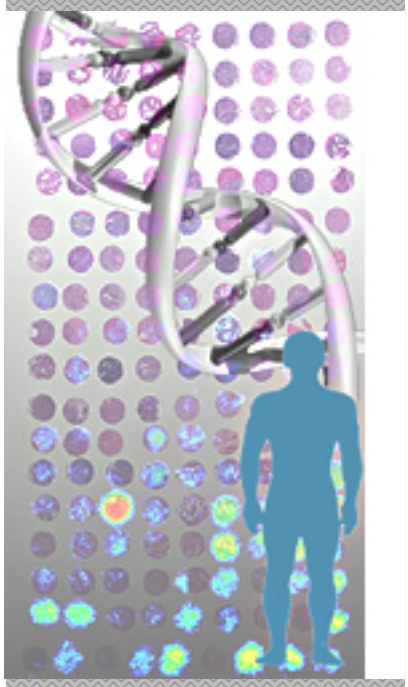

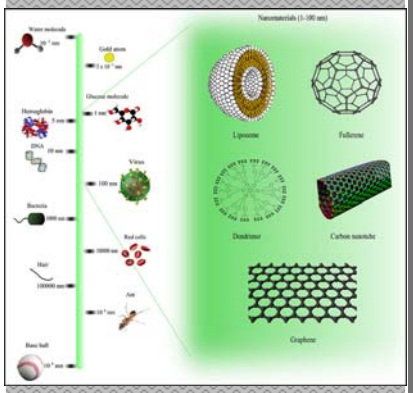

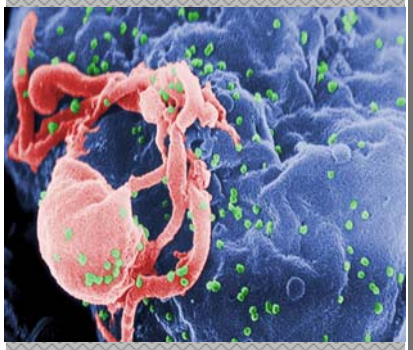

EMGEN Newsletter

Vol. 6, Issue 8

IN THIS ISSUE:

Eastern Mediterranean Health Genomics and Biotechnology Network (EMGEN) was created in 2004 with collaboration of representatives of selected centers of excellence in (health related) molecular biology, biotechnology & genomics in the Eastern Mediterranean region by recommendations and efforts of WHO/EMRO. Sponsored by Iran Biotechnology Development Council.

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HUMAN T-CELL LYMPHOTROPIC VIRUSES (HTLV)

HTLV belongs to the *Retroviridae* family in the genus *Deltaretrovirus* which was the first human retrovirus discovered. Before 1979, the isolation of retroviruses was related to just nonhuman primates; actually, it puts confidence that there are no human retroviruses as it was unpopular to put time and do research about human retrovirus. Gallo was the first one who interested in research on leukemia and the person who raised most effort on discovery of human retrovirus on the track of his main field.

T-cell lymphotropic virus isolation from a patient`s T-cell lymphoma led to the first HTLV finding in 1979, and then the human retrovirus era started. Later in 1981, HTLV-2 was evidenced in a patient who had been discerned with hairy cell leukemia. Although, pursuing studies indicated that there is no affiliation between the two mentioned processes. Discovery of the third and most important retrovirus which was classified in the HTLV genus (HIV) have been done in 1983. Though, subsequent studies leading to reclassification and putting it in the Lentivirus genus and the name officially changed to Human Immunodeficiency Virus (HIV). HTLV-3 and HTLV-4 as two novel viruses were discovered. However, information about these last two is less because there are just a few cases had been reported. Now, after 30 years around 15-20 million people affected by HTLV-1 and HTLV-2 all over the world. Moreover, it is found that both are involved in actively spreading epidemics.

HTLV-1 is more clinically important than HTLV-2, since it has been affirmed to be the etiologic agent of multiple ailments. A few ailments have been definitively related to HTLV-I. For example, fatal leukemia, uveitis, debilitative myelopathy, and atopic eczema, or skin inflammatory related to HTLV-1. The HTLV-2 is related to chronic pulmonary infections and mild progressive neurologic ailments. The recent HTLV-3 and HTLV-4 have been just illustrated in a few cases; particular illnesses related with these viruses have not been defined. From the pathophysiology aspects, HTLVs are intracellular proviruses that crossing thru constitution of a "virological synapse", which results in passing of viral genome from one cell to another.

As infection happens, little replication will occur. The expression of T-lymphocyte gene expression affected by infection, allowing for enhancement of proliferation of affected T-lymphocytes. HTLV mainly brings about T-lymphocytes; more specifically, HTLV-1 mainly affects CD4 lymphocytes, but HTLV-2 affects CD8 lymphocytes chiefly. Moreover, HTLV-1 can also affect other kinds of cells *in vitro*, possibly consider for the different pathogenesis of HTLV-1.

One example of HTLV-1 capability to infect various cell types is GLUT-1, a ubiquitous glucose transporter, which lately has been recognized as a receptor for HTLV-1. Acute HTLV infection is hardly ever seen or diagnosed, as a majority of infections are cryptic and asymptomatic. Infection diagnosis may happen after an attempted blood donation or via workup of a virus affected disease. For instance, adult T-cell leukemia (ATL) and tropical spastic paraparesis/HTLV-1-associated myelopathy (TSP/HAM) are two diseases which associated with HTLV-1. The transmission mode of both types, HTLV-1 and HTLV-2, are same while have different transmission in term of efficiency. However, HTLV-2 due to a lack of unbiased data gathering, has an inexact transmission efficiency. The same transmission ways as sexual contact, breast milk, and intravenous drug use are applicable about HTLV-1 and HTLV-2, and both could be introduced straightly into the vascular system. Data about transmission patterns of HTLV-3 and HTLV-4 are pretty little, but it seems the direct human interaction with mammalian such as through hunting, butchering, keeping them as pets intended for spreading and transmission of it. In terms of epidemiological consideration, due to the low replicating nature of HTLV which leads to little genome differences, most epidemiologic information in this regard achieved by serological research rather than on molecular typing. There is an alteration in the env gene for each HTLV which called the HTLV subtypes. The HTLV-1 and HTLV-2 subtypes propagation is quite different and perhaps can be explained by varying evolutionary trends. HTLV-1 subtypes are related to specific zones of the globe, while HTLV-2 subtypes are associated with highly specific subpopulations such as Indians, and injection drug use manner. The HTLV-1 and HTLV-2 transmission ways are: breastfeeding, sexual, transfusion, transplant and intravenous drug use.

HTLV-1

There are six diverse subclasses of HTLV-1 and each subtype is endemic to a specific area of the globe. HTLV-1 takes place in cluster form due to ascertain the high occurrence in southwestern Japan athwart to a low occurrence in neighboring zones such as Korea, China, and eastern Russia. It is worth to note that the cause of this is unknown.

- Subtype A (Cosmopolitan subtype): Japan;
- Subtypes B, D, and F: Central Africa;
- Subtype C: Melanesia;
- Subtype E: Central and South Africa.

HTLV-1 is related to the following diseases:

- TSP/HAM develops in 1%-2% of HTLV-1 infected patients.
- HTLV-1-associated infective dermatitis (IDH).
- HTLV-1-associated oral manifestations.
- HTLV-1-associated adult T-cell leukemia (ATL).

HTLV-2

HTLV-2 has been classified into four molecular subtypes which may have a distinct characteristic geographic association.

- Subtypes A and B: discovered in particular in Western Hemisphere and Europe. Partly with sporadic distribution in Africa and Asia;
- Subtype C: Kayapo indigenous people of the Amazon and urban Brazilian populations;
- Subtype D: present throughout African pygmy tribe.

Up to now, there is no certain evidence which has proved that HTLV-2 is an etiologic operator in any especial sickness.

HTLV-3 and HTLV-4

First isolation of HTLV-3 and HTLV-4 have been done in 2005. Isolation of HTLV-3 was initially done from a dwarf man with 62-years-old in southern Cameroon. Now, with the help of laboratory technology advances, identification of new strains is going fast. HTLV-3 infected Individuals have all been asymptomatic, with a low proviral load. HTLV-4 has been characterized in African game meat hunters. In studies conducted in 2010 in a sample of 1200 New York State subjects (human and apelike subject category) at retroviral infection risk, there wasn't any evidence of HTLV-3 and HTLV-4 infection.

Neither HTLV-3 nor HTLV-4 has been related with specific diseases up to now, and further research is ongoing on. At the first, the HTLV-3 label was applied to the virus causing AIDS. However, finding of further research suggest that pathogenesis and genetics of the virus causing AIDS differed from HTLV-1 and HTLV-2. Afterward, the name was formally changed to HIV.

Mortality and morbidity

Morbidity and mortality in patients with HTLV infections are mainly related to diseases caused by HTLV-1, namely ATL or TSP/HAM. The lifetime cumulative incidence risk of 1%-4% of emerging ATL or TSP/HAM has seen in the infected individuals. A typical ATL latent period is 30 to 50 years. ATL is usually quickly progressive and mortality and its median survival time is 2 years. A typical case of TSP/HAM has occurred three months after blood injection-related HTLV-1 infection. The most common latent period is three years, and 20-30 years is possible. In connection with sexuality, in endemic sub-region, HTLV-1 seropositivity is clustered in families, particularly among women. Due to this fact, the transmission from men to women compared to the transmission from women to children occurs easier. Determining the sexual superiority of HTLV-2 infection because of intravenous drug use in the population addressed in the study is pretty complicated. According to the results, it may propose that vertical contagion is especially rampancy among men and has a male predisposition. However, in return, it can explain this fact, why the prevalence of ATL has an upward trend in males. The females usually are affected by TSP/HAM disproportionately.

At the end, the enhancement of the HTLV-1 and HTLV-2 infection prevalence has a relation to age. The delay has happened at the start point of ATL or TSP/HAM until later in life as a result of the prolonged latency state; vertical contagion is intercommunicated with a high risk of ATL or TSP/HAM.

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GRAPHENE-BASED NANOBIOCATALYTIC SYSTEM

A new rapidly emerging edge of biotechnology known as nanobiotechnology has potential applications in bio-energy and biosensors which drawn the researcher's interest during the last 10 years. Much interest has been evinced on the graphene-based nanomaterials because of their important role in diverse fields of biotechnology and biomedicine. Their tremendous properties are due to their unique structural features and their ability to affect the microenvironment of biomolecules which make them to be suitable for use in various applications, such as immobilization of enzymes.

The nature of the interplay between enzyme-nanomaterial and, so, the approachability of their coupling method could affect the catalytic behavior of nanosized materials with graphene-base. Constructive and positive interplay between nanotechnology and biotechnology along past decade has eventuated in drastic and advanced functional biological nanosystems with potential usage in biotechnology, biosensing, and biomedical areas. A typical example of this area is the advances to create drastic nanobiocatalysts, which enzymes are immobilized onto sturdy nanosized materials. Enzyme immobilization, a fully grown and developed technology, resulted in stability enhancement, reusability and easy separation from the reaction mixture, let to the conflation of the catalytic behaviors of immobilized enzymes, and then makes robust biocatalysts which could be suitable for the commercial biocatalytic process development.

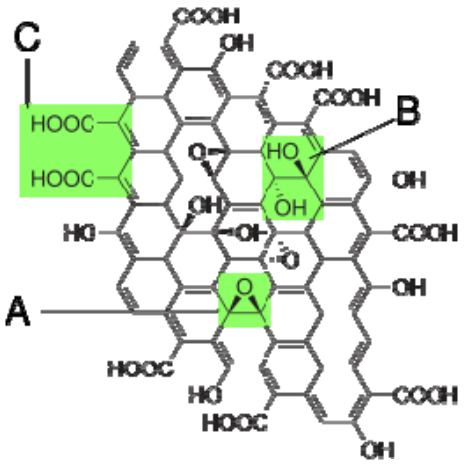

Figure 1: The molecular model Of graphite oxide .

Lately, immobilization of enzymes has done by utilizing several prestigious approaches. Among applied approaches for immobilization to date, nanosize composite and hybrid materials, especially nanoparticles, nanofibers, and carbon-based nanomaterials, are of considerable interest. One of the most effective aspects of nanostructured materials is their potential for controlling the environment of the biomolecules which result in their stability and their biological function. The nanostructured materials and immobilization are ubiquitous and in addition their unique features, they have alternative properties with useful benefits. For example, conductivity and magnetism, as two valuable features of nanostructured materials generate exciting opportunities for the expansion of effective nanobiocatalysts and the unique enzyme applications.

Graphene and graphene oxide (GO), the 2D nanosystems, are carbon-based layered materials that have unique physicochemical possessions and high explicit superficial area which makes it as distinguished usable option in various fields such as sensing, catalysis, preventing environmental damage, and energy storage. There are two types of bonds, strong in-plane chemical bonds and weak out-of-plane, van der Waals bonds, in the structure of these 2D solid materials. After isolation of graphene, monoatomic thickness layered of carbon atoms in the hexagonal crystal system have been used. This monoatomic thickness material drawn high interest because of its supernatural possessions. It is worth to note that the Nobel Prize for Physics in 2010 won by researchers in this field. Theoretically, the isolated 2D solid materials (graphene sheets) are exempt of any defect include a vast surface area which could easily be modified, with excellent mechanical and thermal stability, and good electronic particularity. Thus, the mentioned possessions make it possible the applicability of these materials as ideal systems for use in biotechnology and biomedicine, such as in tissue engineering, gene and drug delivery, bioelectronics, bioimaging and biosensing, and as antibacterial agents. The interaction of these nanomaterials with biomolecules can affect by its surface chemistry that initiate changes on the adsorption, conformation and biological function of conjugated proteins. Grapheneoxide (GO) thanks to having different functional groups, including the hydroxyl, epoxy and carboxyl group on their surface could provide operative nanomaterials with suitable possessions.

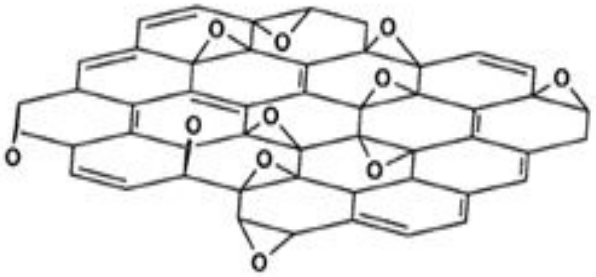

Figure 2: The GO structure with different functional groups.

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WATCHING MOLECULAR MACHINES AT WORK

When a cell apportion to two cells, the newly born daughter cells have to be armed with all they will require in their tiny lives. Most important of all is that they inherit a complete copy of the genetic information from their mother cell. If this is not the item due to an incorrect amount of chromosomes transfer through cell separation, the daughter cells will be destroyed, or worse, help to the progress of ailments as well as tumor or other disorders. Separating chromosomes properly is thus having a great significance and cells use complex molecules to carry out this process. How one of these "molecular machines" works has now been elucidated by researchers.

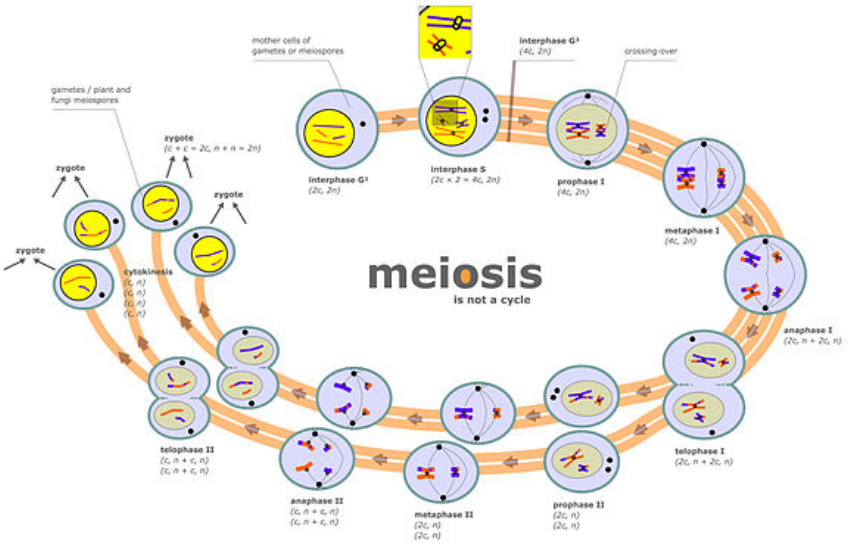

Figure: Meiosis diagram.

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GENE SIGNATURE IN HEALTHY BRAINS PINPOINTS THE ORIGINS OF ALZHEIMER'S DISEASE

Scientists have revealed a gene mark in healthful brains that reflect the schema in which Alzheimer's ailment disseminate in the brain in old persons. The results published as a scientific paper in the journal of Science Advances. These tremendous results could help figure out the molecular provenance of this highly destructive disease, and may be used to breed prophylactic remedy for at-risk individuals to be taken serious before symptoms become obvious.

This finding elucidated an explicit mark of a cluster of genes in the parts of the brain that have the most potential of getting Alzheimer's ailment. They found that these regions of the brain are assailable because the defense mechanisms of the body contra the proteins obligation to Alzheimer's ailment are crippling in these areas.

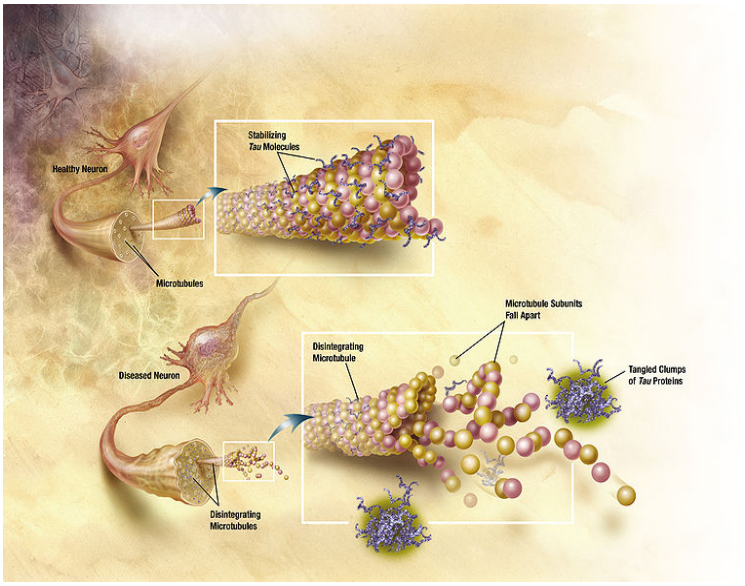

Figure: Alzheimer's disease: The disintegration of microtubules in brain cells is a result of changes in *tau* protein

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Book Alert

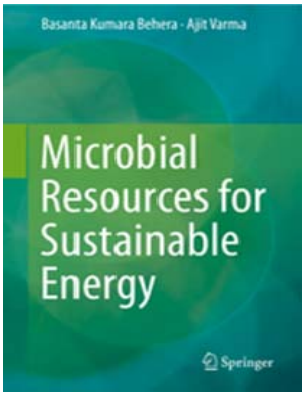
MICROBIAL RESOURCES FOR SUSTAINABLE ENERGY

Publisher: Springer International Publishing.

Editors: Basanta K. Behera and Ajit varma

ISBN: 978-3-319-33778-4

Publication date: 2016



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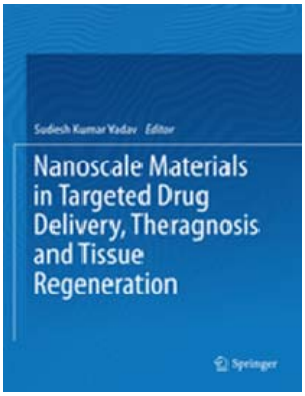

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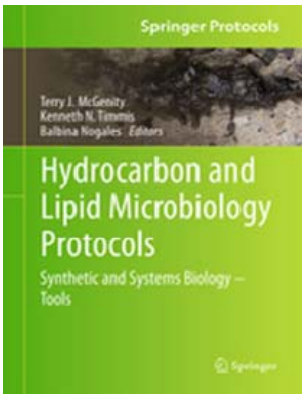

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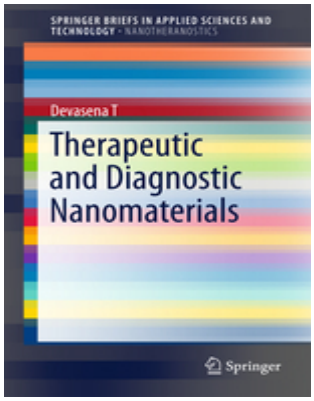

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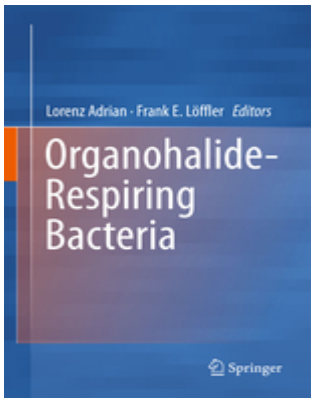
Publisher: Springer International Publishing.

Editors: Lorenz Adrian and Frank E. Löffler

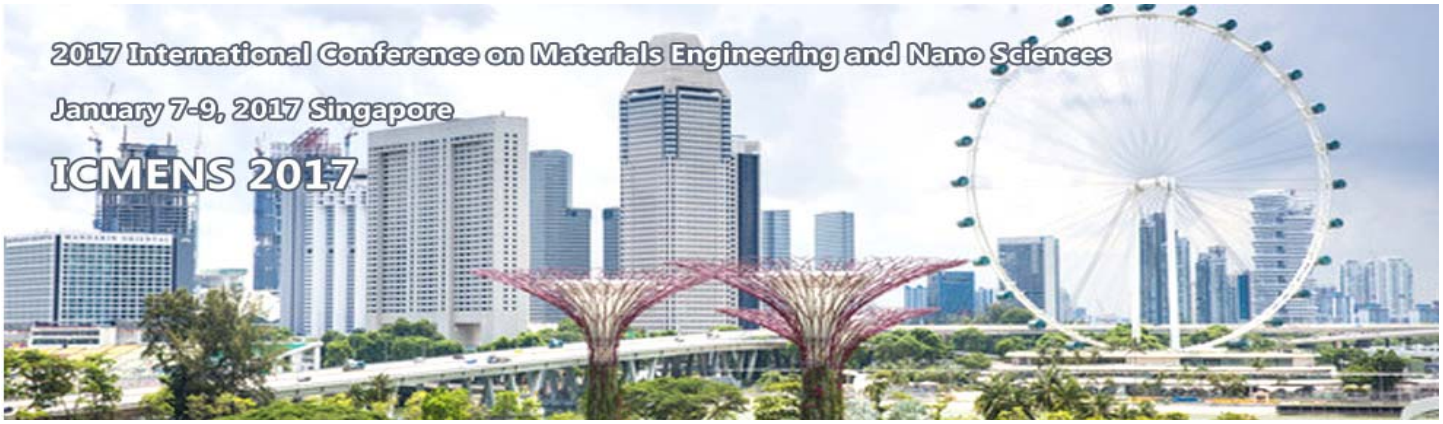
ISBN: 978-3-662-49875-0

Publication date: 2017



Announcements

http://www.iccbs.org/



http://www.icmens.org/

http://www.icnms.org/

Announcements

ICBSB 2016

November 21-24, 2016
AUT University, Auckland,
New Zealand

2016 International Conference on Biomedical Signal and Bioinformatics is a main annual research conference aims to bring together researchers around the world to exchange research results and address open issues in all aspects of Biomedical Signal and Bioinformatics.

http://www.icbsb.org/

ICBCT 2017

January 6-8, 2017 | Hong Kong

2017 International Conference on
Bioinformatics and Computing Technologies

http://www.icbct.org/

Bioelectronics & Biosensors Congress

17-18 November 2016, London, UK

http://www.bioelectronics-congress.com/download-agenda/

HUMAN GENETICS

The education of humanoid heredity is called human genetics. Human genetics include a group of related arenas, such as: genetic counseling, population genetics, molecular genetics, cytogenetics, genomics, developmental genetics, biochemical genetics, clinical genetics, and classical genetics. The human genetics studies are useful due to it can answer to overriding questions about human nature, comprehend genetics of human life and recognize the diseases and developing effective treatment for them.

In recent years, the human genome attracts researcher concern. Scientists look for approaches to edit to human genome, which are inheritable. They found that unlike gene therapy, an accepted remedial branch of science that mutate the body's ordinary tissues by changes made to the human germline could be inherited by the valetudinarian's children and then provide sequential changes to the human gene reservoir. Thus, if be extensive enough, might change the nature of the human species.

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NANOBOT

A nanobot or robot hand, that rarely renown as nanoagent, appertain to an imaginary machine or "robot nano" on a few hundred nanometers in size, which made for use in specific tasks such as collect radicals, takedown cancer cells, or damage repairing in the cell tissues. Therefore, nanobots would be capable of appropriate self-replicating of themselves. Some specific cells, such as DNA self-generating process and phagocytes, which ingesting foreign materials are prototype models for most of these concepts.

Reference: https://en.wikipedia.org/wiki/Nanotechnology

HIV

HIV is a retrovirus that mainly infects the human immune system components such as dendritic cells, macrophages and $CD4^+$ T cells. This virus from the *Retrovirus* family causes directly and indirectly destruction of T cells of the immune system. The two parallel routes, cell-free spread and cell-to-cell mode, has known for the deployment of HIV between $CD4^+$ T cells. Sometimes it could use a mix of mentioned deployment mechanisms. Two types of HIV have been identified: HIV-1 and HIV-2.

HIV-1, that initially referred to also as LAV or HTLV-III, was the first originally discovered virus. It is more malign, more infective, and is the major reason of HIV infections globally. According to the lower infectivity of HIV-2 as compared with HIV-1, it can be concluded that a few number of people who are exposed to HIV-2 become infected with that. According to a 2013 Harvard Medical School study, in a pioneering medical testing, it is found that all traces of HIV in two men with HIV infection have eliminated by the bone marrow transplants.

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