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We The Microbiologist, Bangladesh

WTM (We The Microbiologist)

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CONTENTS

TOPIC **Page No.**

NOTE: - THE IMAGE ON THE COVER PAGE IS TAKEN FROM GOOGLE IMAGES.

Managing Director

We The Microbiologists, India

MESSAGE

We The Microbiologist has started as group in Facebook and now it is known for its leader of spreading useful knowledge among young Microbiologists and Life Science students. WTM has its leading support from International Union of Microbiological Societies and also from Bioclues Organization. After it successful two years of e-magazine release, **Md. Golam Moktadir Khan** (*International Outreach Coordinator of WTM – Bangladesh and WTM, BD Manager*) has decided for the warm release of all new WTM, BD e-magazine which I feel is much more interactive and attractive for the readers and hope this first issue of this magazine will give you much more interest to grab the next e-magazine upcoming. I am personally proud to have **Md. Golam Moktadir Khan** as an active Administrator of We The Microbiologist community and his participation is a major deal for the International Collaboration of India and Bangladeshi Biologists. Hope this magazine will hold the bridge of unity among Biologists of both countries, where we can exchange news more effectively with wider aspect of future goals. In this first e-magazine of We The Microbiologist Bangladesh, the clear outline of the introduction including the history behind the Microbiology is highlighted to grab interest of both New Microbiologists as well as to readers who are well known to this subject. I would be personally being glad enough if you readers appreciate us and please do mail us with valuable comments at our email. Hope this first magazine will delight your interest to take active part in the next.

Thanking You,
Saumyadip Sarkar
director.wtmindia@gmail.com

PREFACE

Microbiology is a broad discipline which has both basic and applied aspects. Therefore, Microbiologists must have good understanding about Microbial taxonomy, Genetics, Immunology etc. We The microbiologists, Bangladesh (WTM, BD) is a new and foreknown group of Microbiology in Bangladesh. The goal of our group is to communicate people from different section of 'Life Science', especially Microbiology. WTM, BD work with different event in Bangladesh. One of our events is to publishing a monthly e-magazine on different topic. So, WTM, BD published their first e-magazine about ***Introduction to Microbiology***.

All student of 'Life Science' are cordially invited to join with us and improve your skill of knowledge and creativity.

Thanking You,

Md. Golam Moktadir Khan

International Outreach Coordinator

& Chief Editor (WTM, BD)

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This Magazine committee is glad to present its 1st volume of magazine. We the microbiologist is a fore known group of microbiology in South Asia and mainly connected in Bangladesh, This magazine is connects the people from different nation who are related to biological science and also related in medical science, mainly the people are related to the Life Science background. Firstly we are focused this magazine to the introductory of Microbiology, and also the man gets some advantage from the scientific research developing in the region and microbiology. In this focus mind we always believed in the all the members and young researchers. We try to inculcate various dimensions of science for the develop in the scientific research area. We greatly appreciate the efforts of all the authors for their immense contribution. This activity is to acquaint research, scientific writing and correlate it to the society of microbiology and other life science related sector. The purpose for this magazine is to provide platform for constructive decisions by young and researchers. It aims at creating public awareness and understanding the current status of the Life Science sector for this month published of magazine on "Introductory Microbiology". With all these modern science and technology, microbiology is also improving. "Dream is highly, drive is carefully, unite together.

I am very happy for work with all members in this magazine.

Best regards,

Md. Mehedi Hasan Magnet

Magazine Editor

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Introduction to Microbiology:

Anton van Leeuwenhoek was a man born before his time. Although not the first to discover the Microscope or to use magnifying lens, he was the first to see and describe bacteria. We know that he was a "cloth merchant" living in Delft Holland. And that he used magnifying lens to view the quality of the weave of the merchandise he purchased. He traveled to England in 1668 to view English cloth and there he saw drawings of magnifications of cloth much greater than any of the current lens available in Holland would do. He returned to Holland and took up lens grinding. Being meticulous, he developed his lens grinding to an art and in the process tested them by seeing how much detail he could observe with a given lens. One can guess that he chanced to look at a sample of pond water or other source rich in microbes and was amazed to see distinct, uniquely shaped organisms going, apparently purposefully, about their lives in a tiny microcosm. He made numerous microscopes from silver and gold and viewed everything he could including the scum on his teeth and his semen. His best lens could magnify 300-500 folds which allowed him to see microscopic algae and protozoa and larger bacteria. He clearly had excellent eyesight because he accurately drew pictures of microbes that were at the limit of the magnification of his lens. He used only single lens and not the compound lens of the true microscopes we employ today; which makes his observations all the more amazing. He wrote of his observations to the Royal Society of London in 1676 and included numerous drawings. He astonished everyone by claiming that many of the tiny things he saw with his lens were alive

because he saw them swimming purposefully about. This caused no end of shock and wonderment and numerous people hurried to Delft to see if this Dutchman was "in his cups" or if he was really onto something new and wonderful. A few minutes with one of his numerous microscopes was all it took to convert his visitors to enthusiastic believers in the existence of these tiny beasties living all around them. His discovery was the equivalent of our finding life on Mars today.

Historical Year of Microbiology:

YEAR	NAME	INVENTION
1677	Antony Leeuwenhoek	Observed "little animals"
1796	Edward Jenner	First scientific Small pox vaccination
1850	Ignaz Semmelweis	Advocated washing hands to stop the spread of disease
1861	Louis Pasteur	Disproved spontaneous generation
1862	Louis Pasteur	Supported Germ Theory of Disease
1867	Joseph Lister	Practiced antiseptic surgery
1876	Robert Koch	First proof of Germ Theory of Disease with *B. anthracis* discovery
1881	Robert Koch	Growth of Bacteria on solid media
1882	Robert Koch	Outlined Kochs postulates
1882	Paul Ehrlich	Developed acid-fast Stain
1884	Christian Gram	Developed Gram Stain

1885	Louis Pasteur	First Rabies vaccination
1887	R.J. Petri	Invented Petri Dish
1899	Martinus Beijerinck	Recognized viral dependence on cells for reproduction
1900	Walter Reed	Proved mosquitoes carried the yellow fever agent
1910	Paul Ehrlich	Discovered cure for syphilis
1892	Dmitri Iosifovich Ivanovski	Discovered viruses
1928	Alexander Fleming	Discovered Penicillin
1977	W. Gilbert & F. Sanger	Developed a method to sequence DNA
1983	Kary Mullis	Polymerase Chain Reaction invented

A Novel Concept of Microbiology (Germ Theory):

Louis Pasteur worked in the middle and late 1800s. He performed numerous experiments to discover why wine and dairy products became sour, and he found that bacteria were to blame. Pasteur called attention to the importance of microorganisms in everyday life and stirred scientists to think that if bacteria could make the wine “sick,” then perhaps they could cause human illness. Pasteur had to disprove spontaneous generation to sustain his theory, and he therefore devised a series of swan-necked flasks filled with broth. He left the flasks of broth open to the air, but the flasks had a curve in the neck so that microorganisms would fall into the neck, not the broth. The flasks did not become contaminated (as he predicted they would not), and Pasteur's experiments put to rest the notion of spontaneous generation. His work also encouraged the belief that microorganisms were in the air and could cause disease. Pasteur postulated the germ theory of

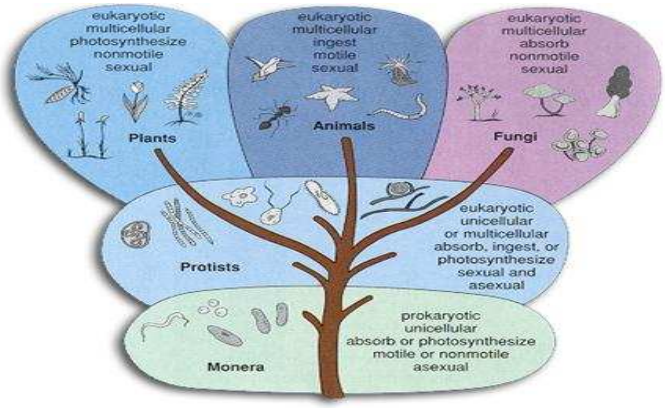
disease, which states that microorganisms are the causes of infectious disease. Pasteur's attempts to prove the germ theory were unsuccessful. However, the German scientist Robert Koch provided the proof by cultivating anthrax bacteria apart from any other type of organism. He then injected pure cultures of the bacilli into mice and showed that the bacilli invariably caused anthrax. The procedures used by Koch came to be known as Koch's postulates. They provided a set of principles whereby other microorganisms could be related to other diseases.

Koch's Postulates:

- First, isolate the suspected agent from a disease victim.
- Second, grow the agent in pure culture.
- Third, infect a healthy host and show that the organism produces the classical clinical disease.
- Fourth, isolate the "same" organism from the new victim.

Five Kingdom Classifications:

The present trend in biology is to follow the five kingdom classification proposed by R.H.Whittaker in the year 1969. Whittaker classified the living organisms into five kingdoms namely.



1. KINGDOM: MONERA (prokaryotic organisms)

2. KINGDOM: PROTISTA (primitive eukaryotic organisms)

3. KINGDOM: MYCOTA (exclusively fungi)

4. KINGDOM: METAPHYTA (advanced eukaryotic plants)

5. KINGDOM: METAZOA (all multicellular animals)

According to this classification, Monera represent the earliest group of organisms. The Monera are thought to have given rise to Protista from which the three other kingdoms of organisms namely, the fungi, plants and animals evolved along separate lines. Fungi were the first to appear from Protista. Later, about a billion years ago some protists must have evolved into primitive multicellular animals. Still later, probably about 350 million years ago, some protists must have evolved into higher forms of plants.

Structure of Fungi:

Yeasts are single-celled but most fungal species are multicellular. Multicellular fungi are composed of filaments called hyphae (singular: hypha). Hyphae may contain internal cross walls, called septa that divide the hyphae into separate cells. Coenocytic hyphae lack septa. The septa of many species have pores, allowing cytoplasm to flow freely from one cell to the next. Cytoplasmic movement within the hyphae provides a means to transport of materials. The hyphae may be branched. A mass of hyphae that is not a reproductive structure is called a mycelium. Fungi have cell walls (like plants) but the cell walls are composed of

chitin, which is what arthropod (insects, crayfish, etc.) exoskeletons are composed of. The cell walls of plants and some protests are composed of cellulose. The hyphae of some symbiotic fungi become specialized for penetrating the cells of the host. These hyphae are called haustoria. Most fungi do not have flagella in any phase of their life cycle. They move toward food by growing toward it.

Bacterial Reproduction Process:

1. Binary fission--here, bacterium cell divides to form 2 identical sisters cell during this process the single circular chromosome duplicates itself; cytoplasm divides and wall formation takes place and 2 daughter cells r formed.
2. Endospore formation; a part of the protoplast forms an impermeable coat around the chromosome and the remaining part of the protoplasm. Rest of the cell degenerates under favorable conditions these germinate.
3. Conidia; which is found in filamentous bacteria. The conidia spore like formations found in chains. Each conidium gives rise to new bacterium.

Sexual Reproduction:

1. Conjugation: transfer of genetic material from one cell to another on contact[2 cells of opposite strains {F+ & F-}become attached to one another with the help of sex pili and the genetic material of the donor cell F+ is transferred to F-through conjugation tube.]

2. Transformation: here the genetic material from dead and decaying donor bacterial cell enters the living cell of a diff strain. Once the DNA is taken up by the recipient cell recombination occurs

3. Transduction: it is the process of gene transfer from one bacterium to another by means of a temperate bacteriophage. In this process, DNA of bacterial cell is transferred to another by bacteriophage. Obviously asexual reproduction, especially by amitosis which occurs at a fast pace.

Structure of the Gametes before Fertilization:

Fertilization presents some major challenges to both sperm and egg:

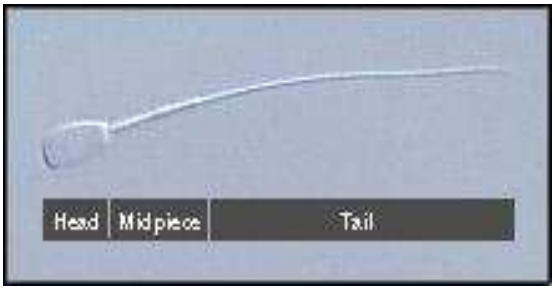
- The fertilizing sperm must somehow recognize, bind to and ultimately traverse the zona pellucida surrounding the egg. It then must bind to the plasma membrane of the egg.
- The egg must not only respond to the fertilizing sperm in a number of ways, but actively prevent more than one sperm from fertilizing it. Fertilization by more than one sperm is bad.

Structure of the Sperm:

Mature sperm, known formally as spermatozoa, have a morphology that most people over the age of ten would recognize immediately. The nucleus is contained within the head, which, for most mammals, has a flattened, oval shape. During spermiogenesis, the haploid sperm cell develops a tail or flagellum, and all

of its mitochondria become aligned in a helix around the first part of the tail, forming the midpiece. The entire cell is, of course, enveloped by a plasma membrane. The image to the right shows these structures at the light microscopic level with a bull sperm. The other structure in the mature sperm that plays a critical role in fertilization is the acrosome. The acrosome is, in essence, a gigantic lysosome that forms around the anterior portion of the nucleus. It is bounded by a membrane that is considered to have two faces the inner acrosomal membrane faces the nucleus, while the outer acrosomal membrane is in close contact with the plasma membrane.

Structure of the Egg:



Most mammals ovulate an "egg" that has matured into a secondary oocyte; it is always the secondary oocyte that is fertilized. The secondary oocyte is produced along with the first polar body as a result of the first meiotic division. Both of these cells are encased in a thick glycoprotein shell called the zona pellucida. The image to the right shows a secondary oocyte from a mouse; residual follicle cells have been stripped away. Genetically, the secondary oocyte that arrives in the oviduct is in metaphase of the second meiotic division. The metaphase plate is located inside the oocyte immediately below the first polar body. The final structural feature of the egg that serves a critical function during fertilization is a set of cortical granules.

Basic Structure of Viruses:

A virus is a small parasite that cannot reproduce by it. Once it infects a susceptible cell, however, a virus can direct the cell machinery to produce more viruses. Most viruses have either RNA or DNA as their genetic material. The nucleic acid may be single or double-stranded. The entire infectious virus particle, called a virion, consists of the nucleic acid and an outer shell of protein. The simplest viruses contain only enough RNA or DNA to encode four proteins. The most complex can encode 100 – 200 proteins. The study of plant viruses inspired some of the first experiments in molecular biology. In 1935, Wendell Stanley purified and partly crystallized tobacco mosaic virus (TMV); other plant viruses were crystallized soon thereafter. Pure proteins had been crystallized only a short time before Stanley's work, and it was considered very surprising at the time that a replicating organism could be crystallized. A wealth of subsequent research with bacterial viruses and animal viruses has provided detailed understanding of viral structure, and virus-infected cells have proved extremely useful as model systems for the study of basic aspects of cell biology. In many cases, DNA viruses utilize cellular enzymes for synthesis of their DNA genomes and mRNAs; all viruses utilize normal cellular ribosomes, tRNAs, and translation factors for synthesis of their proteins. Most viruses commandeer the cellular machinery for macromolecular synthesis during the late phase of infection, directing it to synthesize large amounts of a small number of viral mRNAs and proteins instead of the thousands of normal cellular macromolecules. For instance, animal cells infected by influenza or vesicular stomatitis virus synthesize only one or two types of glycoproteins, which are encoded by viral genes, whereas uninfected cells produce hundreds of glycoproteins. Such virus-infected cells have been used extensively in studies on synthesis of cell-surface glycoproteins. Similarly, much information about the

mechanism of DNA replication has come from studies with bacterial cells and animal cells infected with simple DNA viruses, since these viruses depend almost entirely on cellular proteins to replicate their DNA. Viruses also often express proteins that modify host-cell processes so as to maximize viral replication. For example, the roles of certain cellular factors in initiation of protein synthesis were revealed because viral proteins interrupt their action. Finally, when certain genes carried by cancer-causing viruses integrate into chromosomes of a normal animal cell, the normal cell can be converted to a cancer cell. Since many viruses can infect a large number of different cell types, genetically modified viruses often are used to carry foreign DNA into a cell. This approach provides the basis for a growing list of experimental gene therapy treatments. Because of the extensive use of viruses in cell biology research and their potential as therapeutic agents, we describe the basic aspects of viral structure and function in this section.

What Makes People Sneeze?

Sneezing usually occurs when the nerve endings of the mucous membrane of the nose are irritated, due to a swelling of the membrane, for example when we have a cold, or when some foreign body, such as a gnat, invades our nose, or when allergy and pollen season strike. Surprisingly enough, sneezing can be brought on (or out!) when the optic nerves in our eyes are exposed to bright light! For whatever reason, the membrane is irritated, sneezing is a reflex act, completely beyond our control, by which the nose trumpets out air in an attempt to

eject (and project!) the irritating bodies. Sometimes, however, this is accomplished only through multiple sneezes. Medical science dispelled ancient beliefs concerning the out-of-control sneeze, and snuffed out superstitions in the process. Primitive people held the belief that a sneeze signified approaching death, and immediately assisted the distressed person by crying out "God help you!" Egyptians, Romans, and Greeks, saw the sneeze as an omen of approaching danger, or, on a more positive note, as a way of foretelling the future. Lucky ones sneezed to the right, while unlucky ones sneezed to the left. The moral of the story is to know your right from your left, and to sneeze in that direction, regardless of who is next to you! Biblically speaking, sneezing meant a certain death, until Jacob nosed in and made a deal with God, whereby a prayer per sneeze cheated the grim reaper. Pope Gregory the Great, in response to the sixth century plague in Italy, carved out his place in history as being the one responsible for insisting that prayers, such as "God bless you!," be said in response to the deadly sneeze. He did not, however, order that tissues be kept close at hand to snare the airborne germs spewed forth by the sneeze.

National Fruit of Bangladesh: JACKFRUIT (*KATHAL*)

Scientific Name: *Artocarous heterophyllus*

Jackfruit is the national fruit of Bangladesh. It is sweet, fleshy, and delicious to eat when ripen. It grows in plenty on the hilly areas of Chittagong and *Sylhet* and on the high land of Dhaka, *Mymensingh*, *Comilla* and *Jessore.*

Nutritional Value:

Jackfruit contains isoflavones, antioxidants, and phytonutrients and provides cancer fighting properties. Jackfruit seeds are extremely high in Vitamin B1 and Vitamin B2.

Nipah Virus Outbreak in Bangladesh:

Agent:

Nipah virus is closely related to Hendra virus. Both are members of the genus Henipavirus, a new class of virus in the Paramyxoviridae family.

Situation Update (Bangladesh):

As of 15May 2013, 24 cases of Nipah virus infection have been reported in Bangladesh since the beginning of 2013, of which 21 cases have died. These cases are from 13 different districts (*Gaibandha, Jhinaidaha, Kurigram, Kushtia, Magura, Manikgonj, Mymenshingh, Naogaon, Natore, Nilphamari, Pabna, Rajbari*, and *Rajshahi*). The age distribution of cases is from 8 months to 60 years. Sixteen cases are male and eight are females.

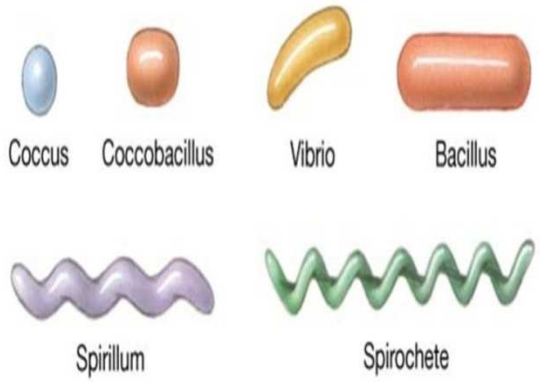
Description of Nipah Patients in 2013:

AGE IN YEAR	SEX	ADDRESS	OUTCOME
24	Male	Rajbari	Death
11	Male	Jhenaidah	Death
8	Male	Naogaon	Death
35	Female	Natore	Death
0.7	Male	Natore	Alive
9	Male	Gaibandha	Death
8	Male	Mymensingh	Death
41	Male	Mymensingh	Death
3	Female	Pabna	Alive
43	Male	Pabna	Death
30	Female	Rajshahi	Death
48	Male	Nilphamari	Death
7	Male	Kurigram	Death
55	Male	Nilphamari	Death
45	Female	Nilphamari	Death
5	Female	Kushtia	Death
32	Male	Naogaon	Death
40	Male	Naogaon	Death
1.8	Male	Magura	Death
53	Male	Manikgonj	Death
39	Female	Manikgonj	Death
7	Female	Manikgonj	Alive
60	Female	Manikgonj	Death
30	Male	Manikgonj	Death

Source: Disease Control and Research (IEDCR) in collaboration with ICDDR, B

ARTICLE RECEIVED BY WTM

Life of Bacteria



Bacteria (singular: bacterium) are a major group of simple, single-celled living organisms. They are known as prokaryotes (from the Greek word which means prenucleus) because their genetic material is not enclosed by a special nuclear membrane. Bacteria belong to a very large group of microorganisms that display a wide range of metabolic types, geometric shapes and environmental habitats-and niches-of occurrence. Major characteristics that constitute the morphology of bacteria include its size, shape, structure and arrangement. Bacillus (rod like), coccus (spherical or ovoid), and spiral (corkscrew or curved) are the three basic shapes of bacteria. In addition to these shapes there are star shaped, rectangular shaped and triangular cells. Some bacteria such as *Rhizobium* and *Corynebacterium* are genetically pleomorphic, which means they can have many shapes, but most bacteria are monomorphic, that is, they maintain a single basic shape. Furthermore, the cells are arranged in groups, the most common of which are in pairs, chains, clusters and filaments. Bacteria come in a great many sizes. Most bacteria range from 0.2 to 2.0 µm in diameter and from 2 to 8 µm in length. Bacteria are found in a very broad gamut of habitats; for example, bacterial extreme and spiral thrive in such places as hot springs, arctic environment, radioactive wastes, and deep sea soil seeps etc. There are approximately 50 million bacterial organisms in a single gram of typical surface soil. The worldwide

bacterial biomass exceeds that of all plants and animals on earth. Major group of bacteria include Gram-negative bacteria (Example: *Escherichia coli*) and Gram-positive bacteria (Example: *Staphylococcus*). Other groups include Mycobacteria. (Example: *Mycobacterium tuberculosis*), Actinomycetes (Example: *Streptomyces*), Chemoautotrophic bacteria (Example: *Nitrosomonas*), Phototrophic bacteria (Example: *Anabaena*) and gliding, appendaged, and budding bacteria (Example: *Cytophaga*, *Caulobacter*, *Hyphomicrobium*). One separate group of bacteria, known as Archaea (Example: *Halobacterium*), from which Eubacteria are thought to have evolved. They are highly unusual in morphology and their roles in environment.

How do Bacteria Move?

It's obvious that Bacteria do not have legs or feet to move. So the question is how do a Bacteria move? Bacteria contain thin, hairlike, helical appendages that protrude through the bacterial cell wall and are responsible for their motility. They are called as flagella (singular: flagellum). They don't actually 'walk' with them; rather these flagella(s) help them for swimming motility. They are 0.01 to 0.02 µm in diameter. Their location on the cell varies depending upon bacterial species and they might be polar (at one or both ends of the bacterium) or lateral (along the sides of the bacterium). Flagellar arrangements are of four types: Monotrichous (a single polar flagellum); amphitrichous (a tuft of flagella at each end of the cell); lophotrichous (two or more flagella at one or both ends of the cell); and peritrichous (flagella distributed over the entire cell). Bacteria that lack flagella are referred to as atrichous. A flagellum has three basic parts. The long outermost region is the filament that is constant in diameter and contains the

globular protein flagellin. The filament is attached to a slightly wider hook and the third part is the basal body which anchors the flagellum to the cell. Bacteria propel themselves by rotating their helical flagella. Recent studies suggest that the concentration of cGMP (guanosine 3´, 5´-cyclic phosphoric acid) within the cell governs the direction in which the rotation occurs. The flagellar protein called H antigen is useful for distinguishing among serovars. For example, there are atleast 50 different H antigens for *Escherichia coli*. The serovars identified as *E.coli* O157:H7 are associated with food borne epidemics. Apart from bacteria that have flagella as their means of motility, there is another group of bacteria that have unique structure and motility. This group of bacteria is known as spirochetes. Examples of spirochetes are *Treponema pallidum* (causative agent of syphilis) and *Borrelia burgdorferi* (the causative agent of lyme disease). They move by the means of axial filaments or endoflagella. These are bundles of fibrils that arise at the end of the cell and spiral around it. The axial filament produces a movement similar to a corkscrew moving through a cork. This corkscrew probably enables *T. pallidum* to move more effectively through body fluid. Gram-negative bacteria contain hairlike appendages that are shorter, straighter, and thinner than flagella that are used for bacterial attachment and transfer of DNA rather than for motility. They are called pili and contain proteins known as pili which are again divided into two types. Fimbriae (singular: fimbria) might be found at the poles or evenly distributed over the entire cell surface. Fimbriae of *Neisseria gonorrhoeae* (the causative agent of gonorrhea) help them to colonize mucous membrane and cause disease. Pili are longer than fimbriae and join bacterial cell for the transfer of DNA from one cell to another and are known as conjugation pili.

Composition of Bacterial Cell Wall:

Bacterial cell wall is composed of macromolecular network called as peptidoglycan. It is composed of repeating disaccharide. The disaccharide is made up of two monosaccharides named as N-acetylglucosmaine (NAG) and N-acetylmuramic acid (NAM). Among the ordinary bacteria, the walls of Gram-negative species are generally thinner (10-15 nm) than those of Gram-positive species (20-25 nm).

Occurrence and Function of Bacteria:

Bacteria coincide in almost all the man-made as well as natural environment such as soil, water, atmosphere including the inside and on of living beings. Many bacteria are extremophile, which means they are adapted to extreme temperature, pH, and salinity including other abiotic factors. Bacterial members of the genus *Deinococcus* are highly resistant to extreme doses of ionizing radiation. Some bacterial species within each phylum are some type of extremophile. Bacterial organisms are important in recycling nutrients, and many aspects depend on bacterial metabolism, such as nitrogen fixation from earth's atmosphere and putrefaction.

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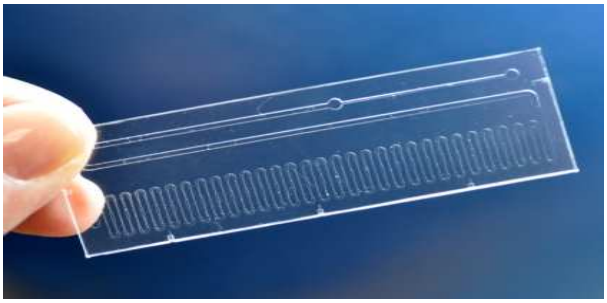
LATEST INVENTION IN MICROBIOLOGY

A Cheaper and Quicker Method of Detecting Malaria and HIV:

This is an origami paper device, which is very cheap to print and takes very short time for folding. In this technique a hydrophobic substance such as wax is applied on the chromatography paper, to channelize the under test sample (blood, urine, saliva etc) towards the reagents which have been embedded over few spots on the paper. If the sample contains (glucose, HIV, malaria, etc), for whatever it is being tested then a specific reaction occurs such paper turning into a specific color or showing two lines instead of one hence indicating presence of a disease very quickly and at a very low cost.

Micro Fluidic Chip to Quickly Diagnose the Flu:



The chip is made of a top column that extracts RNA from signature proteins associated with the influenza A virus, a middle chamber that then converts the RNA into DNA, and a climate-controlled lower channel that replicates the DNA enough times to be detected by an external reader. The team found that their chip not only rivals RT-PCR, they say it also outperformed other common flu diagnostic tests, including viral culture

(which typically takes days to a week for results), rapid immunoassays (imagine a pregnancy test that is only 40 percent accurate), and DFA (direct fluorescent antigen testing, which is lab-intensive). "The new test represents a major improvement over viral culture in terms of turn-around time, over rapid immunoassay tests in terms of ... the ability to detect the virus from minimal sample material, and over DFA and RT-PCR in terms of ease of use and portability," Klapperich said. The team is currently working to further improve its chip so that it costs just $5 and can produce results in an hour.

Source: http://news.cnet.com/8301-27083_3-57406431-247/microfluidic-chip-to-quickly-diagnose-the-flu/

3 OF 3

3 Health Benefits of Mushrooms:

1. ***Safeguard Against Cancer.***
2. ***Supply Hard-to-Get Nutrients.***
3. ***Help You Cut Calories.***

Top 3 Pharmaceutical Company in Bangladesh:

1. ***SQUARE***
2. ***INCEPTA PHARMA***
3. ***BEXIMCO***

Source: http://medibd.blogspot.com/2011/07/top-pharmaceutical-company-of.html

Top 3 Private Universities for Microbiology in Bangladesh:

1. ***Primeasia University***
2. ***North South University***
3. ***Stamford University***

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