



KSRCT IEEE-EMBS Student Chapter Newsletter

(K.S.Rangasamy College of Technology
Institute of Electrical & Electronics Engineers
Engineering in Medicine and Biology Society)



Published by
Department of Biotechnology
K.S.Rangasamy College of Technology
Tiruchengode-637 215.
Namakkal District, Tamil Nadu, India

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Editors Desk

It gives us immense pleasure to present the first issue of KSRCT IEEE-EMBS Newsletter, the measure of progress of our editorial board members of the KSRCT IEEE-EMBS Student Chapter are rejoiced to see the Newsletter published by the Department of Biotechnology, KSRCT.



We owe our special thanks to our Chairman Lion Dr.K.S. Rangasamy MJF, Principal Dr.K.Thyagarajah and the members of the various committees for their whole-hearted support .We also thank Shri.R.Srinivashaan, Secretary and Smt.Kavitha Srinivashaan, Assistant Secretary, K.S.R. Educational and Charitable Trust, Tiruchengode for their excellent support and constant encouragement in bringing out this magazine successfully every semester.

Dr.P.Ponmurugan
Professor & Head
Department of Biotechnology
K.S.Rangasamy College of Technology.

Nehru Group of Educational Institutions Presents “P.K.Das Memorial Best Faculty Award” in Biotechnology



Nehru Group of Educational Institutions, Coimbatore under the Chairmanship of “P.K.Das Memorial Best Faculty Award” is honoring teaching staff members from Engineering, Management Studies, Arts and Science disciplines covering Tamil Nadu and Kerala States. The award carries Rs.10,000/- cash prize along with a shield and certificate. The award is given to the meritorious faculty members during the birth Anniversary of Dr.P.K.Das on 15th December 2010. A minimum of five years teaching experience in colleges is considered as one of the main criteria for the award. Separate awards will be conferred to teaching faculties in Mechanical, EEE, ECE, CSE and Aeronautical disciplines in Engineering,

HR, Finance, Marketing in Management Studies and in various disciplines in Arts and Science streams. Teachers below 40 years of age will be considered under Junior faculty

category and those 40 and above under Senior faculty category.

Biotechnology Department of K.S.R. College of Technology stands 8th Position among 280 private Indian Institutions

The Department of Biotechnology at the K.S.R.College of Technology, Tiruchengode, Namakkal District, Tamil Nadu has been ranked as eighth among 280 private Biotechnology Institutions in the country reported by Biospectrum magazine. This magazine has conducted a survey to identify top ten private educational institutions based on the criteria such as number of faculty members and their qualification, industry-institute interaction, infrastructure development, placement and research activities.

Association Activities

Mr.K.M.Johnson, Regional Head, Water lab, Eureka Forbes, Ltd. New Delhi has delivered the guest lecture on “Water Pollution Technology and its

implementation at New Delhi” on 27.07.2010.

Mr.Sivaramakrishnan, Executive Director, Summer India Textile Pvt Ltd, has delivered the guest lecture on “Textile Industry” on 28.07.2010 to B.Tech., Biotechnology students. In the meeting, some of the collaboration research projects are offered to the student communities to solve the individual problems.

Dr.V.V.Subramanian, Director-Executive, Phycospectrum Consultants Pvt.Ltd. Chennai, has delivered the guest lecture on “Algal Culture Biotechnology”.

Dr.Prakash Vincent, Reader & Research coordinator, Department of Nanobiotechnology, Manonmaniam Sundaranar University, Tirunelveli, has delivered the guest lecture on “Nanobiotechnology” on 30.12.2010.

Dr.S.Venkatesan, Associate Professor, Department of Petrochemical Technology, Anna University of Technology Tiruchirappalli has delivered the guest lecture on “Bio-products Separation using Liquid Membranes Technology”.

Placement Details for 2007-2011 batch

Tata Consultancy Services (TCS), Bangalore



N.Ayub Khan
IV B.Tech
Biotechnology



P.Vinothini
IV B.Tech
Biotechnology



S.Charu Priya
IV B.Tech
Biotechnology



K.Arthi
IV B.Tech
Biotechnology



Jiby James
IV B.Tech
Biotechnology



A.Mohammed
IV B.Tech
Biotechnology

Alternative medicinal therapy for HIV – AIDS

Alternative and complementary medicine is the name generally given to those medical and health care systems, practices, and products that are not presently considered to be part of conventional Western medicine. Well known examples include herbal and other nutritional supplements, acupuncture, aromatherapy and homeopathy.

- Alternative medicine is used in place of conventional medicine
- Complementary medicine is used together with conventional medicine.

The more ancient forms of complementary and alternative medicine are also known as traditional medicine. There is increasing recognition of the role that traditional health practitioners can play in preventing and treating STIs including HIV/AIDS. Traditional practitioners already see and treat most of the STIs in Africa and clinical research is needed into herbal medicines used for STIs.

In relation to HIV, *alternative* therapies are most commonly used in areas where it is difficult to access Western medicine. In the absence of antiretroviral treatment, people seek other ways to delay the onset of AIDS,

or to treat opportunistic infections. In sub-Saharan Africa, for example, traditional healers outnumber medically qualified doctors eighty-to-one. Traditional healers also usually provide immediate treatment, whereas clinics may have lengthy waiting lists and tests for eligibility.

Most people living with HIV in developed countries have ready access to antiretroviral therapy and conventional treatments for opportunistic infections. Because these treatments are so effective, there is less demand for alternative HIV medicine, except perhaps for addressing relatively minor infections, or when antiretroviral treatment cannot any longer be taken, for example because of drug resistance. Many instead look to *complementary* medicine as a way to prevent or relieve aids treatment side effects, some of which are not easily treatable with conventional medicine. There is also demand for complementary therapies that might boost immunity, relieve stress, or improve general health and wellbeing.

Amazing facts about animals' world

Every creature, as the art of the God, keeps secrets and miracles inside it. We, as human, are the only creature who has ability to think. Various animal kinds have different features to survive in wild nature. Some of them are discovered by scientists in the history.

1. Dolphins sleep with one eye open
2. Crocodiles are blind in the water but very keen of sight in the air.
3. Crocodiles are color-blind.
4. Owls are the only bird that can see the color blue.
5. Unlike all other insects, flies have five eyes. They have two large eyes and three smaller eyes between them.
6. Snails have four noses.
7. Giraffes have no vocal chords
8. The tongues of chameleons are as long as its body or even longer. Some chameleon types have a tongue longer than two times of its body.
9. The tongues of chameleons are faster than a fighter jet.

10. The eyes of ostrich's are bigger than their brains.

11. An ant can lift fifty times of its own weight

12. A cockroach can survive without its head for nine days. At the end of nine day, it dies because of hunger.

13. A tarantula can survive for more than two years without food.

Health benefits of Apricot

Combats cancer

Apricots, especially dried ones, are another source of lycopene, the amazing carotenoid that can help prevent prostate, breast, and several other cancers. Though apricots aren't nearly as good a source of lycopene - about 30 dried ones have the same amount as one tomato - munching on them throughout the day can boost our lycopene quicker than we think. Apricots are also a good source of the most famous carotenoid of them all - beta carotene. This powerful antioxidant reduces your risk of some types of stomach and intestinal cancers. To get these benefits, experts suggest getting at least 5 milligrams of beta carotene each day. That's equal to about six fresh apricots.

Halts heart disease

Eating dried apricots as a snack can punch up your levels of iron, potassium, beta carotene, magnesium, and copper. These important nutrients help control your blood pressure and prevent heart disease. Plus, as few as five dried apricots can give you up to 3 grams of fiber, which sweeps cholesterol out of your system before it has a chance to clog your arteries.

Chases away cataracts

Apricots are a good source of beta carotene, which your body converts to vitamin A, and several other nutrients, they are used against cataract.

Adds to a long life

Some people claim apricots are the secret to living to age 120. They get this idea from the Hunzas, a tribe living in the Himalayan Mountains of Asia. Common health problems, like cancer, heart disease, high blood pressure, and high cholesterol, do not exist in Hunza. The Hunzas eat fresh apricots in season and dry the rest to eat during their long, cold winter. Although eating apricots can't guarantee you'll live a long life, recent research suggests the little fruit may help you live a better life. The B vitamins in dried apricots may protect you

from Alzheimer's and age-related mental problems, like memory loss.

Pantry pointers

Avoid apricots with yellowish or greenish tinges and those that are hard, shrunken, or bruised. The peach, apricots can ripen the kitchen counter at room temperature. When they feel and smell ripe, wrap them in a paper bag and store them in the refrigerator. They'll stay fresh for several days.

Current and future scenario on Telomerase and aging

Telomerase

Telomerase is an enzyme that adds DNA sequence repeats ("TTAGGG" in all vertebrates) to the 3' end of DNA strands in the telomere regions. Carol Greider and colleagues were awarded the 2009 Nobel Prize in Medicine for their discovery and work on telomerase, the enzyme that lengthens telomeres. In normal circumstances, without the presence of telomerase, if a cell divides recursively, at some point all the progeny will reach their "cell senescence" or "Hayflick limit". Telomerase appears to play a role in the formation, maintenance, and renovation of telomeres. There has been great interest in

the possible relationship between human telomeres in the one hand and cellular senescence (aging) and cellular immortality on the other.

Aging

Many scientists believe that what imposes a limit on our lifespan and the decline in our health is the shortening of telomeres. Experiments have demonstrated that if we can keep our telomeres from shortening, our cells can duplicate accurately indefinitely. In other words, this goes beyond slowing the aging process. They are talking about a cure for aging. Activating telomerase protects the telomeres from shortening and serves as an anti-aging treatment, slowing or reversing aging. On the contrary, knocking out or inhibiting telomerase activity results in shortened telomeres with acceleration of the aging process.

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Medicinal Values of *Aloe vera*

Aloe vera is a stemless or very short-stemmed succulent plant growing to 60–100 cm (24–39 in) tall, spreading by offsets. The leaves are thick and fleshy, green to grey-green, with some varieties showing

white flecks on the upper and lower stem surfaces. The margin of the leaf is serrated and has small white teeth.

Scientific evidence for the cosmetic and therapeutic effectiveness of *Aloe vera* is limited and when present is frequently contradictory. *Aloe vera gel* is used as an ingredient in commercially available lotion, yogurt, beverages and some desserts. *Aloe vera* juice is used for consumption and relief of digestive issues such as heartburn and irritable bowel syndrome. It is common practice for cosmetic companies to add sap or other derivatives from *Aloe vera* to products such as makeup, tissues, moisturizers, soaps, sunscreens, incense, razors and shampoos. Other uses for extracts of *Aloe vera* include the dilution of semen for the artificial fertilization of sheep, use as fresh food preservative, and use in water conservation in small farms.

Aloe vera is alleged to be effective in treatment of wounds. Evidence on the effects of *Aloe vera* sap on wound healing, however, is limited and contradictory. Some studies, for example, show that *Aloe vera* promotes the rates of healing, while in contrast, other studies show that wounds to which *Aloe vera* gel was applied were significantly slower to heal than those

treated with conventional medical preparations. A more recent review concludes that the cumulative evidence supports the use of *Aloe vera* for the healing of first to second degree burns. In addition to topical use in wound or burn healing, internal intake of *Aloe vera* has been linked with improved blood glucose levels in diabetics, and with lower blood lipids in hyperlipidaemic patients, but also with acute hepatitis (liver disease). In other diseases, preliminary studies have suggested oral *Aloe vera gel* may reduce symptoms and inflammation in patients with ulcerative colitis. Compounds extracted from *Aloe vera* have been used as an immunostimulant that aids in fighting cancers in cats and dogs; however, this treatment has not been scientifically tested in humans. The injection of *Aloe vera* extracts to treat cancer has resulted in the deaths of several patients.

Topical application of *Aloe vera* may be effective for genital herpes and psoriasis. However, it is not effective for the prevention of radiation-induced injuries. Although anecdotally useful, it has not been proven to offer protection from sunburn or suntan. In a double-blind clinical trial both the group using an *Aloe vera* containing dentifrice and the group using a fluoridated dentifrice had a reduction of gingivitis and

plaque but no statistically significant difference was found between the two.

Aloe vera extracts have antibacterial and antifungal activities, which may help in the treatment of minor skin infections, such as boils and benign skin cysts. *Aloe vera* extracts have been shown to inhibit the growth of fungi that cause tinea; however, evidence for control beneath human skin remains to be established. For its anti-fungal properties, *Aloe vera* is used as a fish tank water conditioner. For bacteria, inner-leaf gel from *Aloe vera* was shown to inhibit growth of *Streptococcus* and *Shigella* species *in vitro*. In contrast, *Aloe vera* extracts failed to show antibiotic properties against *Xanthomonas* species.

Stem Cell Discovery Could Lead to Improved Bone Marrow Transplants

Researchers at the University of California, Santa Cruz, have identified a key molecule for establishing blood stem cells in their niche within the bone marrow. The findings, reported in the January issue of *Cell Stem Cell*, may lead to improvements in the safety and efficiency of bone marrow transplants.

Bone marrow transplants are a type of stem cell therapy used to treat cancers such as lymphoma and leukemia and other blood-

related diseases. In a bone marrow transplant, the "active ingredients" are hematopoietic stem cells, which live in the bone marrow and give rise to all the different kinds of mature blood cells. The new study shows that hematopoietic stem cells use a molecule called Robo4 to anchor them in the bone marrow.

Robo4 is a rare molecule that is found only in hematopoietic stem cells and in the endothelial cells of blood vessels. Earlier work in lab showed that Robo4 is specific for hematopoietic stem cells.

The discovery that the cells need Robo4 to stay in the bone marrow has potential therapeutic implications. An increasingly common alternative to traditional bone marrow transplants involves harvesting hematopoietic stem cells from the blood. Repeated injections of drugs are needed to get the stem cells to leave the bone marrow and enter the bloodstream so that they can be collected with a blood draw. A drug that blocks Robo4 could be a safer and more effective way to do this.

Robo4 acts as an adhesion molecule, interacting with other components of the bone marrow to bind the stem cells into their proper niche. They are finding the molecules bind to Robo4, which could lead to a better

understanding of that niche. While other types of stem cells are routinely grown in petri dishes, hematopoietic stem cells are very difficult to grow in the lab. They seem to require the bone marrow environment to function properly.

Other molecules besides Robo4 are also known to be involved in guiding the localization of hematopoietic stem cells in the bone marrow. One of these, called Cxcr4, acts together with Robo4 to retain hematopoietic stem cells in the bone marrow. But the two molecules appear to act through different molecular mechanisms. Inhibition of both molecules may be the best way to achieve efficient mobilization of hematopoietic stem cell.

Detecting breast cancer using thermal imaging

Screening to detect breast cancer early may become a reality if thermography (thermal imaging) that is in the early stages of testing is perfected. The trial is jointly done by the Indira Gandhi centre for atomic Research (IGCAR), kalpakkam and the Chennai based Sri Ramachandra medical college (SRMC).

Thermography detects infrared radiation emitted by a body, and the wavelength of

the infrared radiation is correlated to the temperature.

“Any cancerous/abnormal cells will cause increased blood flow. Increased blood flow results in increased temperature. Thermography looks for such increase in temperature in any part of the breast,” said Dr. B. Venkatraman, Head, Quality Assurance division at IGCAR. However, not all cells that exhibit an increased temperature due to increased blood flow are cancerous. Hence its ability to identify all cancerous cells and only the cancerous cells is crucial.

The performance and ability of Thermography to detect breast cancer were first tested on 25 patients who had come to the department of Atomic energy Hospital at Kalpakkam with pain/indication of breast cancer. The clinical standardization (determining the ambient temperature at which the screening should be done etc) has already been done at SRMC.

Results from thermography were compared with mammography and tissue biopsy in nearly 200 patients. Patients above the age of 40 and who complained of pain in the breast were chosen.

High Sensitivity

“The sensitivity is about 98 percent (ability to detect positive cases) and the specificity (ability to pick up only the positive cases) is 88-90 percent,” said DR. P. Surendran, Associative Professor in General Surgery, SRMC. The sensitivity and specificity were derived during the process of clinical standardization.

According to him, the specificity is as high as 96 per cent in well established breast cancers and about 85 percent in the case of early lesions(about 1 cm size).

Following the clinical standardization, thermography has been used on 60 patients at SRMC. The Analytical standardization to know which cells/areas exhibiting abnormal temperature are actually cancerous is in progress. Analytical standardization would help provide accurate information of the sensitivity and specificity.

“What we have done now is to see if thermography can be more sensitive than mammography, so we can pick up cases at a much earlier stage and confirm it with mammography and tissue biopsy,” It will be an ideal and a superior tool for screening compared with mammography if the specificity is also high. For instance, unlike

mammography, thermography detects breast cancer non-invasively.

Discover the health benefits of eating purple carrots

(NaturalNews) Carrots provide a lot more nutritional and medicinal value than we realise. The purple carrot is a lot less widely known than its orange relation, yet it offers just as many, if not more, benefits than the orange variety.

Purple carrots are even higher in antioxidants than orange carrots, and they also possess anti-inflammatory properties. This could make them very useful in the treatment of arthritis. They have been found to be antiviral, antiseptic and antimicrobial, and they also contain anticarcinogens and betacarotenes. They also contain phytochemicals including carotenoids, polyacetylenes, isocoumarins, phenolics and sesquiterpenes. Phytochemicals have antioxidant, anti-bacterial, and other disease preventative and health enhancing properties.

Anticarcinogens help to reduce the risk of cancer and also help to fight against any already-present cancer cells in our bodies. Purple carrots are also excellent at fighting against viral as well as bacterial infections,

such as flu, measles and internal infections of the urinary tract, mouth and stomach. Prevent cancer and start drinking your purple carrot juice as often as possible.

Purple carrots contain high doses of Vitamin A, which helps to prevent clogging of the arteries and thus helps to prevent strokes. Along with that, they also contain vitamin B, C and E as well as calcium pectate, which is a very good source of fibre, and they help to lower cholesterol levels. They are also very useful in the prevention of macular degeneration.

They are known to nourish the hair, skin and nails, and they also greatly enhance the quality of breast milk. They also contain a form of calcium which is more easily digested by our bodies than many other sources. The roots of carrots have long been used in treating intestinal parasites, indigestion, tonsil issues and constipation. In ancient times, they were used as a medicine to treat virtually anything. Even the carrot greens contain vitamin K, which is not present in the rest of the carrot.

In studies done at Queensland University, it was shown that purple carrot juice is able to lower blood pressure, stabilise blood sugar, and assist in fighting against liver and heart disease.

Green Fluorescent Protein (GFP)

The green fluorescent protein (GFP) is a protein composed of 238 amino acid residues (26.9 kDa) that exhibits bright green fluorescence when exposed to blue light. Although many other marine organisms have similar green fluorescent proteins, GFP traditionally refers to the protein first isolated from the jellyfish *Aequorea victoria*. The GFP from *A. victoria* has a major excitation peak at a wavelength of 395 nm and a minor one at 475 nm. Its emission peak is at 509 nm, which is in the lower green portion of the visible spectrum. The GFP from the sea pansy (*Renilla reniformis*) has a single major excitation peak at 498 nm. In cell and molecular biology, the GFP gene is frequently used as a reporter of expression. In modified forms it has been used to make biosensors, and many animals have been created that express GFP as a proof-of-concept that a gene can be expressed throughout a given organism. The GFP gene can be introduced into organisms and maintained in their genome through breeding, injection with a viral vector, or cell transformation. To date, the GFP gene has been introduced and expressed in many bacteria, yeast and other fungi, fish (such as

zebrafish), plant, fly, and mammalian cells, including human.

Wild-type GFP (wtGFP)

In the 1960s and 1970s, GFP, along with the separate luminescent protein aequorin, was first purified from *Aequorea victoria* and its properties studied by Osamu Shimomura. In *A. victoria*, GFP fluorescence occurs when aequorin interacts with Ca²⁺ ions, inducing a blue glow. Some of this luminescent energy is transferred to the GFP, shifting the overall color towards green. However, its utility as a tool for molecular biologists did not begin to be realized until 1992 when Douglas Prasher reported the cloning and nucleotide sequence of wtGFP in Gene. The funding for this project had run out, so Prasher sent cDNA samples to several labs. Remarkably, the GFP molecule folded and was fluorescent at room temperature, without the need for exogenous cofactors specific to the jellyfish. Although this near-wtGFP was fluorescent, it had several drawbacks, including dual peaked excitation spectra, pH sensitivity, chloride sensitivity, poor fluorescence quantum yield, poor photostability and poor folding at 37°C.

GFP uses

GFP is used to express the protein in small sets of specific cells. This allows researchers to optically detect specific types of cells in vitro (in a dish), or even in vivo (in the living organism). Genetically combining several spectral variants of GFP is a useful trick for the analysis of brain circuitry (Brainbow). Other interesting uses of fluorescent proteins in the literature include using FPs as sensors of neuron membrane potential, tracking of receptors on cell membranes, viral entry and the infection of individual influenza viruses and lentiviral viruses, etc.

It has also been found that new lines of transgenic GFP rats can be relevant for gene therapy as well as regenerative medicine. By using "high-expresser" GFP, transgenic rats display high expression in most tissues, and many cells that have not been characterized or have been only poorly characterized in previous GFP-transgenic rats. Through its ability to form internal chromophore without requiring accessory cofactors, enzymes or substrates other than molecular oxygen, GFP makes for an excellent tool in all forms of biology.

Transgenic pets

Alba, a fluorescent rabbit, was commissioned by Eduardo Kac using GFP for purposes of art and social commentary. The US company Yorktown Technologies markets to aquarium shops green fluorescent zebrafish (GloFish) that were initially developed to detect pollution in waterways. NeonPets, a US based company markets green fluorescent mice to the pet industry as Neon Mice. Green fluorescent pigs, known as Noels were bred by a group of researchers.

New species of fish found in Indian sea waters

The presence of a shark species new to science and 84 other deep-sea dwellers new to the Indian waters have been brought out by a stock assessment of deep sea fish of the Indian Exclusive Economic Zone and the central Indian Ocean, according to research.

Mustelus mangloreensis, a new gummy shark species, was discovered from a depth of 500 metres off the Mangalore coast. This is the second gummy shark that has been reported from the Indian Ocean against the 19 known worldwide.

Of the 84 species of fish found in the Indian waters, 15 were shark varieties, including

Balloon, Cat, Lantern and Gulpers. It has also confirmed the presence of 10 species of eels belonging to Conger, Cusk and Snipe families from the study region. Most of the species were found inhabiting the sea at a depth beyond 500 metres.

The assessment was carried out by a team of research experts. This study was supported by a Ministry of earth Sciences.

The assessment also revealed that the Indian waters supported rich and diverse deep sea angler fish, which uses the fleshy lure on its head to catch its prey. The presence of six new species coming under 'smooth', 'double', 'dicerateid' and 'blackmouth' angler fish categories were also recorded. Most of them were found occupying the ocean space between a depth of 500 and 800 metres.

The samples were collected from the exploratory deep sea fishery cruises on board the ocean research vessel Sagar Sampada. Fishing was carried out in depths between 200 and 1100 metres from the Wadge bank in the south and Ratnagiri in the north along the south west coast during the last 10 years. Fishing operations were carried out in 220 stations with high speed demersal fish and shrimp trawls.

The analysis has revealed that the Kozhikode-Mangalore region was rich in deep sea fish biodiversity as 121 species were collected from there. This was followed by the Kochi-Kozhikode belt with the presence of 95 species. In the Kozhikode-Mangalore belt, the richest fish biodiversity was found at depths ranging between 500 and 800 metres.

The morphological features of some of the species identified included transparent or black body, poorly developed muscles, absence of gas bladder and greatly reduced eyes. Some possessed expandable stomachs. In some other fish, jaws were either absent or present with huge hinged jaws with long and inward pointing teeth.

The origin of many species could be tracked to the tropical regions of the Pacific and Atlantic, especially to South African coast, Madagascar Bridge, Mozambique, Gulf of Aden, Canary Islands and the Mediterranean Sea. Many species share similar habitats with their counterparts in other oceans.

Artificial Mini – chromosomes

Artificial mini – chromosomes are small chromosomes built by incorporating genes into a DNA molecule that initially contains only the units that regulate the replication of

chromosomes those that initiate the replication and those that ensure the right distribution of chromosomes in new cells.

Multiple genes can be added to these two basic units and, to render them functional, there is no need to include the regulating DNA that makes up more than 90 per cent of most natural chromosomes. The biggest artificial mini – chromosomes built so far carry between a dozen and 20 genes but, in theory, there is no limit to the number of genes that can be included in one single artificial chromosome. Artificial mini – chromosomes can be built and inserted into all kind of species, from yeast and bacteria, to higher plants, insects, mammals and humans. In fact, in the early years bigger advances were made in developing artificial chromosome technology for animals and humans than for other species, but more recently the technology for plants, yeasts and bacteria.

There are natural mini – chromosomes too, and they are encountered widely among different species and kingdoms. They may be present in the nucleus, as well as in the cell "organelles", that are responsible for photosynthesis, energy processing and other fundamental processes of life. They characteristically lack regulating DNA and

may exist in highly variable numbers of copies in the same cell. The role and functioning of natural mini – chromosomes is little understood, but they may be important in the process of adjusting to very different or changing habitats and conditions.

One characteristic of artificial mini – chromosomes that has attracted the attention of biotechnologists is that they seem to be more **"independent"** from the rest of the genetic material than larger nucleus chromosomes. That is, their expression seems not to be determined by and seems to have little influence on the behavior of other chromosomes. When foreign genes are inserted, the genetic material of the artificial mini – chromosomes is not **"silenced"** or **"deleted"**, as often happens with genes inserted into existing chromosomes. Once inserted into the cell, artificial mini – chromosomes also remain physically independent from other chromosomes and genetic material; they are not incorporated into the native DNA and therefore do not cause mutations in the native DNA.

Industry and labs developing and using the technology thus claim that mini – chromosomes will avoid the side-effects of

genetic engineering because there will be no disruption of genetic material.

US man is HIV-free after stem cell transplant

The process began in 2006 when a US man in his 40s, who had been HIV positive for more than a decade, sought treatment for acute myeloid leukemia, a lethal blood cancer. After a first round of chemotherapy failed, his German doctor, Gero Hutter, thought he would see if he could perform a bone marrow transplant using a donor with a rare genetic mutation that is naturally resistant to HIV.

About one in 100 Caucasian people, or one percent of the population, have the mutation, known as Delta 32, inherited from both parents which prevents the protein CCR5 from appearing on the cell surface. Since HIV enters the cell through CCR5 molecules, when they are absent HIV cannot penetrate. The process was not easy, but after rejecting dozens of potential donors Hutter finally found a match and performed the bone marrow transplant using stem cells from the HIV-resistant donor in February 2007.

In this treatment they are trying to treat the patient's own cells so there will not be any immunological problem.

Biofilms

Biofilms consist of micro organisms immobilized at a substratum surface and typically embedded in an organic polymer matrix of microbial origin. They develop on virtually all surfaces immersed in natural aqueous environments, including both biological and abiological. Extensive microbial growth, accompanied by excretion of copious amount of extracellular organic polymers, leads to the formation of visible slimy layers on solid surfaces.

Most of the human gastrointestinal tract is colonized by specific microbial groups that give rise to natural biofilms. At times, these natural biofilms provide protection for pathogenic species, allowing them to colonize the host. Insertion of the prosthetic device to the human body often leads to the formation of biofilms on the surface of the device. The micro organisms that primarily involve in biofilm formation are *Staphylococcus epidermidis*, other coagulase-negative staphylococci and gram-negative bacteria. These normal skin inhabitants possess ability to adhere to the surface of the inanimate prosthetic devices.

Within biofilms, they are protected from the body's normal defence mechanisms and also from antibiotics. Biofilms are critical in ocular diseases also because pathogens like *Chlamydia*, *Staphylococcus* etc. survive in ocular devices such as contact lenses and in cleaning solutions and may cause vision problems.

Diamonds: The Latest in Treating Infections

Chicago, IL – Northwestern University scientist Dean Ho recently discovered that using nanoscale diamonds can help heal wounds much faster. Dr. Ho and his team found that [diamonds](#) tend to attract insulin, best known for helping to regulate blood sugar. Insulin has also been found to speed up the healing process and prevent infections from growing at wound sites.

In wound healing, insulin prompts skin cells to grow and divide, facilitates blood flow to the wound, acts as an anti-inflammatory, and fights infection. Dr. Ho's group found that these tiny diamonds offer ideal surfaces to carry insulin to injury sites. The surfaces bind quickly with different molecules, including proteins and antibodies. They also have a large enough surface area that large amounts of medicine can be loaded onto them. Because of the nature of the

diamond's surfaces, insoluble drugs will stick to them even when suspended in water.

Not only has it been found that nanodiamonds are an easy way to get insulin to a wound site, but also that the only thing that will get the insulin to release from the diamonds' surfaces is the presence of a base pH level, which naturally occurs in wounds and infected body tissues. A normal pH level of 7.4 wouldn't cause any release of medicine from the nanodiamonds. But, at the site of a cut with infection, a pH level can rise as high as 10.5, causing the insulin to detach from the nanodiamonds and go to work on repairing the wound.

These tiny diamonds do not cause any significant cell damage, and the insulin releases slowly and steadily enough not to upset other body functions. This new discovery could begin an entirely new therapy for wound care. They are currently working on integrating the nanodiamond solution into curative gels or creams, and will begin pre-clinical trials soon.

The Production of biological weapons

The production of biological weapons can be divided into several stages, a biological agent must first be chosen and acquired, the production method must be acquired, the

agent must then be grown and multiplied to sufficient quantities and finally the agent has to be prepared for delivery.

Deciding which agent is needed will depend on what the particular outcome is to be and then match this with the agent's characteristics.

The characteristic relies on how much of a particular agent can cause disease, the time it takes from exposure to illness, how debilitating the result will be, how readily the disease will spread and how lethal the agent. Countermeasures to the disease are also taken into account.

Natural environment and a microbiology laboratory are the two main sources for the pathogen and as laboratories in which biochemical's are stored are well guarded with the most advanced of security measures acquiring pathogen from a lab would be extremely hard to accomplish.

However there could be a way of getting around this; toxins can be produced by adding the DNA coding needed for its production to bacteria. Advancements over the last few years in biotechnology have made it possible to synthesize certain viruses; however this isn't an easy matter as

growing microorganisms require optimal conditions.

Actual living cells are required in order to grow viruses and some bacteria, fungi some bacteria and other microorganisms are usually grown in Petri dishes or fermentation vats. However growing large amounts of an agent requires a lot of space and is limited by factors such as cost, specialized equipment and the safety concerns that arise from handling dangerous substances.

Selection techniques and the great advancements in genetic engineering over the last few years now allow us more modifications of microorganisms which can alter an agent in a particular manner. Agents are now being modified to allow increased pathogenicity with a much shorter incubation period which will result in a much more severe and fast acting disease.

If scientists wanted, then using the biotechnology of today the possibilities could be endless and alterations could be made to them to make vaccines, treatments or the body's own immune system defenseless against them.

Delivering an agent would also require great planning and preparation for it to remain

effective when outside of its optimal growing conditions. Exposure to the outside world would have a negative effect on the pathogen, temperature, ultraviolet radiation, and drying can all have an effect.

Some pathogens are much hardier, anthrax for example can encapsulate itself into a hardy long lasting spore that can resist most of the conditions others cannot, however most agents require extra processing to minimize damage to them and for to remain active when removed from their environment.

Light detects oesophageal cancer

A new, more accurate way to identify pre-cancerous cells in the lining of the oesophagus uses a tiny light source and sensors at the end of an endoscope. Acid reflux occurs when stomach acid splashes, or refluxes, up into the oesophagus. Long periods of acid reflux can change the cells that line the oesophagus, making them appear more like intestinal cells than oesophageal cells.

These cellular changes can also be a precursor to cancer. As in most cancers, early identification of these pre-cancerous cells often leads to better outcomes for patients. Barrett's oesophagus afflicts more

than one percent of the U.S. population, with most patients above the age of 50.

Developed by biomedical engineers at Duke University and successfully tested on patients during a clinical trial at the University of North Carolina at Chapel Hill, the device holds the promise of being a less invasive method for testing patients suspected of having Barrett's oesophagus, a change in the lining of the oesophagus due to acid reflux.

Using an endoscope to reach the oesophagus via the nose, physicians shine short bursts of this light at locations of suspected disease and sensors capture and analyze the light as it is reflected back. In particular, they are trying to spot characteristic changes within the layer of cells known as the epithelium, which line cavities and surfaces throughout the body, according to a Duke University press release.

“By interpreting the way the light scatters after we shine it at a location on the tissue surface, we can spot the tell-tale signs of cells that are changing from their healthy, normal state to those that may become cancerous,” said Neil Terry, a Ph.D. student at Duke's Pratt School of Engineering. “When we compared the findings from our system with an actual review by

pathologists, we found they correlated in 86 percent of the samples.”

Synthetic blood now closer

Scientists have created particles that mimic some key properties of red blood cells, paving the way for the development of synthetic blood. The new discovery could also lead to more potent treatments for life threatening conditions such as cancer.

University of North Carolina researchers used technology known as PRINT (Particle Replication in Non-wetting Templates) to produce very soft hydrogel particles that mimic the size, shape and flexibility of red blood cells. The technology allows the particles to circulate in the body for extended periods of time, reports the journal Proceedings of the National Academy of Sciences.

However, researchers believe the findings are significant because red blood cells (RBCs) naturally deform in order to pass through microscopic pores in organs and narrow blood vessels, according to a University of North Carolina press release.

Over their 120-day lifespan, the red blood cells become stiffer and are filtered out of circulation after being unable to pass through spleen pores.