** – Digital Computers – Input/output arrangements and interfaces, data conversion and handling, e.g. arithmetic functions. Program controlled systems software e.g. program and instruction execution, operating systems, etc. Error detection and correction, computer system architecture and data transfer. Distributed computing and computer networks. Computer applications. (G06C-F, G06T)
    - This is a subclass of T – Computing and Control
    - G06C-F and G06T are the corresponding IPCs.

APPENDIX F: Patent Families

"If there are several applications or publications for an individual invention (in other countries), claiming the same priority or priorities, we talk about a "patent family". All of these "family members" are related to one another by common priority numbers with associated priority dates.

The concept of the patent family first emerged through the Paris Convention on the Protection of Industrial Property in 1883, while automated systems enabling patent family searching became available through the establishment of the IIB in The Hague in 1947 and INPADOC in Vienna in 1972. Since then, patent searching has evolved due to exponential improvements in computing and communications technology.

The term patent family can be defined in a number of ways, depending on the relationship between a patent document and its priority or priorities within the meaning of the Paris Convention. The differences only become obvious when the structure of a patent application is complex, i.e. when applications are filed in several countries. Such applications may cite various earlier applications as priorities, or the diverse patent offices involved in the grant process may accept or refuse different patent claims. This results in patents which have different scopes of protection.

An important point when using any database to retrieve information on patent families is that there is never any guarantee that you will find all the corresponding patent documents that exist. Database producers do what they can to ensure completeness, but they can never guarantee it."[136]

The "Extended" (INPADOC) Patent Family

"The bibliographic and legal status databases form the basis of the EPO's raw data resources (INPADOC). In February 2008 the bibliographic data included about 60 million bibliographic data sets from almost 80 different countries. The legal status database contains a collection of more than 50 million legal events from 48 countries.

From the beginning, the concept was to cover as many countries and as many publication levels as possible. One of the strongest motives for the integration of INPADOC into the EPO was the wish to combine the particular strengths of INPADOC with the EPO's existing in-house bibliographic database, "DOC-DB".

Following integration of the two databases in the 1990s, the raw data behind both databases is now the same. And since esp@cenet draws on the same pool of data as raw data resources (INPADOC) and DOC-DB, it contains the same documentation.

[136] European Patent Office, *Patent Families* (Feb. 29, 2008), http://www.epo.org/patents/patent-information/about/families.html

However, the philosophy of the "extended" (INPADOC) patent family is quite different, and so are the results of family searches. Unlike the "also published as" feature in esp@cenet , which only shows "equivalents", i.e. almost identical documents, an INPADOC family search should retrieve all documents relating in any way to the root document.

Features of INPADOC

When using INPADOC via one of the commercial database host services, it bears all the esp@cenet features, plus the following:

- Standardisation of applicant and inventor names
- References to abstracts from Chemical Abstracts and Thomson Scientific Abstracts are made within the patent family
- By including the legal status database additional information is available and additional family links can be established
- National application numbers, international application numbers and domestic relations are included in the family search

For both the EPO's raw data resources (INPADOC) and esp@cenet, even where no priority has been claimed by the patent applicant, artificial or "intellectual" links are built in a systematic way for the complete PCT minimum documentation. The same is done for older documents (pre-1968) for which the priority information is not complete.

Definition of the "extended" (INPADOC) patent family

All the documents directly or indirectly linked via a priority document belong to one patent family. In the case shown below, documents D1 to D5 belong to the same patent family, P1.
FAMILY P1

Document D1	Priority P1		
Document D2	Priority P1	Priority P2	
Document D3	Priority P1	Priority P2	
Document D4		Priority P2	Priority P3
Document D5			Priority P3

As mentioned above, national application numbers, international application numbers and domestic relations are included in the family search.

In the "extended" (INPADOC) patent family it does not matter where you start the search. It can be an application number, a priority application number or a publication number.

If the search starts with a publication number, all application numbers, domestic application numbers, priority numbers and international application numbers are used to retrieve additional documents. For all documents found in this step, step one is repeated. This iteration process ends only when no more new documents can be found.

Raw data resources (INPADOC) also use some additional sophisticated rules for certain countries, for example if publication numbers are used instead of priority numbers in the original documents. This happened rather frequently for older documents, when the priority claims were not treated as carefully as they are now.

The inclusion of legal status information in the patent search also sometimes retrieves additional links, e.g. for divisional applications, continuations, continuations in part or national publications of first filings of PCT (international) applications, where the priority links are often missing.

Limitations of the family search in raw data resources (INPADOC)

Like all other patent databases, the EPO's raw data resources (INPADOC) have to rely on the correctness of the data supplied by the co-operating patent offices and the extent to which it is up to date. In particular, delays in the delivery of bibliographic data can vary significantly depending on the country concerned and the time period covered. Before relying on the completeness of a patent family, users should check where there are gaps or delays in certain areas. You can find this kind of information in the PFS and PRS statistics on the internet, which are updated weekly and contain indications of missing or delayed document series. See raw data resources (INPADOC) useful tables and statistics. To be absolutely sure about the actual status of a patent, users are recommended to contact the appropriate patent issuing authority direct.

Particular care has to be taken in the case of European patents which have entered into the national phase. Here the completeness and accuracy of data can vary significantly from country to country. A good overview of the volume and kind of "post-grant" information available in raw data resources (INPADOC) can be found in the raw data resources (INPADOC) FAQ. For most of the EPO member states, information about the validation, lapse, etc., of European patents is given as part of the legal status information, and as mentioned before is less consistent due to the different quality of data available. Starting from week 50/2007, additional post-grant

information is taken from the fee administration system and included in the legal status part of the database.

Example of an "extended" (INPADOC) patent family

The same example is used as for the esp@cenet patent family previously (US5402857). See the example as a PDF document.

As you can see, the iterative INPADOC search retrieves 81 document records, of which esp@cenet displayed only five. The information available includes 323 legal status events (not shown in the example above). This higher recall of documents reflects not only the different philosophies of the two systems, but also the fact that INPADOC displays all publication levels within one country as separate family members."[137]

Thomson Scientific WPI Patent Family (DWPI)

"Patent Families in the Thomson Scientific World Patents Index (WPI) draw together patents covering the same invention. Their relationship is defined by the priority or application details claimed by each document. Thus, in its simplest form, a new document (D1) claiming a unique priority (P1) will be assigned to be the "basic" of its own, new patent family in Thomson Scientific WPI.

Subsequently, if a second document (D2) also claiming priority P1 is received by Thomson Scientific this will be added (as an "equivalent") to the patent family already containing document D1. Other documents claiming priority P1 will also be added to this family as "equivalents" as they are included in the database. Thus, a patent family may contain anything from a single document to 10 or more. Each patent family represents a single record in the Thomson Scientific WPI database.

The basic document is the first member of a patent family that appears in Thomson Scientific WPI, so it may not necessarily be the first one published for that invention. Differences in the speed that patenting authorities supply data to Thomson Scientific, and in the processing time for documents from different countries may affect which document appears in Thomson Scientific WPI first and becomes basic.

Patents often claim more than a single priority and these must match before any equivalent is added to a family. This means that if a basic document (D3) claims priorities P2, P3 & P4, a subsequent document (D4) claiming priorities P2 & P3 will be added to the family as an equivalent, whereas patent D5 which claims priorities P2, P3 and a unique priority (P5) will form the basis of a new, but related patent family. In cases such as this, the accession number of any related family is included in the cross-reference field of each relevant Thomson Scientific WPI record.

[137] *Id.*

Divisions and continuation patents maintain the same status as the original specification. This means that if GB1 is a basic, and GB2 is divisional to GB1, then GB2 will also be a basic (in its own family). However, if GB1 is equivalent to another document already in the Thomson Scientific WPI database, then GB2 will also join this family as an equivalent. It should be noted that family relationships will be defined by the order in which patents appear in Thomson Scientific WPI.

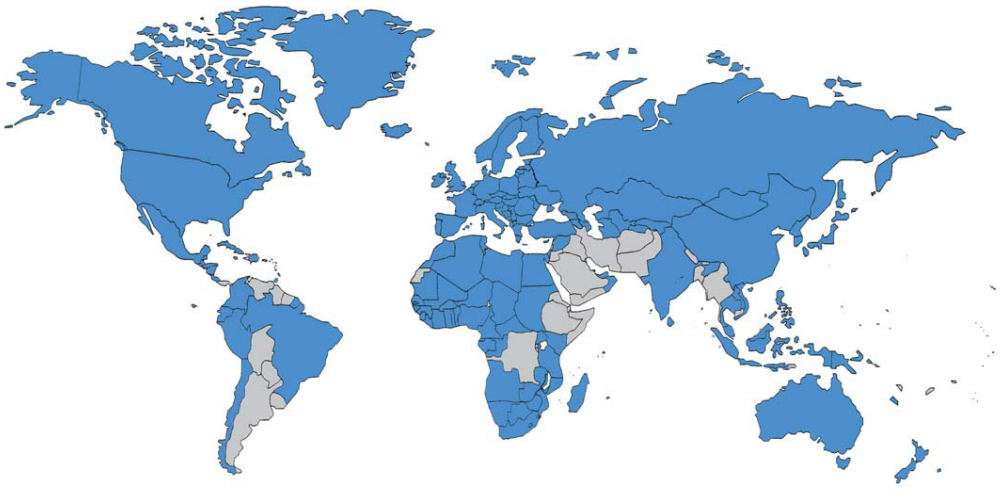
Thomson Scientific also puts a lot of resources into including patents in families even when no foreign priority is claimed, e.g. when an application has been made beyond the 12 months defined by the Paris Convention. Thomson Scientific identifies these "non-convention" equivalents by the presence of foreign nationals and addresses in the Inventor field in the absence of priority data other than the local filing details. Equivalency is determined through a time-consuming manual check of inventors, subject matter, etc.

In this way Thomson Scientific attempts to make patent families in Thomson Scientific PI as comprehensive as possible. However, because of the incidence of multiple priorities, and patent divisions and continuations (especially continuing applications in US documents), it is important to retrieve all related families through their common priorities in order to have a comprehensive overview of patent family relationships."[138]

[138] *Id.*

APPENDIX G: PCT World Map

PCT Contracting States and Two-letter Codes (142 on 1 March 2010)



AE United Arab Emirates
AG Antigua and Barbuda
AL Albania[1] *(from 1 May 2010: EP)*
AM Armenia (EA)
AO Angola
AT Austria (EP)
AU Australia
AZ Azerbaijan (EA)
BA Bosnia and Herzegovina[1]
BB Barbados
BE Belgium (EP)[2]
BF Burkina Faso (OA)[2]
BG Bulgaria (EP)
BH Bahrain
BJ Benin (OA)[2]
BR Brazil
BW Botswana (AP)
BY Belarus (EA)
BZ Belize
CA Canada
CF Central African Republic (OA)[2]
CG Congo (OA)[2]
CH Switzerland (EP)
CI Côte d'Ivoire (OA)[2]
CL Chile
CM Cameroon (OA)[2]
CN China
CO Colombia
CR Costa Rica
CU Cuba
CY Cyprus (EP)[2]
CZ Czech Republic (EP)
DE Germany (EP)
DK Denmark (EP)
DM Dominica
DO Dominican Republic
DZ Algeria
EC Ecuador
EE Estonia (EP)
EG Egypt
ES Spain (EP)
FI Finland (EP)
FR France (EP)[2]
GA Gabon (OA)[2]
GB United Kingdom (EP)
GD Grenada
GE Georgia
GH Ghana (AP)
GM Gambia (AP)
GN Guinea (OA)[2]
GQ Equatorial Guinea (OA)[2]
GR Greece (EP)[2]
GT Guatemala
GW Guinea-Bissau (OA)[2]
HN Honduras
HR Croatia (EP)[3]
HU Hungary (EP)
ID Indonesia
IE Ireland (EP)[2]
IL Israel
IN India
IS Iceland (EP)
IT Italy (EP)[2]
JP Japan
KE Kenya (AP)
KG Kyrgyzstan (EA)
KM Comoros
KN Saint Kitts and Nevis
KP Democratic People's Republic of Korea
KR Republic of Korea
KZ Kazakhstan (EA)
LA Lao People's Democratic Republic
LC Saint Lucia
LI Liechtenstein (EP)
LK Sri Lanka
LR Liberia *(from 24 March 2010: AP)*
LS Lesotho (AP)
LT Lithuania (EP)
LU Luxembourg (EP)
LV Latvia (EP)[2]
LY Libyan Arab Jamahiriya
MA Morocco
MC Monaco (EP)[2]
MD Republic of Moldova (EA)
ME Montenegro[1]
MG Madagascar
MK The former Yugoslav Republic of Macedonia (EP)[4]
ML Mali (OA)[2]
MN Mongolia
MR Mauritania (OA)[2]
MT Malta (EP)[2]
MW Malawi (AP)
MX Mexico
MY Malaysia
MZ Mozambique (AP)
NA Namibia (AP)
NE Niger (OA)[2]
NG Nigeria
NI Nicaragua
NL Netherlands (EP)[2]
NO Norway (EP)[3]
NZ New Zealand
OM Oman
PE Peru
PG Papua New Guinea
PH Philippines
PL Poland (EP)
PT Portugal (EP)
RO Romania (EP)
RS Serbia[1]
RU Russian Federation (EA)
SC Seychelles
SD Sudan (AP)
SE Sweden (EP)
SG Singapore
SI Slovenia (EP)[2]
SK Slovakia (EP)
SL Sierra Leone (AP)
SM San Marino (EP)[5]
SN Senegal (OA)[2]
ST Sao Tome and Principe
SV El Salvador
SY Syrian Arab Republic
SZ Swaziland (AP)[2]
TD Chad (OA)[2]
TG Togo (OA)[2]
TH Thailand
TJ Tajikistan (EA)
TM Turkmenistan (EA)
TN Tunisia
TR Turkey (EP)
TT Trinidad and Tobago
TZ United Republic of Tanzania (AP)
UA Ukraine
UG Uganda (AP)
US United States of America
UZ Uzbekistan
VC Saint Vincent and the Grenadines
VN Viet Nam
ZA South Africa
ZM Zambia (AP)
ZW Zimbabwe (AP)

1 Extension of European patent possible; in the case of Albania, only for international applications filed before 1 May 2010.
2 May only be designated for a regional patent (the "national route" via the PCT has been closed).
3 Only international applications filed on or after 1 January 2008 include the designation of this State for a European patent.
4 Only international applications filed on or after 1 January 2009 include the designation of this State for a European patent.
5 Only international applications filed on or after 1 July 2009 include the designation of this State for a European patent.

Where a State can be designated for a regional patent, the two-letter code for the regional patent concerned is indicated in parentheses (AP = ARIPO patent, EA = Eurasian patent, EP = European patent, OA = OAPI patent).

Important:

This list includes all States that have adhered to the PCT by the date shown in the heading. Any State indicated in ***bold italics*** has adhered to the PCT but will only become bound by the PCT on the date shown in parentheses; it will not be considered to have been designated in international applications filed before that date.

Note that even though the filing of a request constitutes under PCT Rule 4.9(a) the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents, applicants should always use the latest versions of the request form (PCT/RO/101) and demand form (PCT/IPEA/401) (the latest versions are dated January 2010) or, if filing the request using the PCT-EASY features of the PCT-SAFE software, the latest version of that software (which is available at: http://www.wipo.int/pct-safe/en/). The request and demand forms can be printed from the website, in editable PDF format, at: http://www.wipo.int/pct/en/forms/, or obtained from receiving Offices or the International Bureau, or, in the case of the demand form, also from International Preliminary Examining Authorities.

APPENDIX H: Authors' Resumes

Craig T. Ajmo Jr. Ph.D.
88 Falcon Crest Way
Manchester, NH 03104
(727) 422-2014 ctajmo@gmail.com

EDUCATION

Juris Doctor Candidate, 2011
Franklin Pierce Law Center, Concord, NH, GPA 3.03

Patent Bar, Summer 2010

Intellectual Property Courses, 2009 to Present
Fundamentals of Intellectual Property, Pharmaceutical Patent Law, Mining for Patents (patent search engine course), International and Comparative Patent Law, Patent Law, Patent Practice & Procedure I, International Technology Transfer Institute (ITTI), Pierce Law Clinic

Doctor of Philosophy, Molecular Pharmacology and Physiology, 2007
University of South Florida, College of Medicine, Tampa, FL
Member, Society for Neuroscience
Journal Reviewer, Stroke

Masters of Science, Pharmacology 2005
University of South Florida, College of Medicine, Tampa, FL, GPA 3.2
Member, Society for Neuroscience
Journal Reviewer, Stroke

Bachelor of Science, Biochemistry 2003
University of Florida, Gainesville, FL, GPA 3.2
Member, UF sailing team

PATENT TECHNICAL SKILLS

Claims Interpretation
Specifically biotech claims relating to patent landscapes for ITTI

Patent Searching
Proficient searching with the following patent search engines: USPTO (including class/subclass), Derwent, Westlaw, LexisNexus, and Innovation.

EXPERIENCE

Student Attorney, Director of Science and Technology, Team Leader Fall 2009 – Spring 2010
International Technology Transfer Institute, Pierce Law Clinic, Concord, NH
Development and analysis of patent landscapes focusing on HIV vaccines for developing countries to promote advances in health. **Publication** - Franklin Pierce Law Center Educational Report: Patent Landscape of Adjuvants for HIV Vaccines. Fall2009 **Pending Publication** – Patent Landscape of Dengue Diagnostics, Spring 2010

Supervisor of Intellectual Property Summer 2008 to present
Bach Pharma, Inc., North Andover, MA
Over see and prepare patents, manufacturing process forms and trademarks. Compose or edit presentations that are delivered to share holders, investors, and scientific researchers. Directly interact with Bach Pharma's intellectual property attorneys.

Post Doctoral Fellow 2007 - 2008
College of Medicine, University of South Florida, Tampa, FL
Developed and performed experiments to elucidate delayed treatments of stoke. Published peer reviewed journal articles and gave oral presentations at international symposia regarding scientific research.

PUBLICATIONS

Christopher C. Leonardo, Aaron A. Hall, Lisa A. Collier, **Craig T. Ajmo, Jr.**, Alison E. Willing, Keith R. Pennypacker: HUCB Cell Therapy Blocks the Morphological Change and Recruitment of CD11b-Expressing, Isolectin-Binding Proinflammatory Cells after MCAO. (*submitted)* J. Neuroscience Research

Ajmo, C.T. Jr, Collier, L.A., Leonardo, C.C., Hall, A.A., Cuevas, J., Pennypacker, K. R.: Blockage of adrenoreceptors inhibits the splenic response to stroke. Exp Neurol. 2009 Apr 14. [Epub ahead of print]
Hall, A., Herrera, Y., **Ajmo, C.T. Jr**, Cuevas, J., and Pennypacker, K.R.: Sigma Receptors Suppress Multiple Aspects of Microglial Activation. Glia 2008. (in press)

Ajmo Jr., C.T., Vernon, D.O.L., Collier, L.A., Hall, A.A., Willing, A., Pennypacker, K.R.: The Spleen Contributes to Stroke Induced Neurodegeneration. J Neurosci Res 86:2227-2234, 2008. PMID: 18381759

Hall, A., Guyer, A., Leonardo, C., **Ajmo, C. Jr.**, Collier, L., Willing, A., and Pennypacker, K.: Human Umbilical Cord Blood Cells Directly Suppress Ischemic Oligodendrocyte Cell Death. J. Neurosci. Res. 2008. [Epub ahead of print]

Ajmo Jr., C. T; Vernon, Dionne O.L. ; Collier, Lisa A. ; Hall A. A. ; Willing A.; Pennypacker, Keith R. The Spleen Contributes to Stroke Induced Neurodegeneration. Journal of Neuroscience Research (*accepted 12/07*) Journal of Neuroscience Research

Ajmo Jr., C. T.; Vernon, Dionne O.L.; Collier, Lisa; Pennypacker, Keith R.; Cuevas, Javier: Sigma Receptor Activation Reduces Infarct Size at 24 Hours After Permanent Middle Cerebral Artery Occlusion in Rats. Current Neurovascular Research, Vol 3,(2) May 2006, pp. 89-98(10)

Newcomb, J.D., **Ajmo Jr., C.T.**, Sanberg, C.D., Sanberg, P.R., Pennypacker, K.R., and Willing, A.E.: Cord Blood Treatment Leads to Full Recovery in Rats with Experimental Stroke. Cell Transplantation, Vol 15, pp. 213-223, 2006

PRESENTATIONS

37TH Annual Society for Neuroscience 2007, San Diego California, Splenic Reaction to Stroke is not Dependent on Direct Autonomic Neurotransmission via the Splenic Nerves. **Oral Presentation.**

36TH Annual Society for Neuroscience 2006, Atlanta Georgia, The Spleen Contributes to Stroke Induced Neurodegeneration. **Oral Presentation.**

13th American Society for Pharmacology and Experimental Therapeutics 2006, Alternative Treatments of Embolic Stroke in Rats Significantly Reduce Infarction Size. **Oral Presentation.**

35TH Annual Society for Neuroscience 2005, Washington D.C.; Sigma Receptor Activation Reduces Infarct Size after Permanent Middle Cerebral Artery Occlusion in Rats (pMCAO). **Oral Presentation.**

Jennifer Fadden Bryan

20 Country Club Drive, Apt 29
Manchester, NH 03102
(203) 233-2167
JFadden@piercelaw.edu

Education

Franklin Pierce Law Center – Concord NH — Expected May 2011
J.D. and L.L.M.in Intellectual Property
Teaching Assistant for Legal Writing II
Treasurer, Phi Alpha Delta
Admissions Ambassador for Pierce Law
Teaching Assistant for Legal Skills – Writing

Relevant Course Work:
Patent Law, Patent Prosecution and Practice 1 and 2, Technology Licensing, Law and Biotechnology, Fundamentals of IP, Pharmaceutical Patents, Mining for Patents, International and Comparative Patent Law, Professional Responsibility

Summer Study Abroad, University College Cork in Cork, Ireland — July 2009
Comparative IP for the Information Age, Comparative e-Commerce Law, Current Issues in Cyberlaw, European Union Legal and Political Overview

University of Connecticut - Storrs CT — May 2008
B.S., Chemical Engineering
Minors: Chemistry and Mathematics

Experience

Bemis Company, Inc. — Summer 2010
Oshkosh, WI
Summer Legal Clerk in Patent and Trademark Department
During the summer I am working in house as a summer legal clerk for Bemis Company overseeing contracts, confidentiality agreements, disclosures, patent preparation and intellectual property organization. I will also introduce Bemis to novel IP portfolio management technologies including: database searching and management systems, which I have previously encountered in the International Technology Transfer Institute Clinic.

International Technology Transfer Institute Clinic — August 2009 – Present
Franklin Pierce Law Center, Concord NH
Student Attorney
During the clinic I used Thomson Innovation to create a biotechnological patent landscape relating to HIV vaccines using adjuvants. Then I analyzed hundreds of patents claims to determine if the patents were relevant to HIV vaccines using adjuvants. This semester the clinic focused on a patent landscape for the diagnosis technologies of Dengue Fever.
Pending publication through Franklin Pierce Law Center "Patent Landscape of Adjuvants for HIV Vaccine" and "Patent Landscape of Dengue Diagnostic Technologies"

United States Army Corps of Engineers — May 2006 - Present
Cold Region Research and Engineering Laboratory, Hanover NH
Engineering Technician
Design and run experiments on the dissolution of explosive and propellant compounds commonly used on military training ranges. Collect and analyze data on the various dissolution experiments for the lead researcher. *Contributed to the following publications: Simulated rainfall-driven dissolution of TNT, Tritonal, Comp B and Octol particles in (Environmental Science and Technology); Characterization and Fate of Gun and Rocket Propellant Residues on Testing and Training Ranges (ERDC/CRREL TR-08-19); Outdoor Weathering and Dissolution of TNT and Tritonal (Chemosphere 77 (2009) 1338–1345).*

Volunteer Organizations

Daughters of the American Revolution - Junior member — 2003- Present

Amrita K. Chiluwal

77 N. Spring St #2
Concord, NH 03301
603-264-5470
achiluwal@piercelaw.edu

EDUCATION

Franklin Pierce Law Center, Concord, NH
Juris Doctor, expected, May 2011
Moot Court, Giles Sutherland Rich Moot Court Competition

Clark University, Worcester, MA
Major: B.S. Biochemistry and Molecular Biology, 2005
Awards: International Merit Scholarship
James and Ada Bickman Summer Science Research Fellowship, June 2004

WORK EXPERIENCE

Tufts University Medical School, Boston MA
Research Technician (Enzymology) May 2005-August 2008

- Worked towards design of orally active DPPIV inhibitors
- Conducted and analyzed various invitro and invivo experiments for pharmacodynamic and pharmacokinetic studies of potent and functionally selective DPPIV inhibitors
- Screened chemicals to identify potential treatment for Type II diabetes
- Frequently assisted with invivo and invitro experimental designs

Clark University, Worcester MA January 2004-May 2005
Protein Chemistry Research Lab

- Worked towards identification of the active site in *diamine oxidase*
- Performed kinetic studies to identify biological substrate of *diamine oxidase*
- Wrote a research proposal and devised experimental protocols

Clark University, Worcester MA September 2004-May 2005
Department of Chemistry, Chemistry Tutor

- Tutored first year undergraduates in Chemistry 101&102
- Assisted students with difficulties in the course and lab work

Clark University, Worcester MA Summer 2004
Department of Chemistry, Summer Science Resident Advisor

- Supervised a group of twenty high school juniors during a three week summer science program
- Mentored and tutored students, provided resources related to coursework

ACTIVITIES & LANGUAGE

Tutoring-Plus, High School Tutor Cambridge MA February 2007-May 2008

- Help academically challenged students with their course work
- Fluent in Nepali & Hindi. Conversant in French.

PUBLICATION

Beth Connolly et al., *Dipeptide Boronic Acid Inhibitors of Dipeptidyl Peptidase IV: Determinants of Potency and in Vivo Efficacy and Safety*, 59 J. MED. CHEM. Sep. 11, 2008, at 6005.

PRAVIN CONDA

Permanent Address: 27 Allison Drive • East Brunswick, NJ 08816 • 848 391 7375 •
pconda@piercelaw.edu

EDUCATION:

FRANKLIN PIERCE LAW SCHOOL
Juris Doctorate May 2010

RUTGERS UNIVERSITY • School of Engineering
Bachelor of Science in Biomedical Engineering May 2005

Engineering Skills: Hemocytometer, Nova Bioprofile 100 and 400 series, Sterile Guard Hood, Contrast Phase, Microscope, Sigma 3K12 Centrifuge, Radiometer ABL5, Finn-Aqua Autoclave, Innovartis Cedex, Terumo SCD-IIB
Computer Skills: Matlab, Maple, Q Basic, C, Fortran, Visual Basic, Origin Engineering Graphing Software, Delphion®, Westlaw®, LexisNexis®, ThomsonInnovation®

LEGAL EXPERIENCE:

ITTI CLINIC Jan 2009 – Jan 2010
CLINIC TEAM LEADER / CLINIC PROJECT LEADER Concord, NH

- Generated a Patent Landscape on Peptide Vaccines and on Peptide Vaccine Adjuvants for Human Immunodeficiency Virus (HIV)

FOXMANDAL LITTLE July 2009 – Aug 2009
SUMMER LEGAL ASSISTANT Hyderabad, India

- Focused on Section 3(d) in Indian Patent law and tried to defined the 'known efficiency' standard
- Presented to colleagues about differences between Indian Patent Law and U.S. Patent Law and the Hierarchy of the court system within the U.S.

GRIFFITH HACK July 2008 – Aug 2008
SUMMER LEGAL ASSISTANT North Sydney, Australia

- Researched about the regulations on Microorganisms Deposit in the Budapest Treaty in various countries Ex. Japan, China, South Africa, USA
- Assisted in replying to an infringement action by discovering differences within the claims and specifications of the alleged infringed patent to the client's patent.
- Researched post-amendment rules on USA patents and how it would assist an Australian patent firm.

SCIENTIFIC EXPERIENCE:

GE HEALTHCARE (WAVE BIOTECH DISPOSABLE BIOPROCESS GROUP) Feb 2007 – Aug 2007
RESEARCH SCIENTIST Piscataway, NJ

- Conducted Mass Transfer and kLa studies on various experimental Wave Cellbags®

PUBLICATIONS:

FRANKLIN PIERCE LAW CENTER EDUCATIONAL REPORT: PATENT LANDSCAPE OF PROTEIN/PEPTIDE VACCINES FOR HIV (Jan 09 – May 09) – A Patent Landscape project focusing on HIV peptide vaccines conducted by Prof. Stan Kowalski and Prof. Jon Cavicchi and a group of students from Franklin Pierce Law School.

FRANKLIN PIERCE LAW CENTER EDUCATIONAL REPORT: PATENT LANDSCAPE OF ADJUVANTS FOR HIV VACCINES (Aug 09 – Dec 09) – A Patent Landscape project focusing on adjuvants for HIV vaccines conducted by Prof. Stan Kowalski and Prof. Jon Cavicchi and a group of students from Franklin Pierce Law School.

Trent W. Merrell

34 Jackson Street, Apt #1 • Concord, NH 03301
TEL: (518) 487-1498 • TMerrell@PierceLaw.edu

EDUCATION

Franklin Pierce Law Center, Concord, NH
Juris Doctor & LL.M in Intellectual Property Law Candidate, 2011

Activities: Chief Justice, 2010-11 Franklin Pierce Moot Court Board
Finalist, 2009 Franklin Pierce Intramural Moot Court Tournament
Guest Blogger, IPWatchdog.com Blog
President, J. Reuben Clark Law Society – Pierce Law Section

Specialized IP Courses: Fundamentals of Intellectual Property, Patent Law, Patent Prosecution I & II, Technology Licensing, Biotechnology and the Law, Financial Principles of IP Management, Patent Law Moot Court, and Patent Mining in the Digital Age.

Utah State University, Logan, UT
Bachelor of Science in Public Health with a Minor in Chemistry (April 2006)

Select Science Courses: Human Physiology, Microbiology, Biology, Toxicology, Epidemiology, Biochemistry, Physics, Quantitative Analysis, Organic & Inorganic Chemistry, and Laboratories associated with each course.

PROFESSIONAL EXPERIENCE

R⁴ Vascular (Medical Devices), Maple Grove, MN
Intellectual Property Research Assistant May 2009 – Present
Performed patent landscape and freedom to operate searches, including infringement analyses, for a start-up medical device company and two additional private venture groups related to R⁴. Communicated my findings to company executives and inventors.

Franklin Pierce Law Center, Concord, NH
Giles Sutherland Rich Moot Court Competitor (Patent Law) Dec. 2009 – Mar. 2010
Researched, briefed, and argued the issues of obviousness and enablement.

Gold Team Member, International Technology Transfer Institute Jan. 2010 – Present
Created a biotechnological patent landscape related to dengue fever vaccines and diagnostic methods. Analyzed hundreds of patents. Prepared reports for WIPO, The Gates Foundation, and more.

Teaching Assistant for Professor Barry Shanks Jan. 2010 – Present
Served as a teaching assistant for Professor Barry Shanks Legal Skills II writing course.

Student Attorney, Consumer and Commercial Law Clinic May 2009 – Aug. 2009
Prepared legal documents for Copyright Infringement cases and Bankruptcy proceedings.

Colden Corporation (Research & Development), Albany - Tech. Valley, NY
Industrial Hygienist May 2006 – Aug. 2008
Managed my calendar effectively obtaining the highest number of billable hours among salaried employees. Wrote and reviewed technical reports. Worked with Engineers and Inventors to develop processes at GE's Global Research Facility and for other Fortune 500 clients.

Hitachi GST (Semiconductors), San Jose, CA
Intern Summer 2004 & 2005
Performed monitoring services for chemical processes and virtually each step in making a silicon wafer.

SERVICE

Completed a two-year volunteer church assignment in German-speaking Switzerland
Trained other volunteers and served as District Leader from October 1999 – October 2001

Eagle Scout and Scout Master
Served as Scoutmaster in local Boy Scout troops from 2003 – 2009

SKILLS & LANGUAGES

Speak the German language fluently; conversational in some Swiss-German dialects

Software skills include: Thomson Innovation, Dialog Classic, Patent Insight Pro, Micropatent, and Lexis-Nexis Patents.

KARA K. VERRYT
337 Rattlesnake Hill Road
Auburn, NH 03032
(603) 479-0216
kverryt@piercelaw.edu

EDUCATION

Franklin Pierce Law Center, Concord, NH
Juris Doctor, Patent Law, expected, May 2011
Member, Phi Alpha Delta
Student Mentor

Tulane University, New Orleans, LA
Bachelor of Science in Engineering, Chemical and Biomolecular Engineering, May 2008
Business minor
Member, Omega Chi Epsilon

Rensselaer Polytechnic Institute, Troy, NY
Visiting Scholar – Hurricane Katrina Displaced Student
September – December 2005

EXPERIENCE

Raytheon IDS Legal Department, Legal Intern *May 2010 – January 2011*
Raytheon Company Integrated Defense Systems, Tewksbury, MA
Will be working alongside the Senior Counsel of Intellectual Property for Integrated Defense Systems at the Raytheon Company.

International Technology Transfer Institute, Student Attorney *January 2010 – present*
Franklin Pierce Law Center, Concord, NH
Used Thomson Innovation to create a biotechnological patent landscape relating to the diagnosis of Dengue Fever. Analyzed hundreds of patents and patent applications to determine their relevancy to the diagnosis of Dengue. Collaborated with five other student attorneys to complete the report.

Raytheon IDS Configuration Management, Engineering Intern *Summers 2008, 2009*
Raytheon Company Integrated Defense Systems, Andover, MA
Collaborated with a team to create a training package. Reviewed manufacturing shop orders to validate revisions in the design of materials. Created and updated process sheets for several programs. Placed on an educational leave of absence (ELOA) at the end of the summer.

Raytheon IDS Materials Engineering, Engineering Intern *Summer 2007*
Raytheon Company Integrated Defense Systems, Andover, MA
Supervised production on a missile defense system. Trained and certified workers in specialized areas. Completed Raytheon Six Sigma Training. Prepared and presented at meetings with senior management. Placed on an educational leave of absence (ELOA) at the end of the summer.

INTERESTS

Volunteering with Habitat for Humanity, skiing, snowboarding, dancing, gymnastics, coaching gymnasts, reading, hiking, and spending time with family.

APPENDIX I: Westlaw® Asian Pacific Search Strings and Search Results

(Please refer to attached DVD disc for Westlaw® Asian Pacific Search Strings and Search Results)

APPENDIX J: MicroPatent® Summary Report for Relevant and Emerging Technology Patent Documents

(Please refer to attached DVD disc for the MicroPatent® Summary Report for Relevant and Emerging Technology Patent Documents)

APPENDIX K: DWPL Searches Dengue Diagnostics

(Please refer to attached DVD disc for the DWPL Searches for Dengue Diagnostic Patent Documents)