HEPATITIS VIRUS AND LIVER INFLAMMATION

What’s Inside.....???

- Recent Changes to Bacterial Taxonomy
- Immunoglobulins in Periodontitis
- Variable Types of Hepatitis Viruses
- Could Virus-Built Battery Power the Future Electronic Gadgets?
Dear Readers…..

MICROBIOLOGY TODAY now “MICROGRAPHIA TODAY”

Microbiology Today is now renamed as MICROGRAPHIA TODAY (MT) from the starting issue of Dec13’-Jan14’.
Talking about this month’s cover-story, “Many people mistakenly think that hepatitis means viral hepatitis, and that all forms of hepatitis are contagious. Actually, the word hepatitis is a catch-all term that refers to any inflammation of the liver -- the irritation or swelling of liver cells from any cause.
Hepatitis can be acute (inflammation of the liver that lasts less than six months) or chronic (inflammation of the liver that lasts more than six months) and has many different causes. It can be caused by a group of viruses known as the hepatitis viruses, including A, B, C, D, and E. Other viruses may also cause it, such as those that cause mononucleosis (the Epstein-Barr virus) or chickenpox (the varicella virus). Hepatitis also refers to inflammation of the liver caused by drugs and alcohol abuse or toxins in the environment. In addition, people can develop hepatitis from other things, such as fat buildup in the liver (called fatty liver hepatitis or NASH – nonalcoholic steatohepatitis), trauma, or an autoimmune process in which a person's body makes antibodies that attack the liver (autoimmune hepatitis)”. Viral hepatitis is common. Thousands of cases are reported to the CDC each year, but researchers estimate that the true number of people in the United States who have either acute or chronic hepatitis is much higher than what is reported. This is because most people with hepatitis are not diagnosed. Many people mistake their symptoms as the flu instead of hepatitis.
The five hepatitis viruses can be transmitted in different ways, but they all have one thing in common: They infect the liver and cause it to become inflamed. Many people with hepatitis recover with a lifelong immunity to the disease, but some people with hepatitis die in the acute phase. Hepatitis B and C may progress to chronic hepatitis, in which the liver remains inflamed for more than six months. This can lead to cirrhosis, liver cancer, and sometimes death.
We had tried to put forth all the details in our cover story “Hepatitis Virus and Liver Inflammation”. Hope the new name of the e-magazine “Micrographia Today” will get equal support as Microbiology Today had been receiving.

Sincerely,
Swapnil Vichare,
Chief-Editor
swapnil@wethemicrobiologist.in
## CONTENTS

<table>
<thead>
<tr>
<th>Topics</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Global Science News of 2013</td>
<td>3</td>
</tr>
<tr>
<td>Fellowships and Opportunities</td>
<td>7</td>
</tr>
<tr>
<td>The Cover Story: Hepatitis and Liver Inflammation</td>
<td>9</td>
</tr>
<tr>
<td>Portrait</td>
<td>20</td>
</tr>
<tr>
<td>Could a virus-built battery power, the future electronic gadgets? by Debasish Kar</td>
<td>24</td>
</tr>
<tr>
<td>Immunoglobulins in Periodontitis. by Sudheer Aluru</td>
<td>28</td>
</tr>
<tr>
<td><strong>RECENT CHANGES TO BACTERIAL TAXONOMY BY DR. TIM SANDLE</strong></td>
<td>31</td>
</tr>
<tr>
<td>Job Search</td>
<td>37</td>
</tr>
<tr>
<td>Researcher of Tomorrow: Sudheer Aluru</td>
<td>41</td>
</tr>
<tr>
<td>WTM Council and Supporting Organizations</td>
<td>44</td>
</tr>
</tbody>
</table>

*NOTE:* - THE IMAGE ON THE COVER PAGE IS TAKEN FROM GOOGLE IMAGES
DUAL Virus Attack

In 2013, different outbreaks by two viruses snapped World’s attention, but fortunately neither turned to be the global pandemic as was expected to strike.

Among the two, the first MERS virus known to cause Middle East Respiratory syndrome, where the second, H7N9 a rising bird flu virus evolved from China. Each virus is known to infect less than 200 people, but unfortunately killed several who contacted them.

MERS was first isolated from a patient of Saudi Arabia, detected by an Egyptian physicist who eagerly sent samples to Netherlands for tests. The researchers of the lab of Ron Fouchier deciphered the genetic makeup of the virus. The findings proved that MERS is a coronavirus related to SARS, the virus identified in 2003 causing severe respiratory syndrome.

The new evolved virus H7N9 has not yet recorded a serious threat to humans as was recorded with H5N1 bird flu virus. The emerging two viruses MERS and H7N9 globalized some important questions: where did they arise? How did they get into human beings? How efficiently they infect cells? Perhaps the most important question: does they infect person to person?
Bioengineering developed Lab grown Organ Models

Emerging Science Research has developed new ideas into action where researchers have crafted various lab grown functional organs this year.

Lab grown bits of brain, clumps of heart, lumps of liver and retinal cells has emerged the new aspects of the future research understanding.

This was obvious that scientists has not planned to develop a monster but the artificial organs are made in a proper help to replace person’s damaged tissues. Although the retinal cell researcher, Dr. Robin Ali of University College London still believe that the research is a fun but concerning this research would not be used as a sort of therapy.

Past few years of research has developed the understanding how to turn embryonic stem cells into different cell types as that of heart cells, neurons, etc. But this research in 2013 will allow to study how lab grown neurons can behave in culture dish and response to drugs, which was once held a stand of mere impossible.

The arrangement of cells into three dimensional structures was tricky, since the lab grown cells stretch out into flat sheets stuck to the surface of the dish. The trick has become successful while the cells are allowed to be grown in gel scaffolds allowing enough space to arrange itself into organs.
**The Brain Initiative by US President Obama:**

The golden era of neuroscience emerged in 2013 as in April, President Obama announced the ambitious plan of revealing the brain’s secrets.

*The Brain* initiative will give the scientists the tools they need to reveal the better understanding of the brain functions including how we think, remember and learn.

This effort will be funded by US National Institute of Health, the defense Advanced Research Project Agency and the National Science Foundation. This research will also been supported by some private foundations and companies. The neuroscientists has settled to nine important preliminary research priorities after several meetings with different scientists from different parts of the country. The global idea of this research is yet to believe the new era of understanding of *The Brain* function which would soon be updated into science books.

**Putting Kids at Risk:**

“Doctors knows best” the obvious devotion of all the parents while it is concerned with kids. But unfortunately US parents currently delaying their children’s vaccinations, as per research reported in 2013 US statistics. Nearly half of the babies born between 2004 to 2008 fell behind on at least one vaccination.

Vaccination is the termed to be the “fine-tune” of babies’ health to protect them from diseases and develop immunity, but obvious that doctors can’t force this issue. Vaccine problems arose decade ago when some people blamed about health problems, but when properly concerned with this matter, there was aren’t any records to be found. In 2013, a major research claimed that vaccination may cause Guillain-Barre syndrome, a nerve damaging disorder. But later in Kaiser database showed no connection between the disorder and getting such vaccine.
Now doctors proved to know best and hence putting kids at risk unnecessarily would result in big problem. This insights a global message to all the parents.

**Sleep clears cellular grime:**

In October, 2013 Scientists reported sleep showers cellular grime that builds up when brain is awake. Sleep is obviously important for all, the scientific point to that is it helps in strengthening memories.

The research which was lead by Dr. Maiken Nedergaard of the University of Rochester Medical Center, New York where he observed the sleep cleansing function while studying how brain disposes off waste products.

The team found that brain pushes fluid in between the cells to cleanse by removing waste products. After training mice to sit quietly on a microscopic stage, researchers measured the fluid flow while rodents are awake and sleep. Space between cells increased by 60% when animals sleep, during this allowing cerebrospinal fluid to gush in and clean out. The recovery occurs when we wake up, some brain cells including astrocytes swell up to narrow up the crevices between the cells. Now researchers are concerned to give a better understanding about the neuro-degenerative disorders like Perkinson and Alzheimer’s disease.

[NB: News Source Courtesy: Science News]
Fellowships and Opportunities

CCMB Summer Research Fellowship

The yearly initiative for the students of all the branches of sciences and open to all Indian Universities/ Research Institutes.

Eligibility: Only the Students who are admitted in a Master’s program (M.Sc.) in year 2013 or B. Tech. (4 year) program in 2011 or Integrated B. Tech - M. Tech. (5 year) program in 2010 can apply, i.e., the students who will complete their 1st year of M.Sc. or 6th Semester of B. Tech. or 8th Semester of Five year Integrated B. Tech - M. Tech in June/July 2014 are eligible to apply; M.Tech. students are not eligible.

Computer science students with flair for biology may also apply.

Important Dates:
Last date for the receipt of Application in CCMB: Monday, 3rd February 2014.
Selected Candidate list (on home page of ccmb webpage): around 3rd week of April 2014.
Tentative to join the program: 10th to 15th of May 2014.

For details about application procedure visit: http://www.ccmb.res.in/

ICMR International Fellowship Programme for biomedical scientists from developing countries

The Indian Council of Medical Research (ICMR) is the premier national agency for the formulation, promotion and conduct of biomedical research in India. Considering that India has attained excellence and leadership amongst the developing countries in several areas of research especially in tropical and communicable diseases in the field of epidemiology/surveillance/diagnosis, it becomes imperative that India should take a lead in sharing and offering opportunities to scientists from developing countries to come and work in Indian institutes/laboratories.

Duration: One to Six months

Number of fellowships: Five per year

For guidelines and details about fellowships visit: http://www.icmr.nic.in/ihd_research.htm
9th Teacher/Researcher Training Workshop in Biological Sciences at Indian Institute of Science

Applications from teachers and researchers from universities and affiliated institutions are invited to the 9th Workshop in Biological Sciences being held during May 5 – 31, 2014 at Indian Institute of Science. The workshop consists of theory classes, in basic and contemporary topics in different disciplines in biological sciences and focuses on hands-on training in basic recombinant and general laboratory techniques.

*Application procedure and eligibility:* No specific format is required for applying. Since the number of seats is limited, preference will be given from early to mid-career research-oriented universities and college teachers, professionals, postdoctoral fellows and registered Ph.D. students. Application should include approval from appropriate authority for attending the workshop without which, the application will not be considered. Please note that Candidates pursuing M.Sc. degree or working temporarily in projects are not eligible.

For further information and details visit: [http://mcbl.iisc.ernet.in/UGC/news.html](http://mcbl.iisc.ernet.in/UGC/news.html)

**Shastri Student Internship Project (SSIP) 2013-14 for Indian Students**

Shastri Indo-Canadian Institute is inviting applications from Indian Graduate students, Post Graduate and Doctoral Students to further their study-research in STEM (Science, Technology, Engineering and Mathematics), Social Sciences and Business studies stream subjects/areas with a view to better prepare them for a career in related fields. This internship awards will be provided to students with high academic achievements who can clearly demonstrate how the award will contribute to furthering their knowledge supporting long-term career goals.

*Number of awards:* 3 grants

*Duration:* 3months

*Application deadline:* 15th January 2014

The Cover Story: Hepatitis and Liver Inflammation

Bapi Jha, Bambose Princetejay Timothy

The medical term Hepatitis and Liver inflammation are medical condition mostly used to denote a state of destruction of damaged or dead liver cells by inflammatory cells and replaced by with fibrous tissues causing scarring of the liver and Cirrhosis. The medical term Cirrhosis refers to a serious completion of liver in which liver cells are irreversibly scarred. Liver inflammation of the liver may result in liver damage or failure if left untreated.

![Liver comparison](image)

Normal liver  |  Fibrous liver  |  Cirrhosis liver

Viruses are mostly misnomer as only agent of Hepatitis and liver inflammation but it can be caused by many other agents such as Alcohols, Drugs, toxics as well as some protease inhibitors. Most common Drugs which cause liver inflammation are Carbon tetrachloride (CCl4), Amethopterin, Tetracycline, Acetaminophen, Fenofen etc.

Although other agents are also responsible for Hepatitis and liver inflammation but viral hepatitis is most frequent worldwide. Thousands of cases are reported to the CDC each year. Liver inflammation can be Acute (For less than 6 months of periods) or, Chronic (For more than 6 months periods).

- Acute liver inflammation starts with symptoms like,
  - fatigue (tiredness)
  - lethargy (lack of energy)
  - Nausea
  - Abdominal pain
  - Decreased appetite
  - Jaundice (yellowish skin and eyes)
  - Dark urine
  - Malaise
Chronic liver inflammation occurs as onset of acute liver inflammation but progresses to

- Cirrhosis
- Weight loss
- Easy bruising
- Bleeding
- Hepatomegaly
- Lymphadenopathy
- Splenomegaly
- Ascites
- Severe pain and Scarring of liver

Viral Hepatitis is categorized on basis of causal agent (virus) such as Hepatitis-A, Hepatitis-B, Hepatitis-C, Hepatitis-D and Hepatitis-E.

Hepatitis-A, B and C types are most severe and frequent in Asia observed by CDC surveillance report. The diagnosis methods are commonly carried out by physical examination of symptoms, blood tests, imaging studies such as a sonogram or CAT scan, and most important Liver Biopsy. Liver biopsy plays an important role in staging and grading chronic hepatitis-B and C. It helps identify preneoplastic lesions in liver which is major hallmark of carcinoma caused by Heptacellular carcinoma virus.
Although Hepatitis is most severe condition but still patients can overcome and get rid of disease because of liver can function even it is diseased if proper medication and precaution are taken under medical advisory. This is because it has the amazing ability to create new liver tissue (i.e. it can regenerate itself) from healthy liver cells that still exist within it.
**Different Forms of Hepatitis**

Hepatitis could be Acute or Chronic. When Acute it is caused by either virus (about 15 families), bacteria (e.g. *Listeria sp.*), parasitic organism (such as *Ascaris lumbricoides*), protozoal (e.g. *Entamoeba histolytical*), fungal (e.g. *Aspergillus sp.*), algae (e.g. *Prototheca*) or non-infectious such as Toxin. While when it is chronic it is caused by Alcohol, Autoimmune, Drugs, Inherited, Non-alcoholic steatohepatitis and viral hepatitis except Hepatitis A.

There are many causes of hepatitis both infectious and non-infectious. Infectious agents account for the majority of acute cases: hepatitis C alone accounts for around 20% of acute cases. Thus, we have:

**Alcoholic hepatitis**

Ethanol, mostly in alcoholic beverages, is a significant cause of hepatitis. Usually alcoholic hepatitis comes after a period of increased alcohol consumption. Alcoholic hepatitis is characterized by a variable collection of symptoms, which may include feeling unwell, enlargement of the liver, development of fluid in the abdomen ascites, and modest elevation of liver blood tests. Alcoholic hepatitis can vary from mild with only liver test elevation to severe liver inflammation with development of jaundice, prolonged prothrombin time, and liver failure. Severe cases are characterized by either obtundation (dulled consciousness) or the combination of elevated bilirubin levels and prolonged prothrombin time; the mortality rate in both categories is 50% within 30 days of onset.

Alcoholic hepatitis is distinct from cirrhosis caused by long-term alcohol consumption. Alcoholic hepatitis can occur in patients with chronic alcoholic liver disease and alcoholic cirrhosis. Alcoholic hepatitis by itself does not lead to cirrhosis, but cirrhosis is more common in patients with long-term alcohol consumption. Patients who drink alcohol to excess are also more often than others found to have hepatitis C. The combination of hepatitis C and alcohol consumption accelerates the development of cirrhosis.
Drug-induced

The clinical course of drug-induced hepatitis is quite variable, depending on the drug and the patient's tendency to react to the drug. For example, halothane hepatitis can range from mild to fatal as can INH-induced hepatitis. Hormonal contraception can cause structural changes in the liver. Amiodarone hepatitis can be untreatable since the long half-life of the drug (up to 60 days) means that there is no effective way to stop exposure to the drug. Statins can cause elevations of liver function blood tests normally without indicating an underlying hepatitis. Lastly, human variability is such that any drug can be a cause of hepatitis.

Metabolic disorders

Some metabolic disorders cause different forms of hepatitis. Hemochromatosis (due to iron accumulation) and Wilson's disease (copper accumulation) can cause liver inflammation and necrosis.

Autoimmune

Anomalous presentation of human leukocyte antigen (HLA) class II on the surface of hepatocytes, possibly due to genetic predisposition or acute liver infection; causes a cell-mediated immune response against the body's own liver, resulting in autoimmune hepatitis.

Obstructive

Obstructive jaundice is jaundice occurring due to obstruction of the bile duct (by gallstones or external obstruction by cancer). If longstanding, it leads to destruction and inflammation of liver tissue.

Non-alcoholic fatty liver disease
Non-alcoholic fatty liver disease (NAFLD) is the occurrence of fatty liver in people who have no history of alcohol use. It is most commonly associated with obesity (80% of all obese people have fatty liver). It is more common in women. Severe NAFLD leads to inflammation; a state referred to as non-alcoholic steatohepatitis (NASH), which on biopsy of the liver resembles alcoholic hepatitis (with fat droplets and inflammatory cells, but usually no Mallory bodies).

The diagnosis depends on medical history, physical examination, blood tests, radiological imaging and sometimes a liver biopsy. The initial evaluation to identify the presence of fatty infiltration of the liver is medical imaging, including such ultrasound, computed tomography (CT), or magnetic resonance (MRI). However, imaging cannot readily identify inflammation in the liver. Therefore, the differentiation between steatosis and NASH often requires a liver biopsy. It can also be difficult to distinguish NASH from alcoholic hepatitis when the patient has a history of alcohol consumption. Sometimes in such cases a trial of abstinence from alcohol along with follow-up blood tests and a repeated liver biopsy are required.

NASH is becoming recognized as the most important cause of liver disease second only to hepatitis C in numbers of patients going on to cirrhosis.

Ischemic hepatitis

Ischemic hepatitis is caused by decreased circulation to the liver cells. Usually this is due to decreased blood pressure (or shock), leading to the equivalent term "shock liver." Patients with ischemic hepatitis are usually very ill due to the underlying cause of shock. Rarely, ischemic hepatitis can be caused by local problems with the blood vessels that supply oxygen to the liver (such as thrombosis, or clotting of
the hepatic artery which partially supplies blood to liver cells). Blood testing of a person with ischemic hepatitis will show very high levels of transaminase enzymes (AST and ALT), which may exceed 1000 U/L. The elevation in these blood tests is usually transient (lasting 7 to 10 days). It is rare that liver function will be affected by ischemic hepatitis.

**Giant cell hepatitis**

Giant cell hepatitis is a rare form of hepatitis (~100 cases reported) that predominantly occurs in children. Diagnosis is made on the basis of the presence of hepatocellular multinucleate giant cells. Cases presenting in adults are rare and tend to be rapidly progressive. The cause is currently unknown but an infectious cause is suspected. The condition tends to improve with the use of ribivirin suggesting a viral origin. Hepatitis E, hepatitis C, paramyxovirus, papillomavirus and Human herpes virus 6 have been suggested as causes. A similar condition has been reported in cats but it is not known if there is any connection between these conditions.

**Variable types of Hepatitis:**

**Hepatitis-A virus:** It is an undeveloped symmetrical virus belonging to Hepatovirus type. It contains 3’-polyadenylated positive sense RNA as genetic material and replicates using virus encoded RNA polymerase. The 5’ end of RNA Strand is a viral protein designated as VPg. Only one serotype of HAV is still known.

**Hepatitis-B virus:** they are also called as Heptacellular carcinoma virus mostly responsible for liver cirrhosis and cancer. It belongs to Hepadnavirus group because of presence of partially double strand DNA as genetic material replicating through an RNA intermediate form by reverse transcriptase similar to retrovirus but can not be categorized retrovirus. The genome of HBV is a circular DNA but it is unusual because the DNA is not fully double stranded. One end of the full length strand is linked to Viral DNA polymerase. The functional protein encoded by X-
gene is associated with development of cancer in liver. It stimulates genes that promote cell growth and inactivates growth regulating molecules. Virus is divided into four major serotypes (adr, adw, ayr and ayw) based on antigenic epitopes presented on its envelop proteins and into eight genotype (A to H) on overall nucleotides sequences variation of the genome.

**Hepatitis-C virus:-** HCV is an enveloped positive sense s/s RNA virus related to Flavivirus group although not transmitted by arthropods vectors. Replication of HCV was robust, producing nearly 105 particles /ml within 48hrs of incubation. It is responsible for chronic liver disease.

**Hepatitis-D virus:-** HDV or Delta virus is a s/s stranded circular RNA virus requiring Hepadna virus helper function for propagation. HDV is called delta virus because they produces delta antigens as delta-small and delta-large. One unique exceptional feature is the presence of 5-20 lower fold proportion of antigenome, an exact complement of genome.

**Hepatitis-E virus:-** These virus replicates in the Hepatocytes and excreted in stool. HEV is undeveloped, positive sense s/s RNA virus related to Calcivirus family. Viral genomic RNA is translated in the cytosol of infected cells to produce the non-structural ORF-1-Encoded Polyprotein (nsP), which function as viral replicase to replicate genomic sequences.

It is very important to mention that the truly important experiment is continuing outside the research laboratory in the world surrounding us. This colossal experiment is responsible for continuity of every life on planet earth with such variability or by being evolutionary conserved.
**Causes and Treatment:**

There are five main types of hepatitis that are caused by a virus, A, B, C, D, and E - plus types X and G.

- **Hepatitis A** - this is caused by eating infected food or water. The food or water is infected with a virus called HAV (Hepatitis A Virus). Anal-oral contact during sex can also be a cause. Nearly everyone who develops Hepatitis A makes a full recovery - it does not lead to chronic disease.

**Treatment**

There is no treatment specifically for hepatitis A. Doctor will advise the patient to abstain from alcohol and drugs during the recovery. The vast majority of patients with Hepatitis A will recover spontaneously.

- **Hepatitis B** - this is sexually transmitted. It is caused by the virus HBV (Hepatitis B Virus) and is spread by contact with infected blood, semen, and some other body fluids. Hepatitis B is usually spread through the following ways:
  
  - Unprotected sexual intercourse with an infected person (i.e. without using a condom)
    - Using a syringe that was previously used by an infected person (most commonly happens with drug addicts and people who inject steroids).
  
  - Having your skin perforated with unsterilized needles, as might be the case when getting a tattoo, or being accidentally pricked. People who work in health care risk becoming infected by accident in this way. Sharing personal items, such as a toothbrush or razor, with an infected person.
  
  - A baby can become infected through his mother's milk if she is infected.
  
  - Being bitten by someone who is infected.

  The liver of a person infected with Hepatitis B swells. The patient can suffer serious liver damage due to infection, resulting in cancer. For some patients the hepatitis becomes chronic (very long-term or lifelong). Donated blood is always tested for Hepatitis B.

**Treatment**

A patient with Hepatitis B needs to rest. He will require a diet that is high in protein and carbohydrate - this is to repair damaged liver cells, as well as to protect the liver. If this is not enough, the doctor may prescribe interferon. Interferon is an antiviral agent.
- **Hepatitis C** - Hepatitis C is usually spread through direct contact with the blood of a person who has the disease. It is caused by the virus HCV (Hepatitis C Virus). The liver can swell and become damaged. In hepatitis C, unlike hepatitis B, liver cancer risk is only increased in people with cirrhosis and only 20% of hep C patients get cirrhosis. Faeces are never a route of transmission in hepatitis C. Donated blood is also tested for Hepatitis C.

Misuse of anaesthesia can result in the transmission of hepatitis B and hepatitis C viruses, researchers reported in the journal *Gastroenterology* that the cause of infection tends to be from anaesthesia contamination, and not endoscopy contamination. Experts say that more effort is needed to better educate the healthcare community about the importance of strict sterile techniques when using any type of anaesthesia.

**Treatment**

A patient with Hepatitis C will be prescribed pegylated interferon and ribavirin.

- **Hepatitis D** - only a person who is already infected with Hepatitis B can become infected with Hepatitis D. It is caused by the virus HDV (Hepatitis D Virus). Infection is through contact with infected blood, unprotected sex, and perforation of the skin with infected needles. The liver of a person with Hepatitis D swells.

- **Hepatitis E** - a person can become infected by drinking water that contains HEV (Hepatitis E Virus). The liver swells, but there is no long-term consequence. Infection is also possible through anal-oral sex.

**Treatment**

So far, there is no effective treatment for either Hepatitis D or E.

- **Hepatitis X** - if hepatitis cannot be attributed to the viruses of hepatitis A, B, C, D, or E, it is called Hepatitis X. In other words, hepatitis of an unknown virus.

- **Hepatitis G** - this is a type of hepatitis caused by the Hepatitis G virus (HGV). Usually there are no symptoms. When there are symptoms they are very mild.

**Non-Viral Hepatitis** - If the patient has non-viral hepatitis, the doctor needs to remove the harmful substance. It will be flushed out of the stomach by hyperventilation or induced vomiting. Patients with drug-induced hepatitis may be prescribed corticosteroids.
References


Center for Disease Control and Prevention (http://www.cdc.gov/hepatitis/index.htm)


MNT – Medical News Today (http://www.medicalnewstoday.com/)


WHO Hepatitis C” Who. int. 2010-12-08. ()
World Health Organization (http://www.who.int/topics/hepatitis/en/)

www.medicinenet.com
Center for Disease Control and Prevention (http://www.cdc.gov/hepatitis/index.htm)
Before turning the page on 2013, All Things Considered wanted to tell you stories you haven't heard — unknown stories about people you've heard of, and unknown people who have affected your lives in ways you can't imagine.

Medicine got smarter in 2013. Scientists figured out how to use our own immune systems to attack cancer. They invented a new way to take pictures of the brain and got closer to developing a vaccine to save infants from respiratory disease.

And it was all made possible by the work of three men, superstars in the world of science, who all died this year.

**Discovering Genes**

In the summer of 1940, a young medical student left his home in occupied France to join the fight against Germany. His name was Francois Jacob, and he wanted to be a surgeon. But first, he wanted to fight.
Jacob never became a surgeon. In August, 1944, he was defending Normandy when a bomb blast nearly killed him. He described his injuries many years later.

"My entire right side was filled with grenade fragments," he said. "It was a dreadful time."

His hands were no longer steady enough for surgery, so in 1950 he joined a small group of scientists in Paris. The laboratory was in an attic — it was cramped and the equipment was old. But there in that attic, looking at bacteria, Jacob figured out how genes work.

"This was one of the most important discoveries in the history of biology," says science writer Carl Zimmer.

"All your cells in your body have the same DNA in them, and yet they're very different," he adds.

"So a neuron in your brain is using a certain set of genes in order to let you think. A cell in your stomach is using a different set of genes to let you eat. If you can't turn your genes on and off, you're dead."

Jacob figured that all out. And for his discovery, he was awarded the Nobel Prize in 1965. With it came fame and fortune.

**The First Genome Sequence:**

Meanwhile in England, another young scientist was also interested in how genes worked. Frederick Sanger was two years older than Jacob. When the war came to England, he didn't fight: He was a pacifist, a Quaker. So he stayed at Cambridge University and worked on his chemistry degree.
Sanger was a smart guy. By 1958, he had his own Nobel Prize for coming up with a way to map out the building blocks of proteins. But he wasn't content, Zimmer says.

"He said, 'Ok well, figured out that problem. Let's think about genes.' So genes are made of their own building blocks and the problem is they're a lot more complicated because genes can be thousands and thousands of building blocks long," Zimmer says.

Sanger was notoriously solitary. He worked long hours, building a machine that would sequence DNA.

"He actually sequenced the first genome. He sequenced the genome of a virus. It was a colossal amount of work. This took him years and years and years," Zimmer says.

But it paid off. In 1980, Sanger won a second Nobel Prize — only three other people have ever done that.

And his discoveries eventually led to the sequencing of the first human genome.

**Listening to the brain:**

At the same time in America, a young doctor named David Hubel wasn't interested in genes or proteins. He was interested in cells, brain cells. He invented a tiny electrode, the width of a single hair, and he hooked it up so he could listen to the brain.
His original recording sounds kind of like staticy gunfire, but that's the sound of nerve cells in the brain. He used his electrode to figure out how vision works.

"People thought of the brain as kind of a camera," Zimmer says. "And so light comes into your eye or smells come into your nose and your brain just sort of passively receives it all and is just making a picture of the outside world."

Hubel turned that theory on its head. He showed that the brain isn't passive at all — it changes and adapts as we experience things. And for that, Hubel won his Nobel Prize in 1981.

Hubel, Sanger and Jacob all died this year. Zimmer says it's worth reflecting on their work.

"It's hard to imagine modern medicine without the contributions of these people," he says.

-Respecting the story by Rebecca Hersher
NPR, Dec 29th 2013
Could a virus-built battery power, the future electronic gadgets?

Debasish Kar

PhD Scholar, Dept. of Biotechnology, IIT Kharagpur

debasish.bios@gmail.com

The progression of electric cars has been torpid in the last decade due to the absence of suitable batteries. Lithium-air batteries are considered to be potent campaigner for electric actuation source because of high energy density with excellent carbon footprint record. Lithium-air batteries gain this advantage in energy density since they use oxygen from the air instead of storing an oxidizer internally. These batteries are attractive for any application where weight is a primary concern, such as in mobile devices. Therefore these batteries have become a prime research area in recent times as they hold the promise of drastically increasing power per battery weight. Employing a genetically-modified virus, researchers at Massachusetts Institute of Technology (MIT) have discovered a way to improve the performance and durability of lithium-air batteries, which offer the potential of two to three times the energy density of current lithium-ion batteries. In a conventional lithium-ion battery, lithium ions run between a negatively charged anode, commonly graphite, and the positively charged cathode, commonly cobalt oxide or lithium iron phosphate. Few years before, an MIT team headed by Prof. Belcher claimed that they had engineered viruses that could figure an anode by surfacing themselves with cobalt oxide and gold and self assembling to form a nanowire. In the current work, the research team focused on constructing a highly powerful cathode to pair up with the anode, said Belcher, the Germeshausen Professor of Materials Science and Engineering and Biological Engineering.
Cathodes are harder to build than anodes because they must be highly conducting to be a fast electrode, however, most candidate materials for cathodes are extremely insulating.

**Better batteries through biotechnology**

To achieve that, viruses are harnessed to develop components for lithium-ion batteries. One virus made the anode, another, the cathode. Battery parts could be finally produced in tobacco plants or sprayed onto clothing. Batteries, built by viruses, could someday be sprayed onto military uniforms as wearable power sources. Teams of researchers, one from MIT, one from the University of Maryland, have used two different viruses to create the cathode and anode for a lithium ion battery. The MIT and Maryland scientists used two viruses that are nontoxic to humans. The MIT scientists used M13, a virus that infects bacteria. The Maryland scientists employed the tobacco mosaic virus (TMV), a common pathogen of tobacco plants. The viral hosts might be different, but the shapes of each virus are alike; long, thin and cylindrical.

**Engineering nature on a nanoscale**

The researchers made a layout of nanowires, each about 80 nanometers across, expending a genetically modified virus called M13, which can trap metals from water and bind them into structural shapes. In this event, wires of manganese oxide, a “favorite material” for a lithium-air battery’s
cathode, Belcher says were actually made by the viruses. These virus-built nanowires are different from wires “grown” through conventional chemical methods and have a rough, spiky surface, which dramatically increases their surface area. The increase in surface area produced by this method can furnish a big advantage in lithium-air batteries’ rate of charging and discharging at least 100 times without losing any capacitance. However the process has other potential advantages too. The viruses normally give rise to a three-dimensional structure of cross-linked wires instead of isolated wires, which render greater stability for an electrode. Adding to its advantages, the viral process is water-based and carried out at room temperature. The last step of the process is the addition of a small amount of a metal, like palladium, which highly enhances the electrical conductivity of the nanowires and permits them to catalyze reactions that go on throughout charging and discharging. Another research groups have attempted to generate such batteries using pure or highly concentrated metals as the electrodes, but this new approach drastically reduces how much of the expensive material is required. These alterations together have the potency to make a battery that could deliver two to three times greater energy density than today’s best lithium-ion batteries, a closely related technology that is today’s lead contender.

**Searching for a greener, skimpier power**

The combination of man-made viruses and nanostructures has all the hallmarks of Angela Belcher’s work. However this is not the first time that Belcher has introduced a genetically modified virus to improve the efficiency of batteries. A few years back, she proposed something similar for use in lithium-ion batteries. It would appear that lithium-ion batteries have lost preferences in this line of research. Naturally, this is just a fundamental
research and only accosts the material used in the cathode. However, the commercial success of the technology will really fall to its energy density in comparison to fossil fuels and the speed of recharging. The MIT researchers have presented some promising results by estimating that their virus-enabled lithium-air battery will have a two to three times better storage capacity than lithium-ion batteries. This still may be somewhat short of the energy density needed to contend with fossil fuels. The researchers don’t mention the exact storage capacity they have taken into consideration for calculating that their melioration. But an average lithium-ion battery today has an energy density around 200 Wh/kg. Doubling or even tripling of that would still only bring it to around 400-600 Wh/kg, far short of the 1000 Wh/kg wanted to be competitive with fossil fuels. This is indeed a significant ground research for a desired application keeping strong market need in mind, but it is still just the initial steps to decipher an alternate path to substitute the internal combustion engine. Before years are exhausted on understanding its full potential, we should be certain that we aren't chasing after a technology that even at its best just won't be good enough.

*For Story Source Contact the author.*
Studies on the immunological diagnosis are gaining importance due to their specificity and reliability. So an effort is constantly made in this direction globally to identify periodontal diseases at a most early stage possible.

Periodontal disease is considered to be a mixed infection wherein the pathogens act directly or indirectly in the destruction of the tooth-supporting tissues. The host reacts to this bacterial challenge by activating its defense mechanisms in an attempt to localize and eventually eliminate the pathogens. The immune responses can be mediated either by antibodies (humoral) or by sensitized lymphocytes (cellular).

Our understanding of dental plaque biofilm has evolved since the non-specific plaque hypothesis that considered plaque as a nonspecific mass of native microorganisms that, because of lack of oral hygiene, builds up in proportions great enough to overcome the host resistance threshold and affect the tooth structure and tooth supporting tissues. A great diversity of microorganisms, over 700 species was detected in the oral cavity and evidence shows that the investigation of specific microorganisms as etiological agents for periodontal diseases and caries is not a simplistic approach. Although oral mechanical hygiene is fundamental to control caries and prevent periodontal disease, it is important to highlight that optimal control is not achieved by most individuals. Thus, a complementary use of chemotherapeutic agents has been investigated to overcome the deficiencies of mechanical oral hygiene habits, insofar as they reduce both plaque formation and gingival inflammation, and represent a valid strategy to change the biofilm and maintain dental and periodontal health.

Antibodies belong to the third fastest migrating group of serum globulins, the gamma globulins. The term Immunoglobulin (Ig) refers to the immunity-conferring portion of the gamma globulin fraction. Based on physicochemical and antigenic differences, five classes of immunoglobulins have been recognized—IgG, IgA, IgM, IgD and IgE. These immunoglobulins contribute to the inhibition of bacterial adherence and colonization, enhance bacterial phagocytosis, and help detoxify bacterial toxins and thus play a major role in the defense against bacterial infections. The inflammatory and immune responses clearly contribute to the maintenance of homeostasis between the host and the microbial biofilm of the periodontium. For the host to maintain
homeostasis within the oral cavity, three distinct but interrelated immune responses contribute to controlling the microbial challenge. These are the salivary and gingival tissue (local) and the serum (systemic) immune systems. According to Lehner, immunological responses (through local secretory and systemic serum antibodies) can be mediated by three related fluid compartments: Saliva, crevicular fluid and blood. Hence, immunoglobulins if present, should be detected in these fluid compartments.

Studies with evaluation of either serum or salivary quantitation of immunoglobulins have provided varying results. Some studies revealed increased serum IgG, IgA and IgM in patients with periodontitis, while others showed no significant differences in serum Ig levels between periodontitis patients and healthy individuals. A study conducted by Kaslick et al. revealed increased levels of serum IgA, IgG and IgM in periodontosis patients, but paradoxically 41% of patients had no increase in IgG, IgA or IgM levels. Studies revealed increased salivary IgA in periodontitis patients, elevated salivary IgG and A levels in severe periodontitis patient, and another study showed salivary IgG and IgA to be elevated in juvenile periodontitis patients. Contradicting these studies, study by Basu MK et al. revealed decrease in salivary IgA in periodontitis patients compared to healthy individuals. Study by Bratthal GT and Ellen RP revealed elevated salivary and crevicular antibodies to periodontal pathogens after conventional gingivitis treatment. Reiff RL stated that levels of salivary and serum Ig G and A declined after Phase I therapy, but in the same study, some study subjects revealed elevations in the immunoglobulin levels after therapy. Basu MK et al. observed higher salivary IgG and lower salivary IgA levels in periodontitis patients before oral hygiene therapy. The concentrations of these immunoglobulins after periodontal therapy was comparable with those found in clinically normal individuals.

**Discussion**

It is pretty much agreed that the immune system is involved in the pathogenesis of periodontal disease. The literature is replete with studies involving the immunoglobulin levels in different forms of periodontal diseases and these studies have yielded varying results. In few studies, individual variations have been observed with regard to the immunoglobulin levels, i.e., although the serum and salivary levels are elevated in most of the cases, there are some exceptions where the levels were lesser than the controls, but still within the normal range. After therapy, in some cases there was a decline in the levels while in some others there was an increase.

One of the possible causes for this may be the individual patient variation with respect to the oral microflora present at the time of sampling, the varying degrees of periodontal pathology and varying degrees of inflammation present at the site. The role of immunoglobulins in the pathogenesis of periodontitis is still not clear. Several unanswered questions still remain. What stage of infection will be able to elucidate or detect the antibody? i.e., it is not clear at what point in the infection and subsequent disease process the initial seroconversion occurs. Once detected should it be considered as a sign of improvement in the condition or decline in the condition? How is the antibody associated with active disease? and can early immune responses be detected
prior to gross infection to enable early institution of therapeutic modalities? Also, the effects of therapy on the levels of immunoglobulins are not clear. Whether the raise in the immunoglobulin levels after Phase I therapy induced by the scaling procedure is beneficial is unanswered. The long-term study of the disease process from its inception and in its various stages may provide answers to the questions raised.

Hence, further long-term studies with a larger sample population and with advanced immunological techniques have to be undertaken to study the role played by the immunoglobulins in the pathogenesis of periodontitis, to define at-risk population, and to use immunological data for diagnosis, classification and monitoring of periodontal diseases. Long-term follow-up studies will also shed light on the changes in the immunoglobulin levels following various treatment modalities employed for treatment of periodontal diseases.

References:

Recent Changes to Bacterial Taxonomy

Dr. Tim Sandle,
Bio Products Laboratory, U.K.

timsandle@btinternet.com

Introduction

From the early 1990s there have been a series of significant changes to bacterial taxonomy following advances in gene sequencing. This had led to many hundreds of changes to bacterial nomenclature (the two part Latinized name). Whilst it can be debated as to the practical significance of many of these changes the pharmaceutical microbiologist needs be aware of the more significant alterations so that he or she can ensure that laboratory procedure reflect contemporary scientific developments (and that when we engage in dialogue with each other we can ensure that we are each talking about the same micro-organisms).

The purpose of this short article is to highlight some of the recent changes to the names of bacterial species. Only those species of relevance to pharmaceutical microbiology have been highlighted and for this the reader must note the judgement of the author has been used. The criteria for this was to select species that are either quoted in pharmacopoeias as recommended test strains or are commonly recovered from clean rooms. Changes to the naming of many other species have taken place and any readers in doubt would be advised to examine this topic further and some of the references included at the end of this article will provide a useful starting point.

A brief introduction to taxonomy

Taksonomia ('taxonomy') is the science of describing, identifying, naming, and classifying organisms. It is based on the Linnean system. This system began over 265 years ago when Carolus Linnaeus, Swedish medical student needed a workable system to identify the array of plants and animals that were being brought back to Europe from Asia, Africa, and the Americas. So he invented binomial taxonomic naming, giving each organism a two-word Latin name (the former being genus, the latter the species) which became the established nomenclature (a formal system of names used to label taxonomic groups which included categories like subspecies, species, genus, family). This article focuses on the two most immediate categories
of genus and species. A genus name is one word whereas a species name is binomial, that is the genus plus a second word. These are defined in Bergey as:

**Genus:** “The bacterial genus is usually a well-defined group that is clearly separated from other genera, and the thorough descriptions of [that] exemplify the depth to which this taxonomic group is usually known.”

**Species:** “A bacterial species may be regarded as a collection of strains that share many features in common and differ considerably from other strains...One strain of a species is designated as the type strain; this strain serves as the name-bearer strain of the species and is the permanent example of the species, i.e. the reference specimen for the name.”

(reference Bergey, 1986 edition)

From these general biological origins modern microbiological taxonomy began in 1923 with the publication of the 1st edition of Bergey's Manual of Determinative Bacteriology. The main method of classification was based on observed physiological and growth characteristics of which Gram’s stain was the most important. The Gram stain that dates back to the work of Christian Gram in 1884, is arguably one of the most important weighted characters in microbiology and has been used to group all prokaryotes that contain a peptidoglycan layer into Gram-positive and Gram-negative taxa.

The legacy of Bergey’s system has been passed onto the International Journal of Systematic and Evolutionary Microbiology. This journal is the only global authority for naming a bacterium.

In 1956 a system of numerical phenetic taxonomy was used for the first time, which advanced classification forwards in a biological equivalent of a ‘quantum leap’. The numerical system used long numerical matrices which correlated hundreds of phenotypic characters into similarity clusters for many bacteria. Numerical criteria were considerably more stringent than previous taxonomic criteria. The criteria included morphology, biochemistry, culture characteristics, physiology, nutritional requirements, antigenic composition, and phage sensitivity. Some later advancements relied upon chemotaxonomy.

This approach began to change in 1988 when DNA→DNA hybridization re-association studies (phylogenetics) became widely accepted. This was followed by advances in comparative analysis of
16S rRNA oligonucleotide catalogues and subsequently near complete sequence analysis of this small subunit rRNA molecule. The reason that so many changes in bacterial nomenclature have taken place is because most bacteria have enough DNA to specify some 1,500 to 6,000 average-sized genes. The numerical taxonomy methods of the past would typical test 50 – 200 chemical and cultural characteristics. However, this number of tests would investigate only 5 to 20 percent of the genetic potential of a bacterium, whereas the genetic techniques can compare genetic material between different bacteria. These genetic methods are now regarded as the fundamental methods for distinguishing both genera and species and they have led to many changes to re-classification and subsequent changes to species.

Although some of the names assigned to micro-organisms appear confusing there is a systematic approach to naming bacteria. This is called the ‘Bacteria Code’ (revised in 19990) and is based on an approved list of suitable names set by the International Committee on Systematics of Prokaryotes. The list contains in excess of 22,000 names. For a micro-organism name or new or a re-classified species to be accepted it has to be approved by the Judicial Commission of the International Association of Microbiological Societies and be accepted in an approved publication.

Changes to species of relevance to pharmaceutical microbiology

<table>
<thead>
<tr>
<th>Former classification</th>
<th>New classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actinomyces humiferus</td>
<td>Cellulomonas humilata</td>
</tr>
<tr>
<td>Aeromonas hydrophila subsp. proteolytica</td>
<td>Vibrio proteolyticus</td>
</tr>
<tr>
<td>Alcaligenes eutrophus</td>
<td>Wautersia eutropha</td>
</tr>
<tr>
<td>Arthrobacter flavescens</td>
<td>Microbacterium flavescens</td>
</tr>
<tr>
<td>Aureobacterium</td>
<td>Microbacterium</td>
</tr>
<tr>
<td>Bacillus acidocaldarius</td>
<td>Alicyclobacillus acidocaldarius subsp. acidocaldarius</td>
</tr>
<tr>
<td>Bacillus agri</td>
<td>Brevibacillus agri</td>
</tr>
<tr>
<td>Bacillus alvei</td>
<td>Paenibacillus alvei</td>
</tr>
<tr>
<td>Bacillus borstelensis</td>
<td>Brevibacillus borstelensis</td>
</tr>
<tr>
<td>Bacillus larvae</td>
<td>Paenibacillus larvae</td>
</tr>
<tr>
<td>Bacillus laterosporus</td>
<td>Brevibacillus laterosporus</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Bacillus polymyxa Paenibacillus</td>
<td>Paenibacillus polymyxa</td>
</tr>
<tr>
<td>Bacillus stearothermophilus</td>
<td>Geobacillus stearothermophilus</td>
</tr>
<tr>
<td>Brevibacterium acetylicum</td>
<td>Exiguobacterium acetylicum</td>
</tr>
<tr>
<td>Brevibacterium fermentans</td>
<td>Cellulosimicrobium cellulans</td>
</tr>
<tr>
<td>Brevibacterium liquefaciens</td>
<td>Arthrobacter nicotianae</td>
</tr>
<tr>
<td>Burkholderia pickettii</td>
<td>Ralstonia pickettii</td>
</tr>
<tr>
<td>Campylobacter butzleri</td>
<td>Arcobacter butzleri</td>
</tr>
<tr>
<td>Campylobacter cinaedi</td>
<td>Helicobacter cinaedi</td>
</tr>
<tr>
<td>Cellulomonas cartae</td>
<td>Cellulosimicrobium cellulans</td>
</tr>
<tr>
<td>Corynebacterium equi</td>
<td>Rhodococcus equi</td>
</tr>
<tr>
<td>Enterobacter intermedius</td>
<td>Kluyvera intermedia</td>
</tr>
<tr>
<td>Klebsiella mobilis</td>
<td>Enterobacter aerogenes</td>
</tr>
<tr>
<td>Micrococcus agilis</td>
<td>Arthrobacter agilis</td>
</tr>
<tr>
<td>Micrococcus halobius</td>
<td>Nesterenkonia halobia</td>
</tr>
<tr>
<td>Micrococcus kristinae</td>
<td>Kocuria kristinae</td>
</tr>
<tr>
<td>Micrococcus luteus</td>
<td>Kocuria rhizophila</td>
</tr>
<tr>
<td>Micrococcus nishinomiyaensis</td>
<td>Dermacoccus nishinomiyaensis</td>
</tr>
<tr>
<td>Micrococcus roseus</td>
<td>Kocuria rosea</td>
</tr>
<tr>
<td>Micrococcus sedentarius</td>
<td>Kytococcus sedentarius</td>
</tr>
<tr>
<td>Micrococcus varians</td>
<td>Kocuria varians</td>
</tr>
<tr>
<td>Proteus morganii</td>
<td>Morganella morganii subsp. morganii</td>
</tr>
<tr>
<td>Pseudomonas acidovorans</td>
<td>Delftia acidovorans</td>
</tr>
<tr>
<td>Pseudomonas antimicrobica</td>
<td>Burkholderia gladioli</td>
</tr>
<tr>
<td>Pseudomonas maltophilia</td>
<td>Stenotrophomonas maltophilia</td>
</tr>
<tr>
<td>Pseudomonas pickettii</td>
<td>Ralstonia pickettii</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Salmonella typhimurium</td>
<td><em>Salmonella choleraesuis subsp. choleraesuis</em></td>
</tr>
<tr>
<td>Staphylococcus caseolyticus</td>
<td><em>Macrococcus caseolyticus</em></td>
</tr>
<tr>
<td>Streptococcus adjacens</td>
<td><em>Granulicatella adjacens</em></td>
</tr>
<tr>
<td>Streptococcus caprinus</td>
<td><em>Streptococcus gallolyticus</em></td>
</tr>
<tr>
<td>Streptococcus casseliflavus</td>
<td><em>Enterococcus casseliflavus</em></td>
</tr>
<tr>
<td>Streptococcus faecalis</td>
<td><em>Enterococcus faecalis</em></td>
</tr>
<tr>
<td>Streptococcus faecium</td>
<td><em>Enterococcus faecium</em></td>
</tr>
<tr>
<td>Streptococcus saccharolyticus</td>
<td><em>Enterococcus saccharolyticus</em></td>
</tr>
</tbody>
</table>

There have also been some changes affecting some specific strains listed in the European and United States Pharmacopoeia. These are:

<table>
<thead>
<tr>
<th>Former classification</th>
<th>Culture Collection Reference</th>
<th>New classification</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>ATCC 6538</td>
<td><em>Staphylococcus aureus subsp. aureus</em></td>
</tr>
<tr>
<td><em>Bacillus subtilis</em></td>
<td>ATCC 6633</td>
<td><em>Bacillus subtilis subsp. spizizenii</em></td>
</tr>
<tr>
<td><em>Salmonella typhimurium</em></td>
<td>ATCC 13311</td>
<td><em>Salmonella choleraesuis subsp. choleraesuis</em></td>
</tr>
<tr>
<td><em>Proteus ammoniae</em></td>
<td>ATCC 7002</td>
<td><em>Proteus mirabilis</em></td>
</tr>
<tr>
<td><em>Streptococcus faecalis</em></td>
<td>ATCC 29212</td>
<td><em>Enterococcus faecalis</em></td>
</tr>
</tbody>
</table>

**Conclusion**

A change to bacterial taxonomy is an evolving branch of bacteriology, coupled with the fact that most bacterial species remain un-named and unidentified. In pulling together this review what has become is clear is the lack of a central source for those changes of relevance to pharmaceutical microbiology. It is without doubt that the list above will grow substantially over the next few years. Unfortunately it is incumbent upon those of us in industry to seek these changes out.
References and further reading

- Bergey’s Manual of Systematic Bacteriology, 1986

*The following major Culture Collections also contain invaluable information:*

(There are over two hundred global culture collections, this list is a selection)

- **ATCC** - American Type Culture Collection
- **BCCM** - Belgian Culture Collections of Microorganisms
- **CCUG** - Culture Collection, University of Göteborg, Sweden
- **CBS** - Centraalbureau voor Schimmelcultures, The Netherlands
- **NCCB** - The Netherlands Culture Collection of Bacteria
- **DSM** - German Collection of Microorganisms and Cell Cultures
- **JCM** - Japan Collection of Microorganisms
- **Micro-Net** - Microbial Information Network of China
- **NCTC / Bioguide** - National Culture Collections, UK
- **PCC** - Pasteur Culture Collection of Cyanobacteria
- **PCM** - Polish Collection of Microorganisms
- **UNSWCC** - University of New South Wales Culture Collection
- **WDCM** - World Data Centre for Microorganisms

*Note*

The images used in this article are royalty free and were obtained from:

http://classroomclipart.com/cgi-bin/kids/imageFolio.cgi?direct=Science/Biology/Bacteria and from:
http://www.fotosearch.com/PHD124/29012/
JOB Search

Work as Assistant Manager at Venus Remedies || Life Science graduates eligible:

Venus Remedies is an Indian company by origin. It specializes in the production of injectables in high-growth therapeutic segments like anti-infective, oncology, cardiovascular and neurology. Venus Remedies is among the world's 10 leading fixed dosage injectables manufacturers. Venus is one of the very few R&D-led in the world working on Antimicrobial Resistance (AMR). The Company's research and development centre, Venus Medicine Research Centre, is certified with GLP accreditation and approved by Department of Scientific and Industrial Research, Government of India (DSIR).

Job Title: Assistant Manager

Eligible candidate should be a expertise in the following techniques:

- DNA and RNA isolation,
- PCR, RT-PCR, SDS-PAGE
- Agarose gel electrophoresis,
- Protein isolation and purification, etc.

Educational qualifications: M.Sc / Ph.D Biochemistry, Biotechnology

Experience: 2 - 5 years

How to Apply:

Interested candidates can apply by sending their updated resumes to vineettraina@venusremedies.com

Apply for Senior Research Scientist at Apotex Research:

Apotex Inc., founded in 1974, is the largest Canadian-owned pharmaceutical company. We employ over 6,000 people worldwide in research, development, manufacturing and distribution. We produce more than 300 generic pharmaceuticals in approximately 4000 dosages and formats and export to over 115 countries around the globe.

Designation: Senior Research Scientist

Job Description: The position entitles the desired candidate to possess adequate practical and technical knowledge on the following techniques and related instruments, but not limited to:

- Dissolution (HPLC & UV)
- Assay (Potentiometry, HPLC)
- Related compounds/ Degradation products (HPLC,GC)
We The Microbiologist

- Water content analysis by KF.
- D.SC, TGA & Malvern particle size analysis.
- Preformulations.
- Stability studies.

Desired Profile: The prospective candidate should possess a master's degree in the relevant field of Analytical/ Organic/ Applied/ Medicinal chemistry or M-Pharmacy with relevant experience in the analysis of solid dosage forms.

Hands on experience in Method development, validation & raw materials is mandatory.

Adequate knowledge on the regulatory guidelines such as ICH, FDA and EMEA.

Candidate should be well versed with GLP and safety practices to be followed in ARD.

Good communication skills and should be able to work cohesively as one of the team members.

Experience: 3 - 8 Years

Desired Profile: B.Pharma - Pharmacy / M.Pharma - Pharmacy

Location: Bangalore

Reference: ARDS001

Eligible candidate can send their resume to careers@apotex.co.in

Notification for the post of Project Assistant at Pondicherry University | Freshers apply:

Pondicherry University, established under an Act of Parliament in the year 1985, has grown from strength to strength in all possible ways all these years and has become a place on the educational hub of the country. 15 Schools, 37 Departments and 10 Centres offering 175 PG & Research programmes are within its fold and housed in the 800-acre sprawling Wi-Fi-enabled vibrant campus.

Applications are invited for one Project Assistant to work in the UGC sponsored Research Award "Molecular Docking and Dynamics studies to understand the interacting mechanism of oncogenic 1D1 protein with its cellular proteins". The duration for the fellowship is 12 months only with consolidated pay of Rs. 5,000 per month.

Position: Project Assistant

No of Post: One

Desired Profile: M.Sc. in Bioinformatics/Biophysics with good academic record.

Experience: M.Sc in Bioinformatics/Biophysics. The person to be considered for appointment as Project Fellow must have second class master degree with a minimum of 55% marks in the
subject concerned or a related subject. The candidate to be appointed as Project Fellows should be below the age of 40 years at the time of appointment.

Application on plain paper with following details: Name, Address, Data of Birth, Father's Name, Nationality, Educational Qualification (SSLC onwards-enclose attested copies of certificate) and Research Experience may be addressed to Dr. R. Krishna, Principle Investigator (PI), uec Research Award, Centre for Bioinformatics, Pondicherry University, Pondicherry -605014.

Deadline : 26.01.14


**Vacancy notification for one JRF post at AAU, Anand | Freshers eligible:**

Anand Agricultural University (AAU) was established this year at Anand with the support of the Government of Gujarat ,Act No.(Guj 5 of 2004) dated April 29,2004. Caved out of the erstwhile Gujarat Agricultural University (GAU), the dream institution of Sardar Vallabhbhai Patel and Dr. K.M.Munshi, the AAU was set up to provide support to the farming community in three facets namely education, research and extension activities in Agriculture, Horticulture Engineering, product Processing and Home Science

The following post is to be filled up for the project "Sustainability of Sarus Crane of Western India : Evaluation with Habitat-Based Meta-Population Model" BH 18488 sponsored by DST-SERB in the office of AINP on Agricultural Ornithology, ICAR U-9, Anand Agricultural University, Anand

Position : JRF

No of Position : One

Desired Profile : M.Sc degree in any branch of biological science with second class marks/equivalent grade and having previous working experience on birds and GIS techniques.

Fellowship : Upto Rs 18000 + HRA

Age : 30 years for men and women

The interested candidates are requested to remain present on 9th January 2014 at Conference Hall of B.A.College of Agriculture, Anand Agricultural University, Anand-388001 at 8.30 hrs

Deadline : 09.01.14

Original Notification: [http://aau.in/sites/default/files/Advt_DST-SarusFellow_dec_13_dro.pdf](http://aau.in/sites/default/files/Advt_DST-SarusFellow_dec_13_dro.pdf)
Q) Can you tell something about yourself?

I like to describe myself with these words Sensible, Uncompromising, Dedicated, High-spirited, Energetic, Exhilarative, Resilient, framing up my name, which best describe me. I get adjusted to niche and try to work towards my goal. I somehow always had that thing of being a scientist deep within.

I strongly believe in God, next to my family followed by my friends, who have been with me all through my journey.

Q) How was your study background, starting from your school life, then college life? Which subject you intimated the most?

Frankly speaking, I am just an average student at school who always had affinity towards sciences over mathematics. I could not crack medical entrance, which landed me in Bachelor’s Degree in Human Genetics. It was Post Graduation in Applied Genetics at Bangalore which changed the face of my career. My scores were extraordinary and had created a very good foundation for my future. The alphabets of science I learned at Indian Academy Centre for Research & Post-Graduate Studies, Bangalore enabled me to prove myself in the scientific community.

Q) In what way you raised your motivation to go for Research after you passed your Graduation?

I lost my mother fighting against cancer. I grew up seeing her pain and suffering while I was schooling. This experience was like blessing in disguise which imparted knowledge about cancer and created interest towards it. I read ‘Har Gobind Khorana synthesized artificial gene’ which fascinated me. These two incidents laid foundation for my path to research. The passion for finding out something new had always been my fuel to move ahead.

Q) What do you think about Research before you joined and how you conclude it now?

I never knew what research was before I entered. The depth of ocean can’t be measured standing at the bay. This is a continuous process, adding up something new every moment. I am still in the process of learning. If I am asked how is research done? I would answer in a single word ‘Patience’. The modern day research is revolutionized with the advent of electronic publications and social networking. So, establishing contacts globally, aids the researchers in every way possible.
Q) What is your family background and how is the motivation from your family to go for PhD?

I hail from a middle class joint family, born to Mr. Ramesh Kumar Aluru & AVS Kumari. My younger brother and my cousins are constant supporters, who stood by me all through this path. My aunt and uncle, with whom I am residing for almost 4 years now, are next to my parents. These peoples’ unconditional love and blessings made me whatever I am today.

My dad is my best motivation. I see him and learn several things. Research requires a lot of patience and presence of mind, for which it requires a good family support and am blessed by having one such.

Q) What is the focus of your current research career?

“Living healthy for 100 years is important rather than living for 100 years”. So, my main aim of research is treatment oriented health status improvement. I am associated with several periodontists and pulmonologists working towards improvement of dental and general health status among immune compromised. I aim high and dream to achieve ‘Nobel’ prize one fine day.

Q) Do you feel India has got bright future in Biological Research (mainly in the field of Microbiology and Biotechnology)?

Indians are known as brains of world. We are efficient workers and strong competitors. Our potentiality in thinking beyond the box excels us in various fields of biology. Microbiology and Biotechnology are potential fields of science which have ample opportunities all around the globe. But most of research in India is lagging behind when compared to western or European worlds. India is still growing in the Research field and I hope several international organizations will come forward to help budding researchers.

Q) The obvious question that arise, what is your plan after completing your PhD?

I love to die as scientist. So, it’s quite obvious that I take up a post doctoral research abroad, where much advanced techniques can be experimented with.

Q) Do you have interest to further your study as PDF or as RA? If yes then where will you wish to continue – in India or abroad?

Yes...!! I am looking forward to get into Europe or Germany to continue my research career.

Q) What will you advise majority of Indian students, researchers or job holders as a young research scholar?

We Indians have analytical minds. We get adjusted to situations and prove to do efficient work. The path of success isn’t a cakes walk. It needs a lot of effort and strong will to achieve your dreams.
Q) Please provide some suggestions to upcoming generations who want to go for PhD, how they should prepare for CSIR-NET, DBT, ICMR-JRF, and other competitive examinations.

Basics are important for any competitive examinations. So I suggest you to get strong in basics. Smart work is important to succeed. Try to make self notes of things you read and possibly a diagram would help to better memorize.

Q) A short comment on “We The Microbiologist”.

We The Microbiologist is a wonderful platform for budding researchers to know about the things happening around the world. I wish to take this into the level of schooling where pupils are better mould. This magazine would surely create interest among them.

I congratulate for the efforts put on by the administrators and wish them a grand success for future.

Aluru Sudheer Kumar
WTM COUNCIL

*President:* Ms. Harshada Kasar (cool18rinks@gmail.com)
*Principal Secretary:* Mr. Bapi Jha (bbapijha@gmail.com)
*Managing Director:* Mr. Saumyadip Sarkar (saumyadip.gis@gmail.com)
*Organizing Secretary:* Mr. Trinankur Bhattacharya
  (trinankur.bhattacharya@facebook.com)

*Chief Editor:* Mr. Swapnil Vichare (swapnil@wethemicrobiologist.in)

*International Outreach Coordinators:*
  *Mr. Golam Moktadir Khan (gmk025@gmail.com) - Bangladesh*
  *Mr. Bamgbose Princeteejay Timothy – Nigeria*
  *Mr. Sajjad Ahmad – Pakistan*

www.wethemicrobiologist.in
Supporting Organizations and Societies:

IUMS
INTERNATIONAL UNION OF MICROBIOLOGICAL SOCIETIES

The Jordanian Society for Microbial Biodiversity

Bioclues Organization

eSci
Home of Science