Probiotics: Bacteria as medicine

MD. RIAJUL HOSSAIN

BEFORE going into heart of the topic, let us listen to a conversation between between Sarah and her brother Saif.

Sarah: My tummy has been upset for two days.

Saif: Why don't you see a doctor?

Sarah: I did, in fact. He prescribed me some probiotics.

Saif: Probiotics? What kind of drug is it?

Sarah had to describe to her brother what probiotics actually are and how they can be used as medication. Today, we are going to focus on probiotics and their health implications. In one of my past articles, I discussed he microbial universe that reside within us which are actually normal microflora of our body. Now, probiotics can be described as the living species (typically bacteria) taken in one form or another by animals or humans in order to improve their health. The form of this intake may be as fermented food products or simply as pills of these beneficial friendly bacteria.

Probiotic species are mostly bacteria. They may also be marketed in phials

The World Health Organization defines probiotics as "live microorganisms which when administered in adequate amounts confer a health benefit on the host". Lactic acid bacteria and bifidobacteria are the most common types of microbes used as probiotics. However, certain yeasts and bacilii may also be helpful.

The probiotics, indeed, could be an alternative to antibiotic treatment as recent research suggested. Furthermore, they can also be used in disease prevention, in some cases. However, the underlying mechanisms of the positive effect they impart upon the body's health are not clear.

The possible explanation is that the species of probiotic bacteria may change the gene expression pattern of the normal gut microflora in a positive direction and thus help treating some disease symptoms like diarrhea and inflammatory bowel diseases. RNA sequencing of the human gut microbes in the mice, after administering them with probiotics, revealed this phenomenon of changing gene expression of gut microbe genes encoding for metabolic enzymes, such as those involved in the catabolism of sugars called xylooligosaccharides, found in many fruits and vegetables. Moreover, it has been observed that mice injected with Helicobacter pylori first and then administering with some probiotic bacterial species, in this case Bifidobacterium bifidum, can make their health condition better.

The insight of this beneficial impact reveals that probably an antibiotic protein produced by Bifidobacterium bifidum is actally responsible for killing the Helicobacter pylori species. To state an example of how probiotics can be useful in disease prevention, researchers at Creighton University School of Medicine in Omaha, Neb. found that regular doses of probiotic bacteria given to hospital patients on mechanical ventilators resulted in fewer cases of pneumonia. The friendly bacterium for this particular case is Lactobacillus rhamnosus GG. The researchers observed that probiotic treatment reduced the number of cases of pneumonia by nearly half.

Again, in one study carried out by the researchers at Baylor College of Medicine and M.D. Anderson Cancer Center investigated how one particular Lactobacillus strain might prevent the growth of certain types of cancer. They noted that further research may lead to discover probiotic treatment against colorectal cancer and inflammatory bowel diseases. In another study, researchers at Virginia Polytechnic Institute and Ohio State University worked on the role of Lactobacillus acidophilus in enhancing the efficacy of a vaccine used against human rotavirus infection that causes severe dehydrating diarrhea in infants and children worldwide.

Indeed, continuous research on these friendly bacteria and investigating their interactions with the gut microflora may help us inventing alternative medication that will bypass antibiotic and some other ways of treatment and will also help preventing many diseases in the first place.

VITAL FLUID

Blood is red

	Group A	Group B	Group AB	Group O
Red blood cell type	A	B	AB	O
Antibodies in Plasma	Anti-B	Anti-A	None	Anti-A and Anti-B
Antigens in Red Blood Cell	A antigen	B antigen	A and B antigens	None

Blood type (or blood group) is determined, in part, by the ABO blood group antigens present on red blood cells.

SHARMEEN RAHMAN

WHAT do you really know about your blood types? Why the terms are "positive or negative" added to a blood type actually? And why are negative blood types an issue of concern?

Well, here are the facts

1) Antigens-Blood contains different chemicals for different functions, and "antigens" are one of them which produce antibodies.

2) A, B, O grouping-are the three most important human antigens and are classified according to their location on the surface of the erythrocytes. A person's erythrocyte may carry an A antigen, B antigen, AB antigens or no antigens at all(which is O)!

3) RH factor- this is another type of antigen in the blood, most people all over the world are Rh-positive. A person without RH antigens in the blood is RH negative. People usually worry to find a Rh negative blood donor as only a small percentage of people carry it.

4) Pregnancy and RH factor-This is a concern for pregnant mothers with a RH negative blood type and where the father is a RH positive. The child may inherit the father's RH factor. Complications may arise because the mother and baby's blood supply is separate and only a small amount of baby's blood reaches the mother's blood stream usually during delivery and the mother may develop antibodies; which may cause damage to the next baby the mother conceives.

But not to worry anymore ! To facilitate the second child's birth without complication an anti-Rh is given to the mother after the delivery of the first child, so it can also be given during the first pregnancy. Thus, donating blood for people with RH negative is highly recommended

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THEY SWIM IN SYNC

Antartic ice sheets

The east antarctic ice sheet, seen jutting into the Weddell Sea

WHEN the last ice age was coming to a close about 19,000 years ago, the ice sheets that cover Antarctica began to shrink to their current sizes at about the same time as those in the Arctic, a new study finds.

That implies that the East Antarctic Ice Sheet, long thought to be relatively stable compared with the western side of the ice-clad continent, "is in fact, not so stable," says geologist Michael Weber of the University of Cologne, Germany. And if the much larger East Antarctic Ice Sheet were to break off into the Weddell Sea, the resulting sea level rise would be tremendous, says Weber, who, with his colleagues, reports the findings in the Dec. 2 Science.

"Before our study, people thought Antarctic ice sheets began their retreat around 14,000 years ago," says Weber. After gathering data from samples of deep-sea sediment plumbed from the Weddell Sea off East Antarctica, the researchers now suggest that Antarctic glaciers started to shrink 5,000 years earlier, around the same time as their counterparts in the Northern Hemisphere.

The sediments the researchers studied contained fossils made of carbonate, a chemical compound that's easy to calculate the age of but rarely found in ice cores used to establish a timeframe for glacial growth and retreat. "This is some of the first carbonate found at high latitudes," says geochemist Jess Adkins of Caltech, who calls the study a "fantastic breakthrough."

Because the seafloor sediments accumulated as varves, or repeating layers that reflect the passage of time much like tree rings, Weber's team calculated the age of Antarctic carbonate shells at a certain layer, and then simply counted the layers downward to reconstruct the history of glacial activity.

Source: Science News

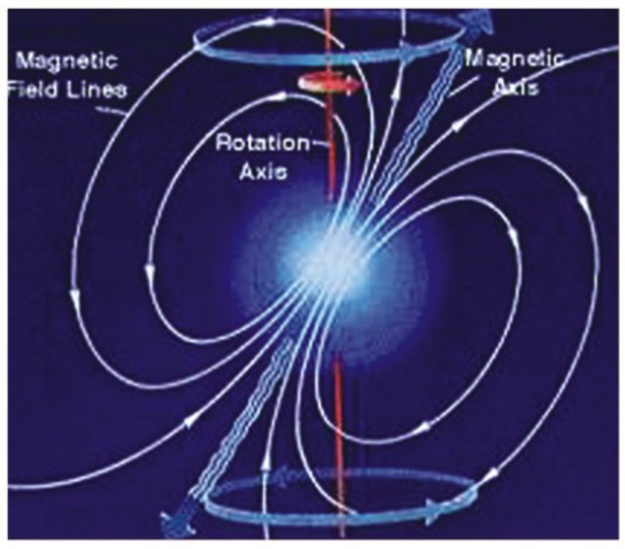
NEVER SAY DIE

Pulsating dead stars

OBAIDUR RAHMAN

IN 1967, a research student named Jocelyn Bell of Mullard Radio Astronomy Laboratory in Cambridge discovered a very mysterious noise coming from the sky. It consisted of very precise, short and rapid pulse of radio waves at regular intervals. She and her team locked down four of such cosmic sources and thought that the extra-terrestrials from a distant alien civilization were sending the Earthlings such systematic signals in an attempt to communicate with them. They were so sure of this explanation that they named these strange sources as LGM 1-4, where LGM stood for Little Green Men. But soon it was realized that these signals were actually coming from rotating neutron stars (the collapsed core of a supernovae, which takes place when the outer region of a star gets blown off in a tremendous explosion). And these neutron stars were emitting pulses of radio waves because of a complicated interaction between their magnetic fields and surrounding matter. The researchers later noticed that the signals coincided with the position of a flashing star located at the centre of the Crab Nebula, the very locale where the remnant of a supernovae that was seen from Earth in 1054 AD.

A neutron star has the core of neutrons (the uncharged particles, very similar to proton) around which lies a fluid layer that is itself made up of neutrons, protons and electrons. The rotational power of the original star remains preserved in neutron star. As a result, the neutron star can spin very fast, between 1000 times and to even just once every single second. A neutron star is also very intense given the fact that a star's soriginal magnetic power is also condensed in it. What happens eventually is that, charged particles like protons and electrons are accelerated and get caught up by the neutron star's magnetic field and spin around to emit radio waves in narrow beams at the magnetic poles of the star. And when the rotational axis of such star is not aligned with the axis of the magnetic field, the beam of the radiation sweeps across the sky, delivering short radio waves.



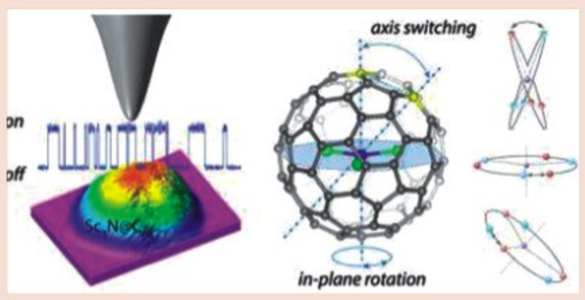
A diagram of a pulsar showing its rotation axis, its magnetic axis, and its magnetic field

Pulsar, A neutron star that emits rapid and periodic pulses of radiation.

So far, hundreds of pulsars have been identified by astronomers worldwide. Crab Pulsar, one that was discovered by Jocelyn Bell, is perhaps the most carefully studied of all the known pulsars discovered so far. One of the most exceptional properties of this particular pulsar is that it emits radiation at all observable wavelengths, from radio wavelengths, through visible light to the highest-energy X-rays. It is believed that the younger the pulsar, the faster is its speed of rotation. Crab pulsar, formed a little over 900 years ago, rotates about 30 times per second whereas Vela pulsar, which is about 10,000 years old and found in a partially dispersed supernova remnant, rotates about 11 times per second. Scientists believe, pulsars will no longer be able to emit its radiation once its rotational rate dies out completely and eventually it'll shut off.

ALL IN A CAGE

Molecular switch



Single-molecule switch for smaller, faster and energy-efficient electronics

Researchers at the University of Pittsburgh have invented a new type of electronic switch that performs electronic logic functions within a single molecule. The incorporation of such single-molecule elements could enable smaller, faster, and more energy-efficient electronics.

The research findings, supported by a $1 million grant from the W.M. Keck Foundation, were published online in the Nov. 14 issue of Nano Letters.

"This new switch is superior to existing single-molecule concepts," said Hrvoje Petek, principal investigator and professor of physics and chemistry in the Kenneth P. Dietrich School of Arts and Sciences and codirector of the Petersen Institute for NanoScience and Engineering (PINSE) at Pitt. "We are learning how to reduce electronic circuit elements to single molecules for a new generation of enhanced and more sustainable technologies."

The switch was discovered by experimenting with the rotation of a triangular cluster of three metal atoms held together by a nitrogen atom, which is enclosed entirely within a cage made up entirely of carbon atoms. Petek and his team found that the metal clusters encapsulated within a hollow carbon cage could rotate between several structures under the stimulation of electrons. This rotation changes the molecule's ability to conduct an electric current, thereby switching among multiple logic states without changing the spherical shape of the carbon cage. Petek says this concept also protects the molecule so it can function without influence from outside chemicals.

Because of their constant spherical shape, the prototype molecular switches can be integrated as atom-like building blocks the size of one nanometer (100,000 times smaller than the diameter of a human hair) into massively parallel computing architectures.

Source: Science Daily

STARRY NIGHT

Cosmic firework!

The Christmas burst van Gogh might have painted.

Source: Live Science

The Christmas sky last year was lit up by an extraordinarily powerful and mysteriously long-lasting explosion in space that scientists now suggest was a comet smacking into a dense star or a peculiar supernova death.

Thöne and her colleagues say an oddball supernova might be to blame. They propose that the Christmas explosion occurred when a neutron star combined with a helium star, a type of super-giant star rich in helium. When the neutron star and the helium star's core merged, the result would have been a black hole or a highly magnetic neutron star known as a magnetar, either of which might power long bursts of radiation.

DID YOU KNOW?

Do animals fall from sky?

Yes, such occurrences have been reported from many countries throughout history.Raining animals is a rare meteorological phenomenon in which flightless animals "rain" from the sky. One hypothesis offered to explain this phenomenon is that strong winds traveling over water sometimes pick up creatures such as fish or frogs, and carry them for up to several miles. However, this primary aspect of the phenomenon has never been witnessed or scientifically tested.