Prelim Bits 08-05-2017

Reversing drug resistance

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- Indian researchers have unravelled the mechanism by which **hydrogen sulphide (H2S) gas produced by bacteria** protects them from antibiotics and plays a key role in helping bacteria develop drug resistance.
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- And by blocking/disabling the enzyme that triggers the biosynthesis of hydrogen sulphide in bacteria, the researchers have been able to reverse antibiotic resistance in E. coli bacteria.
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- Antibiotics kill by increasing the levels of reactive oxygen species (oxidative stress) inside bacterial cells.
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- So, any mechanism that **detoxifies or counters reactive oxygen species generated by antibiotics will reduce the efficacy of antibiotics.**
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- Hydrogen sulphide successfully counters reactive oxygen species and reduces the efficacy of antibiotics.
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- So, the team used a chemical compound that **inhibits an enzyme responsible for hydrogen sulphide production**.
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- There was nearly 50% reduction in drug-resistance when hydrogen sulphide production was blocked.
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Cobweb Phenomenon

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- **An abundance of the produce has led to a crash in prices.** If it is tomatoes in Karnataka, it is red chillies in Andhra Pradesh and Telangana, and tur and grapes in Maharashtra.
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- While most farmers complain about the poor remuneration for their produce in comparison to the prices that prevailed in the previous season, agricultural economists have traced the reasons for the glut and the resultant price crash to the “cobweb phenomenon.”
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- After the prices of a particular agricultural commodity shoot through the roof during a season of scarcity, farmers resort to boosting the production on the premise of the pre-existing demand and prices, leading to a problem of plenty. This is the cobweb phenomenon.
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- Most of the agricultural products that have now suffered a price crash due to their abundance had yielded a rich dividend in the previous season.
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New Frontiers program

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- The New Frontiers program is a series of space exploration missions being conducted by NASA with the purpose of researching several of the Solar System bodies, including the dwarf planet Pluto.
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- There are currently **three New Frontiers missions in progress**.
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- **New Horizons,** which was launched in 2006 and reached Pluto in 2015, **Juno,** which was launched in 2011 and entered Jupiter orbit in 2016, and **OSIRIS-REx,** launched in September 2016 towards asteroid Bennu for detailed studies from 2018 to 2021 and a sample return to Earth in 2023.
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- NASA is now reviewing 12 proposal that it has received for the fourth mission of the New Frontiers portfolio. All of these proposals will be reviewed from which NASA will choose one mission to be launched around 2024.
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Synthetic Soft Retina

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- Scientists from the University of Oxford have developed a synthetic, soft tissue retina that closely mimics the natural retinal process.

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- The retina sits at the back of the human eye, and contains protein cells that **convert light into electrical signals** that travel through the nervous system, triggering a response from the brain, ultimately building a picture of the scene being viewed.
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- The synthetic, double-layered retina replica consists of **soft water droplets (hydrogels) and biological cell membrane proteins.**
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- Designed like a camera, the cells act as pixels, detecting and reacting to light to create a grey scale image.
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- Their efforts could lead to the development of less invasive products that closely resemble human body tissues, helping to treat degenerative eye conditions such as retinitis pigmentosa.
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Armoured Corps

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- The Armoured Corps celebrated its '79th Armour Day' on May 1.
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- The event commemorates **the mechanization of the erstwhile Indian Cavalry on May 1, 1938,** when the **SCINDE HORSE** became the first Indian cavalry regiment to stable its horses and convert to the Vickers Light Tank and Chevrolet Armoured Cars.
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- 'Courage in the face of fearful odds', has been the enduring saga of the Armoured Corps and is exemplified by the award of 2 Param Vir Chakras, 15 Maha Vir Chakras and 60 Vir Chakras, amongst the large number of other gallantry and distinguished service awards bestowed upon its officers and men, after independence.
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White light from pomegranate, turmeric extracts

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- Dr. Vikram Singh, IIT Madras won the **BIRAC Gandhian Young Technological Innovation (GYTI) Award 2017** for his work on producing

white light emission using natural extracts.
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- He used a mixture of two natural extracts — red pomegranate and turmeric — to produce white light emission.
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- While polyphenols and anthocyanins present in red pomegranate emit at blue and orange-red regions of the wavelength respectively, curcumin from turmeric emit at the green region of the wavelength.
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- White light emission is produced when red, blue and green mix together.
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- Though this natural mixture of dyes can be used in a wide variety of applications such as tunable laser, LEDs, white light display, much work needs to be done before it becomes ready for translation.
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