

The Rhinoceros beetle, *Oryctes rhinoceros*, has emerged as a serious pest of coconut and Oil palm. Credited as the strongest creature on earth in proportion to its body weight, control of this beetle is not an easy affair. But through integrated pest management a coastal panchayat in Kerala has succeeded in the war against this pest without the use of chemical pesticides. Edava is a coastal panchayat in Varkala Block area of Thiruvananthapuram District in Kerala. The majority of farmers have coconut plantations and income from coconut palms has been the major livelihood since hundreds of years.

Being a coastal area, phytosanitation was a problem here. This gave ample chance for the rhinoceros beetle to breed and multiply in large

numbers. Rhinoceros beetle in its adult stage bores into un-opened fronds and spathes of coconut. The attacked frond when fully opened shows characteristic triangular cuts. Infestation on spathe often destroys the inflorescence, and thus prevents production of nuts.

The beetle breeds on decaying organic debris, farmyard manure, dead coconut stumps, logs and compost. Rhinoceros beetle has a lifespan of about 90 days and it attacks all stages of the palm right from seedling stage to adult palm, causing heavy loss to farmers. Attack in young seedlings results in stunted growth and delayed flowering. Body of the beetle is covered by thick exoskeleton making control further difficult.

WAR AGAINST A STURDY BEETLE

"Farmers used to apply a mixture of sand, salt and charcoal on tree axils to control Rhinoceros beetle," says Thejasi Bhai, Agricultural Officer, Edava. "Another method was hooking and killing the beetles using metal hooks. Both these measures were not effective in bringing down the beetle population. Due to shortage of skilled labourers for even harvesting coconuts, this kind of control was out of the question. Other prophylactic measures like application of oil cakes of neem or marotti (*Hydrocarpus wightiana*) in powder form mixed with equal volume of sand in to the top most three leaf axils around the base of the spindle leaf during May, September and application of naphthalene balls in the leaf axils at the base of the spindle @ 12 g/palm

covered with sand also became impractical. So we thought of an integrated, less labour intensive option."

With the technical support of CPCRI (Central Plantation Crops Research Institute), Kayamkulam, Edava organized farmers in the war against the beetle. A three dimensional strategy was used for controlling the beetle. Oruveran (*Clerodendron infortunatum*) is a weed that grows in coconut gardens. This has larvicidal properties. Krishi Bhavan officials advised the farmers to apply this plant in Rhinoceros beetle breeding sites. This measure helped to control grubs up to a little extent only. As a second measure, pheromone traps were erected in coconut gardens, but adoption was poor.

Modern biotech medicines are well established in the treatment of many ailments, including some life-threatening ones, with the likelihood of increasing use in future years. Having said that, patients need to discuss access, cost, safety and efficacy of receiving biosimilar medicines as these are now an emerging source of affordable medicines for more patients.

Also known as follow-on biologics, biosimilars are approved new versions of innovator biologic drugs that are developed after the innovator's patent expires. Unlike generics, however, biosimilars are not exact replicas of biologic drugs. To comprehend the implications, we need to take a closer look at how

BIOSIMILAR MEDICINES: ARE WE READY? chemical molecule drugs and biologics are made.

For small molecule generics manufacturers "the product is the product", while manufacturers of innovator biologics claim "the process is the product". These inscrutable statements become clear once we understand the manufacturing process of both drugs. Biosimilars are large molecules produced by living organisms with high molecular complexity and susceptible to the smallest manufacturing process changes, while small molecule generics are produced by chemical synthesis with high levels of stability. Therefore, even a minor change in the process or materials used in

manufacture means the biosimilar drug may have serious differences in treatment outcomes and side effects.

To elaborate, biologic drugs are manufactured by genetically engineered living cells making them miniature factories that produce the desired molecules (proteins). Even minor changes in their environment can, however, significantly alter the proteins these cells are engineered to produce. Any biosimilar manufacturer using similar starting materials and processes may still produce a product that differs from the innovative biologic drug. Moreover, given the complexities of biologics it

is impossible to determine in a laboratory whether a biological product will work in the same way as its original innovator.

In other words, with the original biologic purification process not available to biosimilar makers, biosimilars can never be made in exactly the same manner as the original biologic drug. Among various potential risks of biosimilars, differences in immunogenicity represent one such concern. While generics generally lack immunogenicity, biosimilars are immunogenic – that is, they are inclined to activate an immune response in the



Then, scientists at CPCRI found that successful control of Rhinoceros beetle in larger areas could be achieved using a viral pathogen *Baculovirus Oryctes* (OBV) and a fungal pathogen *Metarhizium anisopliae*.

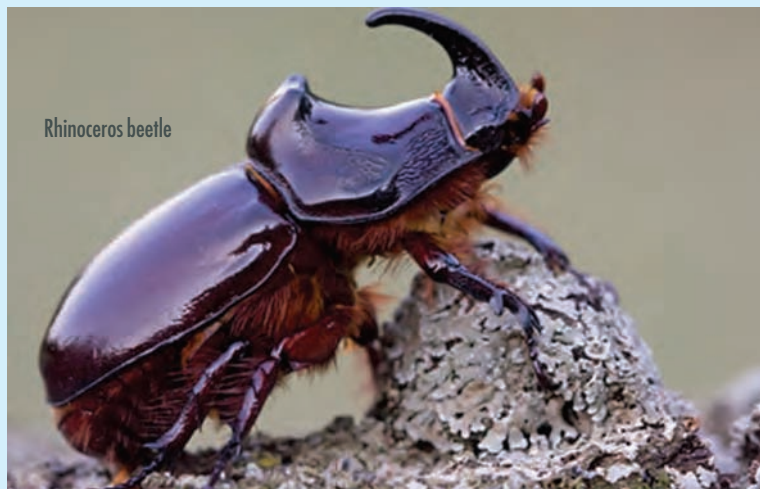
"The second option was the green muscardine fungus pathogen *Metarhizium anisopliae*, multiplication of which seemed easier," says Dr. Anitha Kumari of the Extension Division of CPCRI. "For this we formed a group of 20 women. They were trained in multiplication of green

muscardine fungus using half cooked rice as medium. Mother culture was supplied by CPCRI. About 2000 packets of fungi culture produced by them were supplied to farmers of the panchayat. The group also gave advice to the farmers regarding the method of application of the fungi culture in breeding sites. The adoption was very high and population of Rhinoceros beetle was drastically reduced. Green muscardine fungi attack and kill grub, pupa and adult stages of the fungus and once applied the fungus will be there for up to year.

patient's body. This immune response may cause antibodies in the patient's body to attack and neutralise the biosimilar. Sometimes, this could have serious consequences and may even threaten the patient's life. Since the immunogenicity of biologic drugs is unpredictable, even small changes in a molecule could completely alter the immunogenicity profile.

Therefore, effects of the differences between a biosimilar drug and its innovator product can only be established by putting the biologic product through substantial clinical testing in patients to determine its safety and efficacy. Considering these constraints, it is virtually difficult to create an identical generic of a branded biologic. Due to this drawback, regulatory authorities in many countries are wary about approvals to biosimilars and recommend extensive clinical trials to be undertaken before it can be given to patients.

Given these variations, the European Medicines Agency (EMA) makes a distinction in approvals between biosimilars and



So, one needs to apply the culture once in a year only."

A packet of fungi culture is supplied by the group of women for a mere 15 rupees. Still they get Rs.7.50 as profit by selling one packet.

"It is a good self employment venture for us. Now more and more people are approaching us for fungi culture," explained Ambika,

the leader of group of women. "Further, we trained a women group at Kasaragod District via video conferencing on the methodology of multiplying the fungus and its application. Inspired by our success Cherunniyur, another panchayat in Thiruvananthapuram District also initiated a similar project."

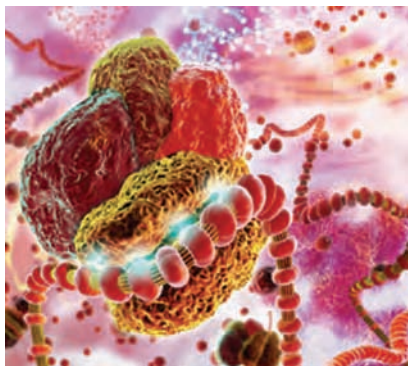
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generics, recognising that the generics approach is unsuitable for biosimilars. EMA guidelines therefore require extensive testing before approval for biosimilars and also treat each biosimilar approval on a case-by-case basis. Similar concerns about safety and efficacy have led the US FDA to rule that each biologic is unique and wholly interlinked with the manufacturing process used to make the drug.

Finally, one needs to remember that biosimilars are promoted primarily on the basis of cost advantage, being cheaper than innovative biologic drugs. Considering the various safety and efficacy risk factors, though, their cost advantage is largely negated. Unlike the US,

Europe, Canada and Japan, which have specific regulatory approval processes for biosimilars, the risks in India are higher, because so far, there are no established regulatory approvals in place and biosimilars can be approved with limited clinical trials. This allows manufacturers to adopt abbreviated pathways and avoid stringent norms, thereby compromising patient safety. But lower drug costs are not worthwhile if it means risking patients' lives and their well being.

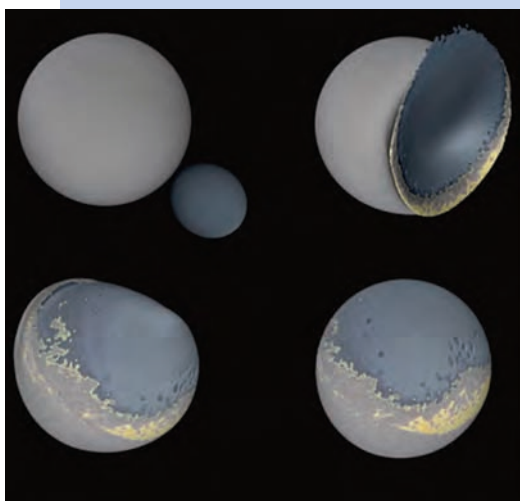
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THE MISSING MOON

Symmetry is the law of nature. Then why is the shape of the moon unsymmetrical?

Since long, astronomers have been examining various probabilities to find an answer. One such, supposed to be the most popular, suggests that during the early stage of its formation, gravitational tidal forces reshaped the moon's crust and made it lopsided. However, recently a team of researchers from the University of California at Santa Cruz have come up with a new idea, which appears to be the most probable one.



According to it, as reported in a recent issue of the journal *Nature* (4.8.2011), once upon a time, the earth had a second satellite, which was smaller in size and slower in motion than the one adorning the sky today. Both these moons circled around

the earth together for a pretty long time. Through a "giant impact" the smaller one amalgamated with the bigger on its far side, which became high and mountainous with a much thicker crust as compared to the relatively low and flat near side. Thus, its symmetry was lost.

Many astronomers believe that during the early history of the solar system, when the earth was not as solid as it is today, a planet size celestial object collided with it, ejecting debris, that was later pulled together by gravity and hardened to form the moon. According to them, the giant crater thus created formed the Pacific Ocean. In support of the theory, they cite the fact that the volumes of both these are roughly equal.

Now, the Santa Cruz team led by Professor Erik Asphaug claims that during that event, in fact, another small moon was also formed. It remained in the orbit for tens of million years along with its bigger sister. Thereafter, the two moved closer to each other and collided slowly. Perhaps the collisions took place in four stages nearly 4 billion years ago. As a result, the smaller moon was missed from the sky forever.

Since the impacts were slow, these neither produced craters nor caused much melting. Instead, the colliding materials only piled up at the site of collision, the far side of the moon.

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NEWS BRIEFS

■ Scientists are reporting deep new insights into the whys and hows of the famous caste system that dominates honey bee societies. Although queen and worker bees share almost identical genes, their destinies could be more different. The differences include changes in the amounts of protein produced in cells and the activity of those proteins. In pre-queen larvae, proteins involved in carbohydrate and energy metabolism, for instance, are much more active than in workers.



■ Biologists have identified more than 70 genes that play a role in regenerating nerves after injury, providing biomedical researchers with a valuable set of genetic leads for use in developing therapies to repair spinal cord injuries and other common kinds of nerve damage such as stroke. They were also surprised to learn that some of the genes involved in the re-growth of axons were known to have other functions, such as regulating the release of neurotransmitters.

■ Beta-blocker drugs, commonly used to treat high blood pressure, may also play a major role in slowing the progression of certain serious cancers, based on a new study. The earlier studies first used tissue from a nasopharyngeal carcinoma cell line, and later from both multiple myeloma and melanoma cell lines. When treated with the beta-blocker propranolol, all cells stopped producing the tumour-enhancing molecules. Similar work by other scientists showed similar results with ovarian cancer tissues.

■ Yawning is not just a sign of tiredness or boredom – it is the body's method of keeping our brain cool, scientists have found. Like a computer, the brain works best when it is cool, but putting too great a strain on it can lead to overheating which reduces its ability to process information. When the head begins to heat up, yawning acts as a natural "thermostat" by allowing cool air to rush in and bring the brain back down to a healthy temperature, research suggests.

■ Eating fresh fruits and vegetables helps people resist the temptation of waist-expanding treats, scientists have found. When our supplies of glucose – found in carbohydrates – drop we begin to lose our ability to control desire, while our urge to eat increases. The lack of glucose – which is used to power the brain – makes us helpless against the urge to reach for high-calorie foods. When glucose levels were lower, the prefrontal cortex – which gives us self-control – lost its ability to control the impulses.



■ A new study puts an end to the long standing debate about how archaic birds went extinct, suggesting they were virtually wiped out by the same meteorite impact that put an end to dinosaurs 65 million years ago. The uncertainty was due to the fact that very few fossil birds from the end of this era have been discovered. Now palaeontologists have provided clear evidence that many primitive bird species survived right up until the time of the meteorite impact.