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ABOUT US

With an aim to nurture the skills of students, the Department of Biotechnology & Bioinformatics, JUIT, has created a platform called Synapse, for students to develop and exhibit their technical, outreach, arts and other skills. And the newsletter is a tiny idea of the members of Synapse Club.

Atavism is a phenotypic trait that appears suddenly in an organism. Yes, it is that feature we have always had the genes for, but have never expressed. Have you heard of the dolphin with legs or the baby born with a tail? Because if you have, you know what we're talking about!

Just like its name, this newsletter is a little something that we always had the genes for, but we never expressed. We agree that the newsletter isn't as weird as the chicken with teeth but it sure is something out of the blue to bring all of us together. We aim to make this newsletter the place you can go for the latest news in the biotechnology world, bizarre but true science headlines, and conversations that you should hear more of.

Need resilience against antibiotics? A shape change should do the trick!

A recent research led by Dr Banerjee from Carnegie Mellon University found that bacteria, when under the attack of antibiotics, do, in fact, change their shape to combat the stress of antibiotics and ensure they grow at a fast pace.

The study aimed to understand the trade-offs that bacterial cells make between the energy used for their survival and the energy/nutrients used for growth and multiplication. The research performed on *Caulobacter crescentus* found that the change in shape led to an increased curvature and a lower surface-to-volume ratio in bacterial cells and therefore reduced entry of antibiotics into the cell. The cells also went back to their initial growth rate after changing shape.

ARE YOU EVEN READING?

If you are, you're sure to have feedback for the team. Send it to 181824@juitsolan.in so that we can know. We would also love to feature your opinion on biology topics or your coverage of the latest research in the next issue. Your email could make our day!



References and Photo credits:

1. Images from Pexels,
2. <https://www.sciencedaily.com/releases/2021/01/210130092739.htm>
3. *Caulobacter crescentus*, Photo Courtesy of Yves Brun.

COVID-19 VACCINES: WHERE WE WERE, WHERE WE ARE?

The beginning of 2021 has seen the commencement of mass vaccination campaigns. With Emergency Use Authorizations for the Pfizer, Moderna and Oxford-AstraZeneca vaccines in several countries, the vaccines are rolling out in a way never seen before. But this rollout has led to questions, doubts and hesitancy in populations across the world. Here we look at the major developments in coronavirus vaccine development in the last few months.

December 2020: Pfizer and Moderna both get reviewed and approved by the FDA for emergency use on 11 and 18th December. The UK is the first country to roll out the Pfizer vaccine. An 89-year old gets the first dose. Moderna registers clinical trials for ages 12-18. Canada also authorizes the Moderna vaccine while the month ends with EU signing off the Pfizer vaccine. Medicos discuss why it is difficult to use these vaccines in India. India readies its vaccine supply chain: more than 28,000 cold chain points are identified and vaccine tracking software, COVIN, is developed. Three vaccines are under regulatory review in India.



November 2020: Pfizer and Moderna announce the efficacy of their vaccine candidates is above 90%. Russia shows preliminary evidence that Sputnik V is indeed effective. A Chennai-based volunteer sues the SII (Serum Institute of India) after he gets nervous system impairment. SII denies it had anything to do with the vaccine.

January 2021: India gives EUA (Emergency Use Authorization) to the Oxford/AstraZeneca vaccine and approves Bharat Biotech's vaccine for emergency use in clinical trial mode. Some experts share their apprehensions about the efficacy of Covaxin. India begins its mass vaccination program on January 16th after successful dry runs. More than a 100,000 vaccinated on the first day. The healthcare and frontline workers are given access to vaccination, after which the government plans to vaccinate the elderly and those with co-morbidities. A few cases of vaccine-based hospitalizations emerge.

CONTROVERSIES AND QUESTIONS

The rollout of the Covaxin from Bharat Biotech has led to concerns over efficacy and safety and several healthcare workers and doctors have decided to wait for the data to be released before they get vaccinated.

Another apprehension of immunology experts is in regards to the meaning of **Emergency Use Authorization in Clinical Trial Mode** and what it means of terms of compensation to those who develop vaccine-related adverse effects.

A HARROWING PERSONAL EXPERIENCE!

We talked to a healthcare worker who was vaccinated with Covishield a few days ago and here's what she said:

I got the vaccine a few days ago and had shivering and numbness for the next two days. I had it worse than most of my colleagues who got the vaccine but a lot of others also reported high fever and drowsiness after getting the vaccine. There have been more than just a few cases of vaccine-based hospitalisations.

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1. Photos credits: Pexels, Pixabay
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Human Challenge Trials: The Good, The Bad and The Ugly



In July 2020, volunteers from an advocacy group called **1Day Sooner** wrote to Dr. Francis Collins, the director of NIH (National Institutes of Health, US) urging him to work in the direction of **Human Challenge Trials** for COVID-19 vaccine candidates. The letter, signed by 15 Nobel Laureates and prominent personalities in science, highlighted how **Human Challenge Trials** could be the fastest way to determine the efficacy of vaccine candidates in development and understand the mechanisms in which they act. This letter sparked a lot of debate among the scientific community.

But, what exactly are Human Challenge Trials? Most vaccine trials allow participants to go about their daily lives after the administration so that they may be exposed to the infectious targets naturally in the future. But, Human Challenge Trials are the exact opposite of the routine vaccine (Phase III) trials. These trials deliberately expose the participants to controlled amounts of the infectious agent after they have been given the vaccine. This allows for a clear picture of vaccine efficacy.

Human Challenge Trials are also called Controlled Human Infection Model (or CHIM) and they have gained popularity because we know how imprecise animal models can be when determining vaccine efficacy. And like everything else in science, the human challenge trials are conducted in a way that the benefits of the trial are maximized and any risks (especially to the participants) are minimized. The main goal of the human challenge trials is to see the effects of a rapidly attacking infectious agent, but one that has non-severe side effects.

Are there going to be human challenge trials for COVID-19? The letter by 1Day Sooner has raised all kinds of questions and has led to many prominent scientists raising concerns.

While certain bioethicists say that a human challenge trial is what we need since the vaccines have been rolled out, scientists and medical professionals remain divided. Ethicists have also argued in the favor of HCTs as the deaths due to this novel coronavirus continue to rise and they believe that accelerating the vaccine development by even a little bit of time could save thousands of lives.

While Human Challenge Trials or CHIMs are not new, a proper framework for conducting these trials needs to be set up. Although these trials could accelerate our understanding of vaccines and their efficacy, the strict selection criteria and the small number of participants means that results from these trials could be overestimating/underestimating the efficacy of the vaccine.

Perhaps, the most important debate here is the ethical one. *Is it ethical to expose humans to an infectious agent that might cause long-term health effects in participants? And more so, is it ethical to do so in the case of COVID-19 where we yet have no effective therapies?* This sentiment was also shared by Dr. Anthony Fauci, an Infectious Diseases expert and director of the National Institute of Allergy and Infectious Diseases in the US.

Despite the concerns, the UK government announced along with Dublin-based organisation **Open Orphan** announced in October 2020 that a Human Challenge Trial (or an HCT) would be conducted to ascertain the immune response and efficacy of vaccine candidates.

After the Emergency approval of the vaccines in the past few months, several countries have put on hold any plans to conduct HCTs saying that it is no longer needed now that vaccination is available to people. But Bioethicist Nir Eyal and his colleagues maintain their support for the trials and he says that despite the mass vaccine rollout, these trials could reveal some important information. **WHAT DO YOU THINK?**

References:

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Platypus: the animal that grows in the dark



A Platypus (*Ornithorhynchus anatinus*) is an amphibious mammal endemic to Australia. It is the sole representative of its family *Ornithorhynchidae* and genus *Ornithorhynchus*, and one of the only two mammals along with *Echidna* identified to lay eggs. Besides being known for its odd combination of primitive features and exceptional adaptations, it also ranks among few mammals known to be venomous. The males release venom known to cause excruciating pain primarily during mating season. The Platypus can be best described as a hodgepodge of more recognizable species as it has a furry body like an otter, a paddle-shaped tail similar to a beaver and bill and webbed feet comparable to that of a duck.

If this unusual creature wasn't strange enough already, researchers at Northland College and the Warner College of Natural Resources at Colorado State University have observed bio-fluorescence in platypus making it first of any such observations made in a monotreme (egg-laying mammal). The research was carried out on three platypus specimens. The Platypus fur absorbs UV light of wavelengths 200-400 nm and re-emits it, making it appear fluorescent. The animals appeared green/cyan under UV light due to fluorescent wavelengths which peaked at 500nm. Researchers have theorized that this bio-fluorescence helps them adapt to low light conditions as they are most active at night. They also believe that it may be a way by which a platypus sees or interacts with its counterparts. Researchers claim that the discovery of bio-fluorescence in the Platypus will add a new dimension to their understanding of this trait in mammals.

The curious case of Wombat Poop!



Unlike all of us, the poops excreted by the bare-nosed wombat, a native marsupial to Australia, are perfect cubes. And their shape is a mystery scientists have just solved.

After a study in 2018, which looked at the gut of these cube-pooing species, scientists have now dissected two further wombats to get a better answer to the mystery. They have found that these bare-nose wombats have stiff and soft regions of muscle in their gut and the inconsistent movement of food through their digestive tract lead to these interesting cubes.

Not only do these cubes have special shape, but they do have a special purpose too. Wombats use their poop-cubes to mark territories where they go and it has been found that a wombat can excrete a hundred of these special turds every day.

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