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OCTOBER 2021 - MARCH 2021

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October 2021

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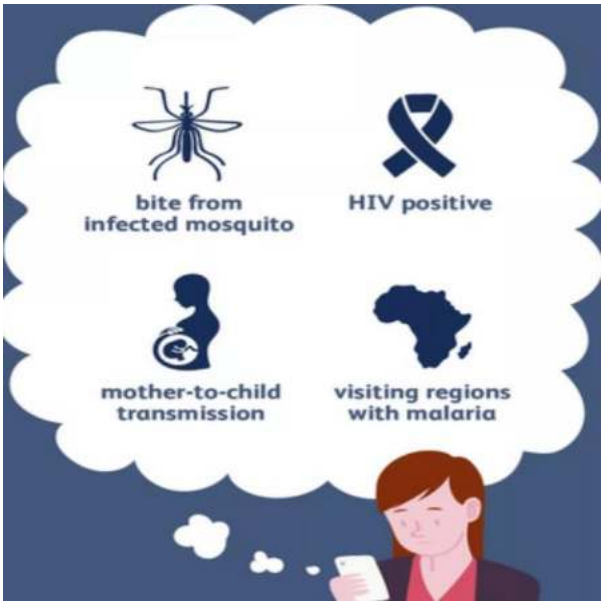
Mosquirix -First malaria vaccine approved by WHO

Malaria

- Caused by **Plasmodium parasites.**
- The parasites are spread to people through the bites of infected female A**nopheles mosquitoes**, called "malaria vectors."
- **Plasmodium falciparum, P. vivax, P. ovale, and P. malariae.**
- In addition, P. knowlesi, a type of malaria that naturally infects macaques in Southeast Asia, also infects humans, causing malaria that is transmitted from **animal to human ("zoonotic" malaria).**
- P. falciparum and P. vivax – pose the **greatest threat.**



Malaria-causes

- Bitten by a malarial vector
- Use of shared and infected syringes.
- Organ transplantation.
- Transfusion.
- From an infected mother to her baby during birth.

Global

- Malaria cases **globally numbered about 229 million,** an annual estimate that has remained virtually **unchanged over the last four years.**
- The report noted that the **11 highest-burden countries** viz. Burkina Faso, Cameroon, the Democratic Republic of the Congo, Ghana, India, Mali, Mozambique, Niger, Nigeria, Uganda and Tanzania, account for **70% of the global estimated case burden and 71% of global estimated deaths from malaria.**

Indian

- India is the only high endemic country which has **reported a decline of 17.6% in 2019 as compared to 2018.**
- **The Annual Parasite Incidence (API, the number of new infections per year per 1000 population) reduced by 18.4% in 2019 as compared to 2018.**
- The percentage **drop in the malaria cases was 71.8% and deaths were 73.9%** between 2000 to 2019.

- States of **Odisha, Chhattisgarh, Jharkhand, Meghalaya and Madhya Pradesh (high endemic states)** disproportionately accounted for nearly 45.47% of malaria cases in 2019.

India - efforts

- **At the East Asia Summit in 2015, India pledged to eliminate the disease by 2030**
- **Five-year National Strategic Plan for Malaria Elimination.**
- Shift in focus from malaria "control" to "elimination". The plan provides a roadmap to achieve the target of **ending malaria in 571 districts out of India's 678 districts by 2022.**
- Durgama Anchalare Malaria Nirakaran (DAMaN) initiative-
- Aims to deliver services **to the most inaccessible and hardest hit people of the State.** The initiative has in-built innovative strategies to combat asymptomatic malaria.
- National Vector Borne Diseases Control Program (NVBDCP)
- Developed a comprehensive framework to achieve the overarching vision of "**Malaria free India by 2030**".
- MERA INDIA
- The **Indian Council of Medical Research** has launched the **'Malaria Elimination Research Alliance (MERA) India '**– a conglomeration of partners working on malaria control – in order to prioritise, plan and scale up research **to eliminate the disease from India by 2030**.

Countries that have eliminated malaria

- Globally, the elimination net is widening, with more countries moving towards the goal of zero malaria.
- I**n 2019, 27 countries reported fewer than 100 indigenous cases of the disease, up from 6 countries in 2000.**

WHO certification of malaria elimination

- Countries that have **achieved at least 3 consecutive years of zero indigenous cases of malaria are eligible to apply for the WHO certification of malaria elimination.**
- Over the last two decades, 11 countries have been **certified by the WHO Director-General as malaria-free**: United Arab Emirates (2007), Morocco (2010), Turkmenistan (2010), Armenia (2011), **Sri Lanka** (2016), Kyrgyzstan (2016), Paraguay (2018), Uzbekistan (2018), Algeria (2019), Argentina (2019), and
- El Salvador (2021).

Challenges in Developing a Malaria Vaccine

- Development of a malaria vaccine is technically very challenging, compared to that of bacterial and viral vaccines.
- The genome of the malarial parasite (Plasmodium) is much larger and more complex than bacterial and viral genomes.
- Moreover, Plasmodium has **three stages in its life cycle** and undergoes both asexual and sexual reproduction within two different hosts.. This makes it a huge challenge for researchers to design an ideal malaria vaccine.
- Another challenge for malaria vaccine development is the **lack of a traditional vaccine market**.

Mosquirix-First malaria vaccine approved by WHO

- The World Health Organisation (WHO) recently **endorsed the world's first malaria vaccine.**
- The global health body said that it **should be given to children across Africa** in the hope that it will spur stalled efforts to curb the spread of the parasitic disease.
- The WHO recommendation is for RTS,S - or Mosquirix - a vaccine developed by British drugmaker **GlaxoSmithKline**

What is Mosquirix?

- According to European Medicines Agency, Mosquirix is a vaccine that is given **to children aged 6 weeks to 17 months to help protect against malaria.**
- It also helps **protect against infection of the liver with the hepatitis B virus,** but European Medicines Agency warns that the vaccine should not be used only for this purpose.
- The vaccine was developed by **GlaxoSmithKline in 1987.**
- However, it does face challenges: **Mosquirix requires up to four doses, and its protection fades after several months.**

How is Mosquirix used?

- Mosquirix is given as a **0.5 ml injection into a muscle of the thigh or in the muscle around the shoulder** (the deltoid). The child is given three injections with one month between each injection.
- A **fourth injection** is recommended **18 months after the third.**
- Mosquirix can **only be obtained with a prescription**

How does Mosquirix work?

- Scientists at the European Medicines Agency say that the **active substance in Mosquirix is made up of proteins found on the surface of the Plasmodium falciparum parasites.**
- When it is administered to a child, the immune system recognises the 'foreign' proteins from the parasite and makes antibodies against them

What is the efficacy of Mosquirix?

- The vaccine's effectiveness at preventing severe cases of malaria in children is **only around 30%,** but it is the only approved vaccine.
- The **European Union's drugs regulator approved it in 2015, saying its benefits outweighed the risks.**
- WHO said the **side effects of the vaccine were rare**, but sometimes included a fever that could result in temporary convulsions.

November 2022

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Human Papillomavirus (HPV) Vaccine

HPV vaccine protects against cervical cancer

- A new research, funded by Cancer Research UK, **has found** that the human papillomavirus (HPV) vaccine, which protects against cervical cancer in women, reduced the risk of developing the cancer by 62 per cent in women between the ages of 14 and 16.

Cancer

- Cancer is a disease in which some of the body's cells grow uncontrollably and spread to other parts of the body.

Cervical Cancer

- is the uncontrolled growth of abnormal cells in the lining of the cervix. The cervix is part of the female reproductive system.
- The various strains of the Human papillomavirus (HPV) play a role in causing most cervical cancer.
- When exposed to HPV, the body's immune system typically prevents the virus from doing harm. In a small percentage of people, however, the virus survives for years, contributing to the process that causes some cervical cells to become cancer cells.

Human Papillomavirus (HPV)

- HPV is a type of virus, of which there are more than 100 types.
- The National Cancer Institute (NCI) notes that more than 40 types of HPV are spread through direct sexual contact.
- Out of these 40, two cause genital warts, while about a dozen of HPV cause different types of cancer including cervical, anal, oropharyngeal, penile, vulvar and vaginal.
- Significantly, almost all cervical cancers are caused by HPV and the vaccine protects against two of the cancer-causing strains, which are HPV 16 and 18.
- Once infected, most people do not develop any symptoms, thereby are not aware that they have the virus.

Types of HPV Vaccines

- Quadrivalent vaccine (Gardasil), which protects against four types of HPV (HPV 16, 18, 6 and 11). The latter two strains cause genital warts.
- Bivalent vaccine (Cervarix), which protects against HPV 16 and 18 only.
- The third type is a non valent vaccine (Gardasil 9), which protects against nine strains of HPV.

HPV vaccination and cervical cancer incidence in India

- In India, bivalent and quadrivalent HPV vaccines were licensed in 2008 and a non valent vaccine was licensed in 2018.
- A paper published in the Asian Pacific Journal of Cancer Prevention notes that in India, the primary obstacle to HPV vaccination is financial.
- It also says that while India is home to 16-17 per cent of the world's population, globally 27 per cent of total cervical cancer cases are from here.
- Further, in India about 77 percent cases of cervical cancer are caused by HPV 16 and 18.

December 2022

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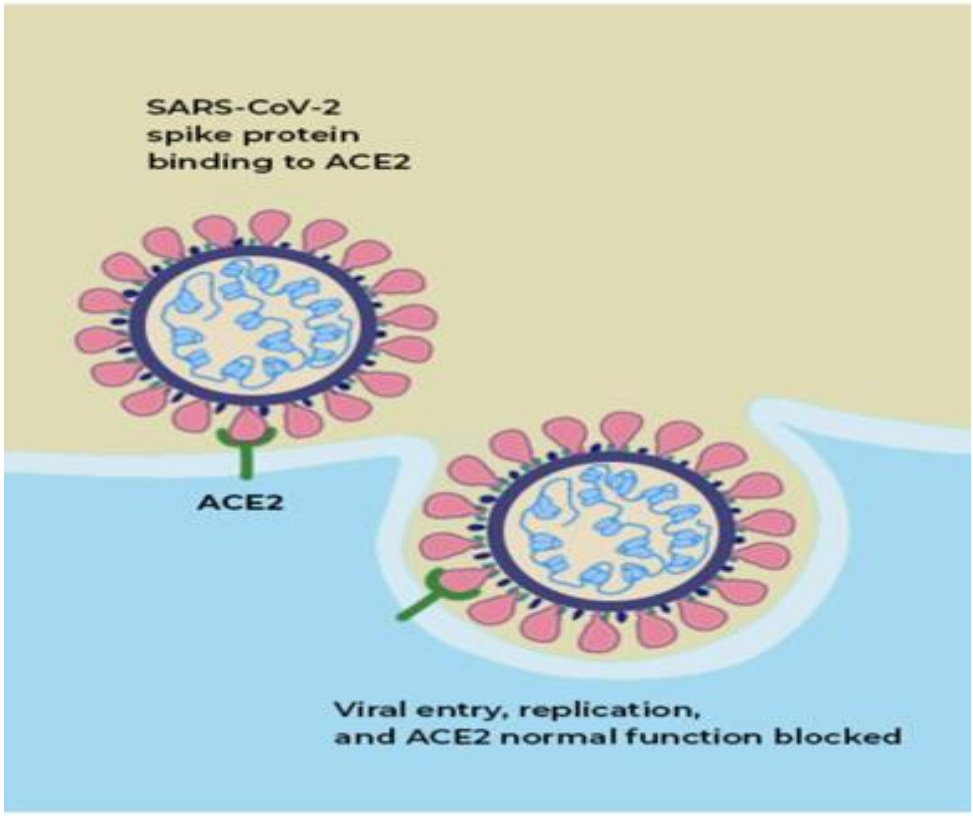
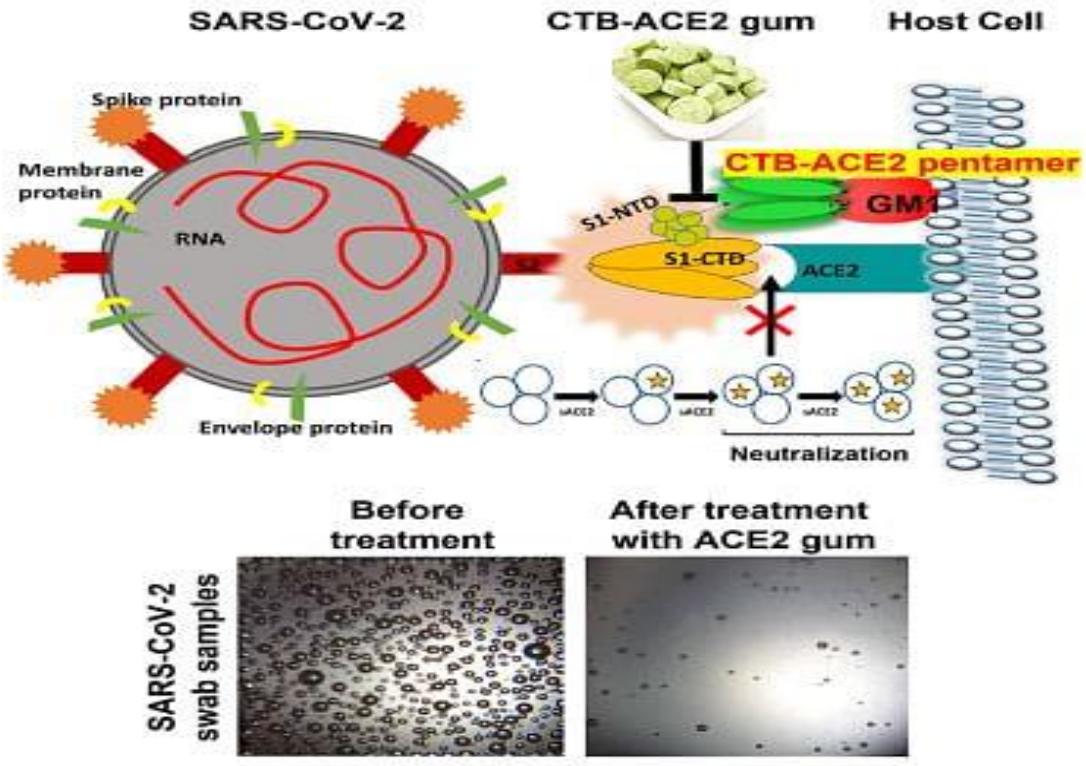
Chewing Gum Trap for Coronavirus

- Researchers at the University of Pennsylvania have now developed a chewing gum, which they say can potentially serve as a "trap" for SARS-CoV-2.



How the Chewing Gum Works

- According to the study authors, the SARS-CoV-2 spike protein binds with the ACE2 protein receptors on some human cells, facilitating its multiplication and spread.
- The researchers have, therefore, developed the chewing gum containing copies of the ACE2 protein receptors with the hope that the virus particles would bind to them instead, leading to a lower viral load in the oral cavity.
- For the study, the researchers used plant grown ACE2 protein—freeze dried, crushed into a powder, and added to the chewing gum base.
- Unlike nasal sprays or mouth washes that wears off fast, they chose chewing gum as their base for its long period contact.


SARS-CoV-2
CTB-ACE2 gum
Host Cell
Spike protein
Membrane protein
RNA
Envelope protein
CTB-ACE2 pentamer
GM1
S1-NTD
S1-CTD
ACE2
Neutralization

Before treatment
After treatment with ACE2 gum
SARS-CoV-2 swab samples

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Racial Bias in Pulse Oximeters

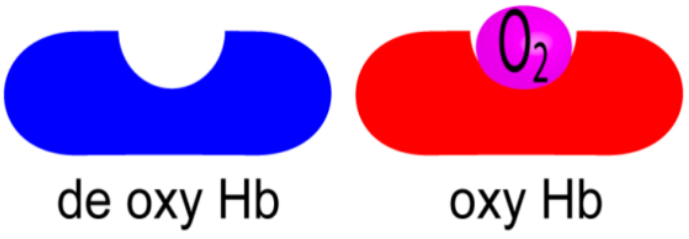
- Recently the **UK government's Department of Health and Social Care** announced that an independent review will be carried out to find out if there is a potential bias in medical items such as pulse oximeters and how they impact patients from various ethnic groups.

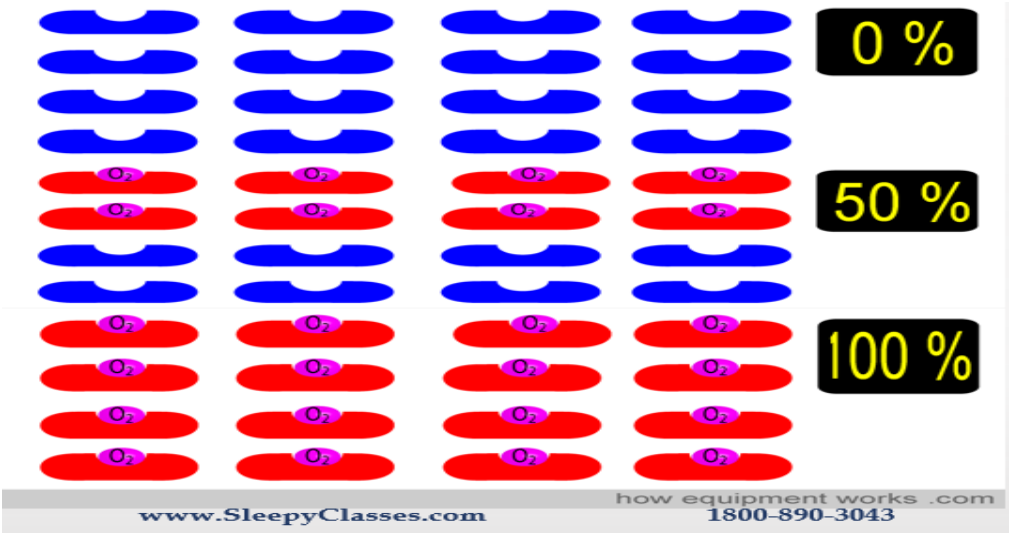
Pulse Oximeters

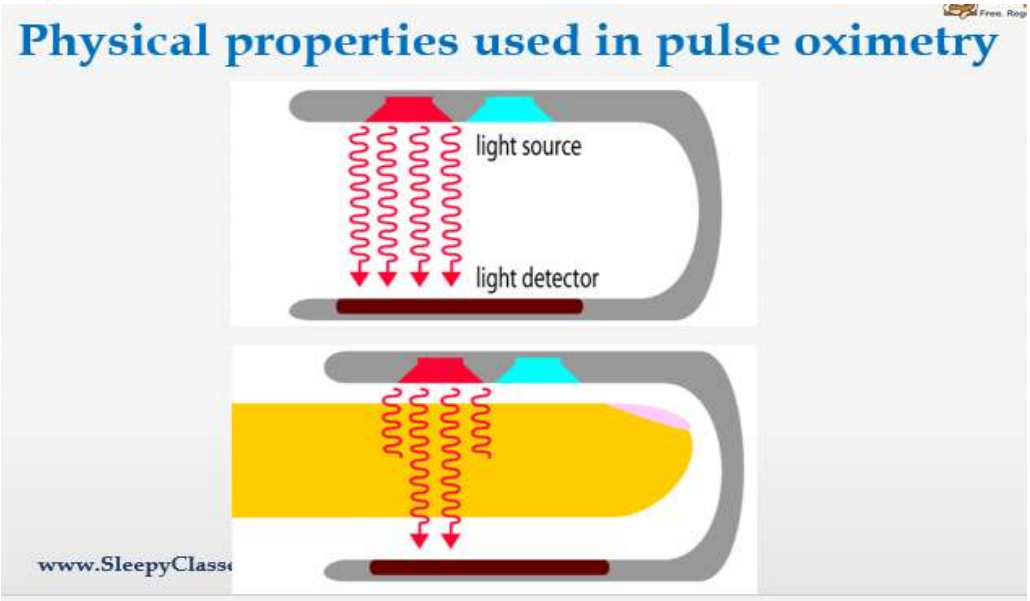
- A pulse oximeter is a small clip-like device used to **calculate the amount of oxygen in your blood.** It can be attached to the fingertip, earlobe or toes.
- The oximeter has a small **electronic processor and a pair of LEDs –** one emitting **red light and another infrared**. The oximeter shines these two lights which pass through your finger and the device senses what comes through the other side.

Oxygen Saturation

- Oxygen saturation simply refers to the percentage of the available hemoglobin that carries oxygen.







Pulse Oximeters Working

The amount of light absorbed depends on the following

- concentration of the light **absorbing substance.**
- **length** of the light path in the absorbing substance
- **oxyhaemoglobin and deoxyhaemoglobin** absorbs red and infrared light differently

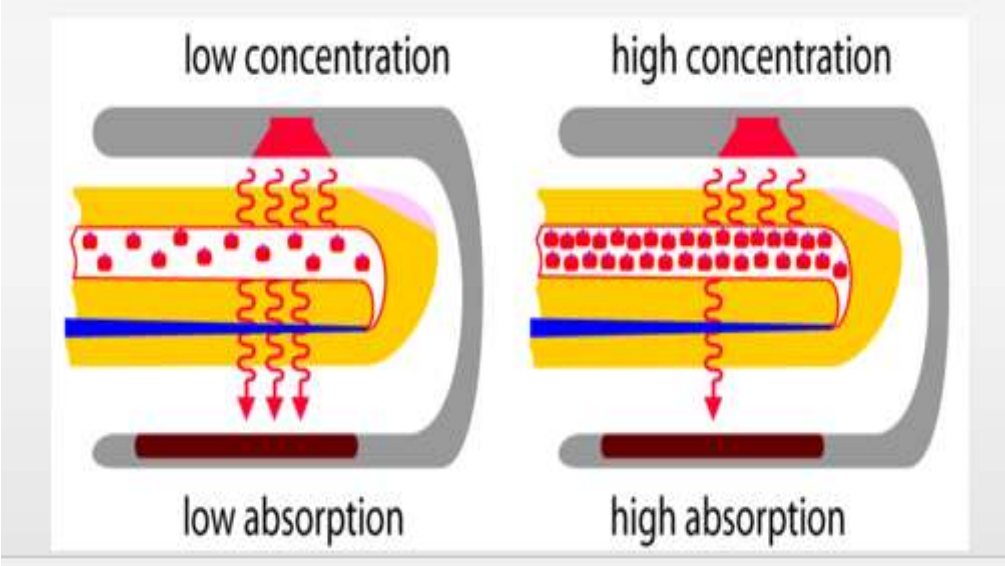
Concentration of the light absorbing substance

Beer's Law

- Amount of light absorbed is proportional to the **concentration of the light absorbing substance**

Application

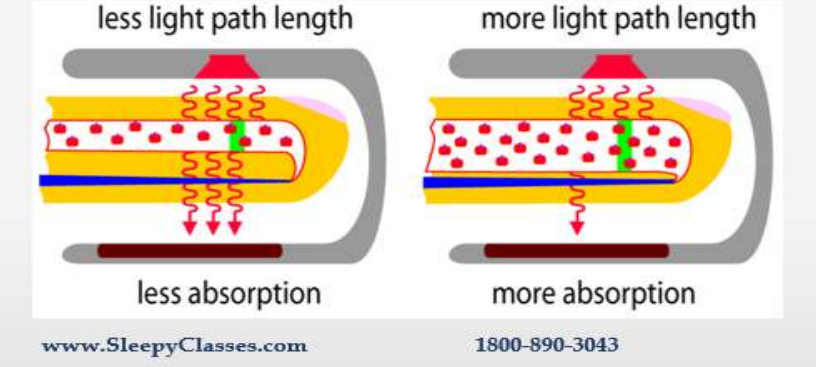
- More the Hb in the finger , more is the light absorbed.



Length of the light path in the absorbing substance

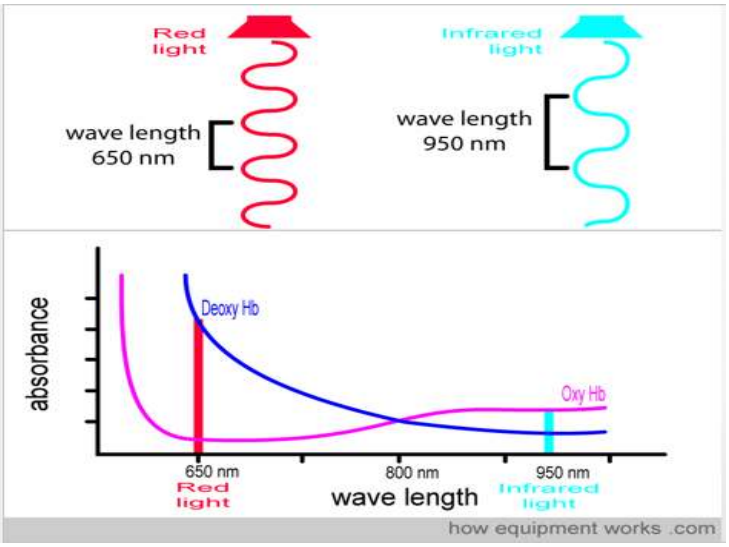
Lambert's Law

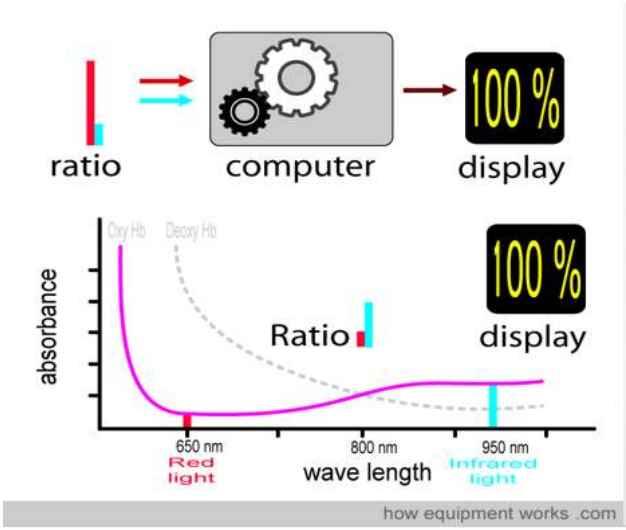
- Amount of light absorbed is proportional to the length of the path that the light has to travel in the absorbing substance.

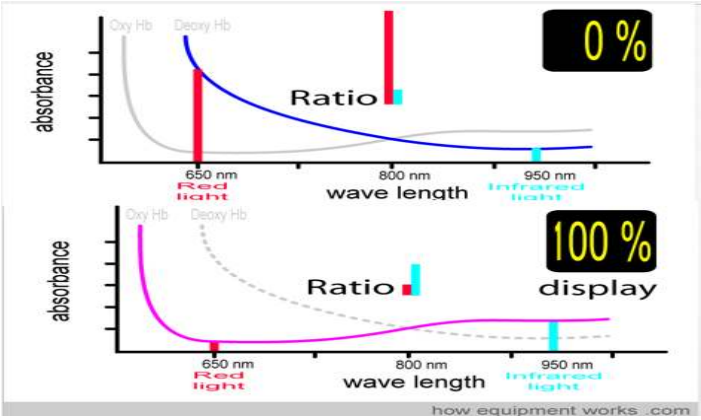


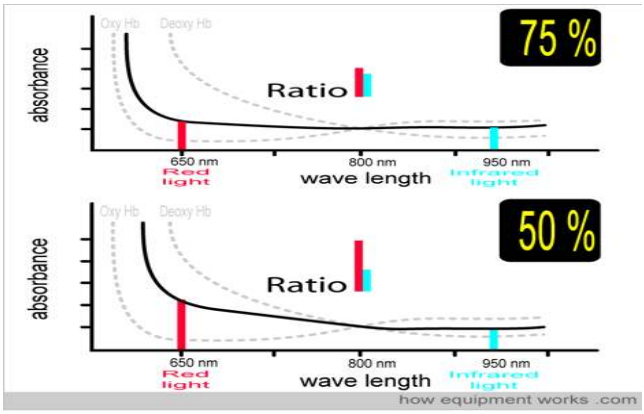
Oxyhaemoglobin and Deoxyhaemoglobin absorbs red and infrared light differently

- **Oxyhaemoglobin** absorbs more infrared light than red light & **deoxyhaemoglobin** absorbs more red light than infrared light.









Pulse Oximeters Working

- Our blood contains haemoglobin and when it is saturated with oxygen it is called oxygenated haemoglobin and is bright red in colour. The hemoglobin without oxygen is called deoxygenated haemoglobin.
- Oxygenated haemoglobin and deoxygenated haemoglobin absorb red and infrared light differently.
- Oxygenated haemoglobin absorbs more infrared light and allows more red light to pass through than deoxygenated haemoglobin.
- The amount of light that is transmitted is measured by the processor and the device displays the oxygen saturation or the percentage of oxygenated haemoglobin in your blood.
- A normal blood oxygen saturation rate is often considered between 95 per cent and 100 per cent.

Why is the Device Racist?

- Dr. Philip Bickler, the director of the hypoxia research laboratory at the University of California, San Francisco, which tests the performance of pulse oximeters, told the simplest way to explain the inaccuracies in patients with darker skin is that the pigment "scatters the light around, so the signal is reduced.
- A letter to the editor published last year in *The New England Journal of Medicine*, titled 'Racial Bias in Pulse Oximetry Measurement', noted that the devices can provide misleading results from Black patients.
- A study found that the pulse oximetry overestimated oxygen levels 3.6 per cent of the time in white patients. In Black patients, the device overestimated nearly 12 per cent of the time.

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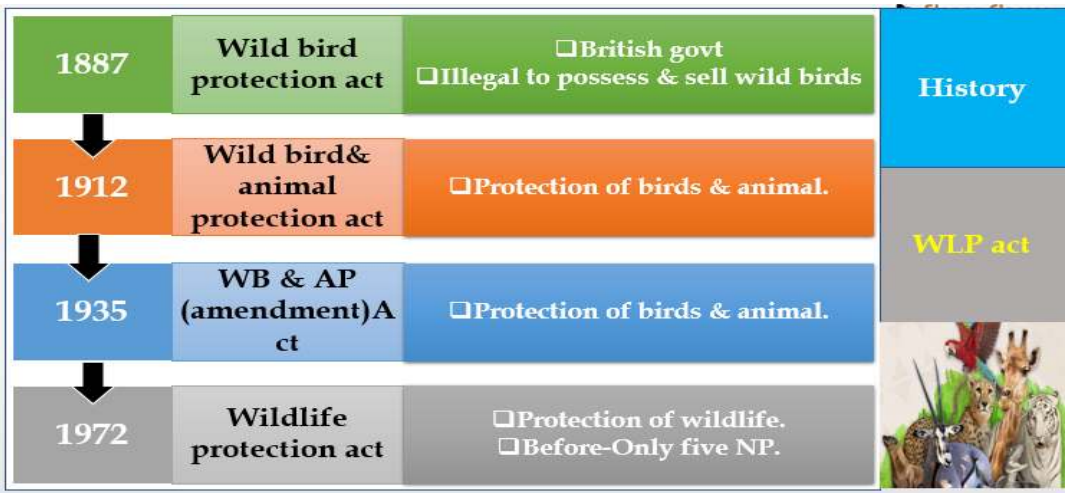
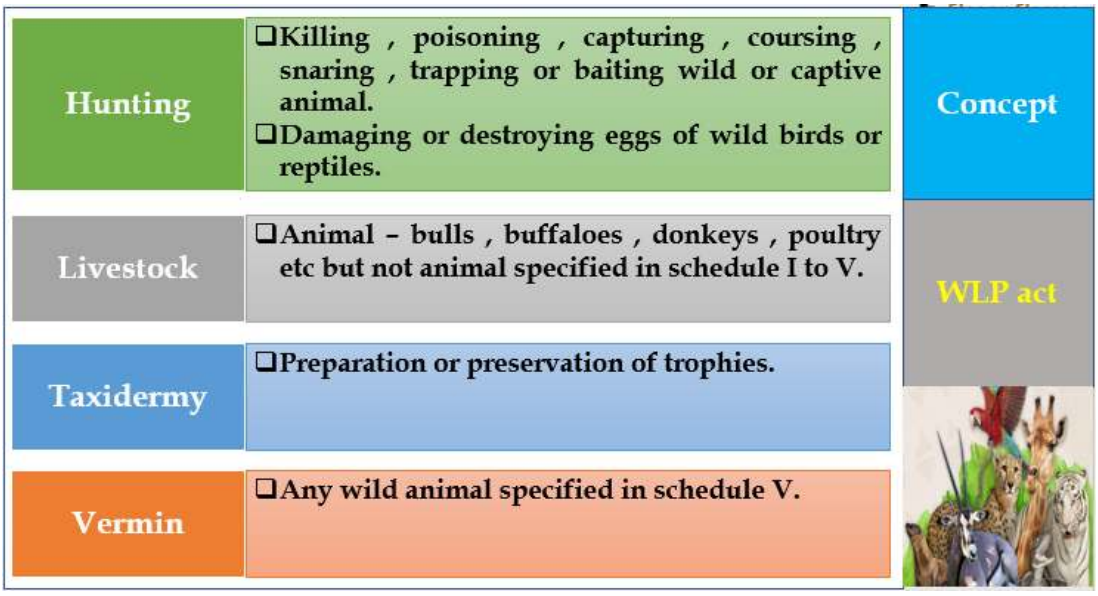
Wildlife Protection Act 1972

Bihar plans to sterilise, not cull, nilgais

- The Bihar government will not cull the Blue Bull, locally known as the nilgai or ghurparas, anymore.
- It will, instead, sterilise them to control their increasing population in the state.
- The government then hired a professional shooter from Hyderabad to cull nilgais.
- The step was the result of a December 1, 2015, notification by the Union Ministry of Environment, Forest and Climate Change (MoEF&CC) that declared the nilgai and wild boar vermin in some districts of Bihar.





Trophy	❑Whole or any part of captive or wild animal , other than vermin. ❑Skin , horn , feather etc through process of Taxidermy.	Concept
Uncured Trophy	❑Whole or any part of captive or wild animal , other than vermin which has not undergone taxidermy. Eg-Freshly killed animal	WLP act

Director	❑By central government.	Bodies
Chief wildlife Warden	❑Subject to General or specified direction given by state government.	
wildlife Warden	❑Selected on recommendation of CWLW	
National board for wildlife	❑By centre within 3 month from WL(protection)amendment act 2002. ❑Chairperson-Prime minister ❑Vice chairperson-Min in charge of forest & wildlife. ❑Standing committee-Vice chairperson. ❑Function- Framing policies. ❑ -Recc on setting up & mgmt.NPetc ❑ -Publishing status report.	WLP act

Schedule I & II	❑Complete protection. ❑Highest penalty & punishment.	Schedules
Schedule III & IV	❑ protection. ❑Lesser penalty & punishment.	
Schedule V	❑Animal -may be hunted. ❑Common crow, rats , fruit bat	WLP act
Schedule VI	❑Plants-forbidden from cultivation. ❑Pitcher plants.	
Prohibition	❑Killing, capturing, trapping of wild animal. ❑Egg of wild bird & reptiles. ❑Hunting of wild animal sch I to IV (except certain conditions)	

Schedule I	❑By chief wildlife warden in writing ❑If dangerous to human life or diseased as to be beyond recovery.	Hunting
Schedule II to IV	❑By chief wildlife warden in writing ❑If dangerous to human life or property(crop) diseased as to be beyond recovery.	WLP act
2016	❑Env ministry declare Nilgai , monkey & wild pig as vermin in 5 states. ❑WLA-Central govt power to declare wild animal (other than Schedule I & part II of schedule II) as Vermin by including in schedule V.	

Qns In India, if a species of tortoise is declared protected under Schedule I of the Wildlife (Protection) Act, 1972, what does it imply ? 2017

(a) It enjoys the same level of protection as the tiger.

(b) It no longer exists in the wild, a few individuals are under captive protection; and now it is impossible to prevent its extinction.

(c) It is endemic to a particular region of India.

(d) Both (b) and (c) stated above are correct in this context

Qns In India, if a species of tortoise is declared protected under Schedule I of the Wildlife (Protection) Act, 1972, what does it imply ?

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(d) Both (b) and (c) stated above are correct in this context

January 2022

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All about Omi sure and SGTF strategy

Omisure

- Omisure – India's first home-grown testing kit – can differentiate the omicron strain of the novel coronavirus from the delta, alpha and the other variants in under four hours.
- It is an omicron detecting RT-PCR kit developed by the Mumbai-based Tata Medical and Diagnostics Ltd (TATA MD) in partnership with the Indian Council of Medical Research (ICMR).
- The kit recently received approval from the Drugs Controller General of India.
- Globally, all other test kits for omicron are either made for gene dropout or mutation-specific detection. Omisure is the first test kit combining both.

How does Omisure work?

- This new kit can identify the Omicron variant by targeting two regions of the S or the spike gene. This gene codes for the spike protein, which helps the novel coronavirus enter and infect human cells.
- The S, the Enveloped (E), and Nucleocapsid (N) genes are some of the targets of conventional RT-PCR tests. When it detects these genes, a patient sample is labelled positive.
- As omicron bears heavy mutations in the S gene, the RT-PCR can sometimes miss it. The absence of S gene likely indicates omicron's presence. This is called S gene dropout or S gene target failure – and is one of the targets of Omisure.
- This kit also depends on a second target: S gene mutation amplification, which detects mutations explicitly in the S gene.

How does Omisure compare with gene sequencing?

- Gene sequencing reads the order of nucleotides, which are the building blocks of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA).
- Despite being considered the gold standard; sequencing has a few limitations. It is slow, expensive and complicated.
- It is a multi-step process. It begins with extracting the virus' RNA from patient samples, converting it into DNA, amplifying or multiplying it through RT-PCR before finally sending it for gene sequencing.
- Identifying variants through gene sequencing can take as many as three days. Omisure, on the other hand, will do test the Omicron variant in four hours
- Gene sequencing is also complicated and expensive. It has to be done in batches of 24, 96 or 384. Testing 384 samples on one sequencing chip "costs around Rs 10,000 per sample. The cost is higher when the number of samples is lower
- A single kit of Omisure will reportedly cost Rs 250 for the laboratory.

How accurate is this new kit?

- ICMR's evaluation showed that the kit picked up all sequence samples with 100 per cent accuracy.
- The Pune-based National Institute of Virology has independently validated the kit.

SGTF strategy

- Researchers are pitching for genome sequencing of positive samples using RT-PCR kits that employ 'S' Gene Target Failure (SGTF) strategy to detect the variant.
- For example, 'S' Gene, ORF, 'N' gene, Rdrp, 'E' gene etc are viral genes that are targeted to detect COVID-19 virus, and multiple genes make up the genetic structure of SARS-Co V-2, said Khairnar of Nagpur-based CSIR-NEERI.
- In case of Omicron variant, the 'S' gene is not getting detected in Thermofisher's Taq Path RT-PCR test due to mutation in the gene, while other gene targets such as ORF gene and N gene are getting detected, he said.
- "The occurrence is called as 'S' Gene Target Failure (SGTF) positive cases. Such samples can be presumptively reported as Omicron positive and can be sent for fast-track genome sequencing for confirmation.
- The SGTF strategy focuses on taking those positive samples in which the RT-PCR test result shows 'S' Gene negative result, but ORF and N gene are positive.
- The SGTF strategy will work as a kind of early detection at RT-PCR stage, and will help in screening COVID-19 positive samples of Omicron variant.

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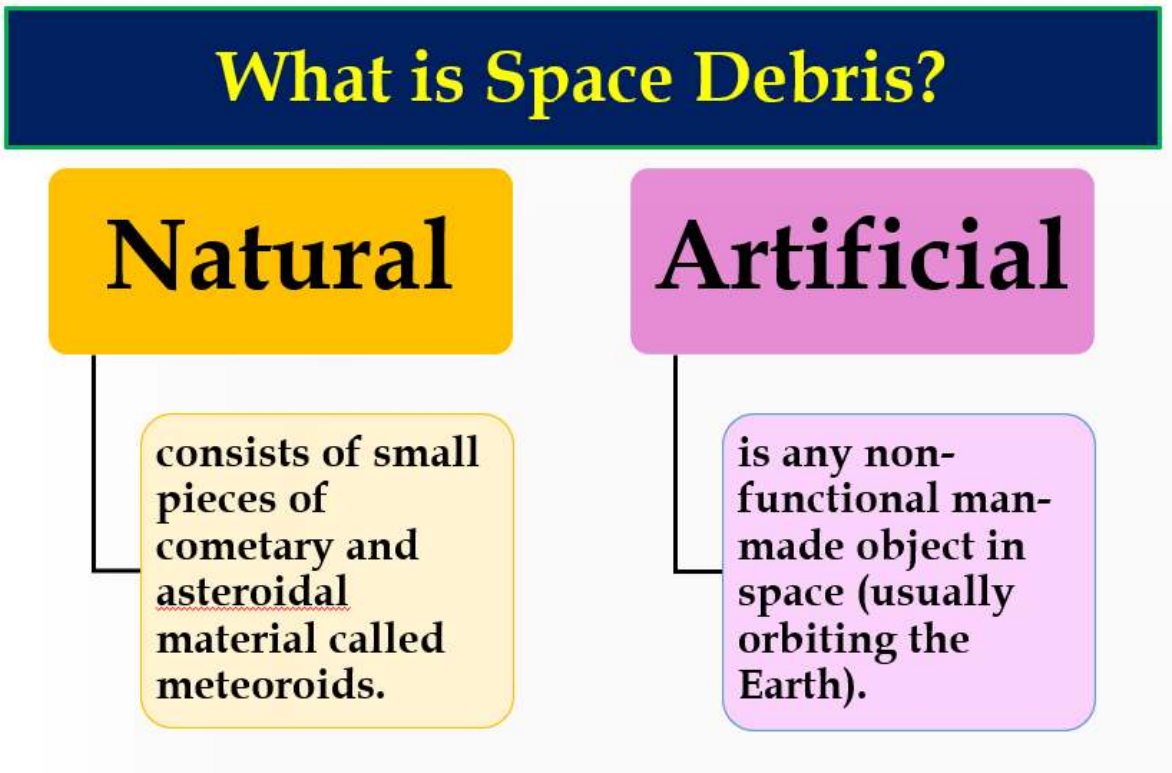
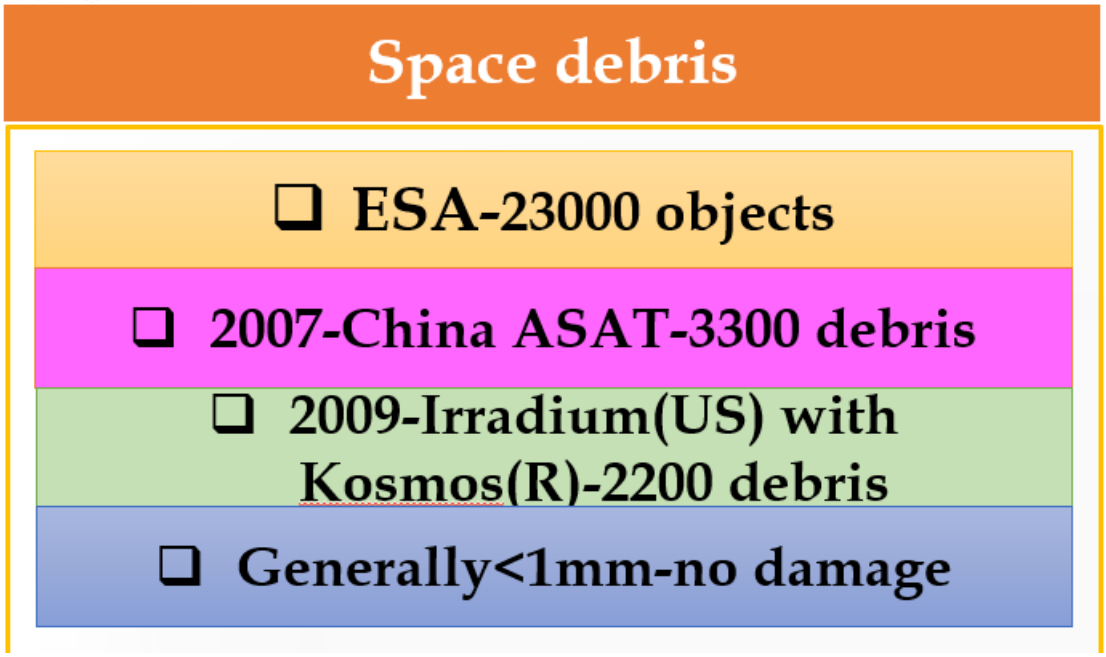
A to Z about Space Debris

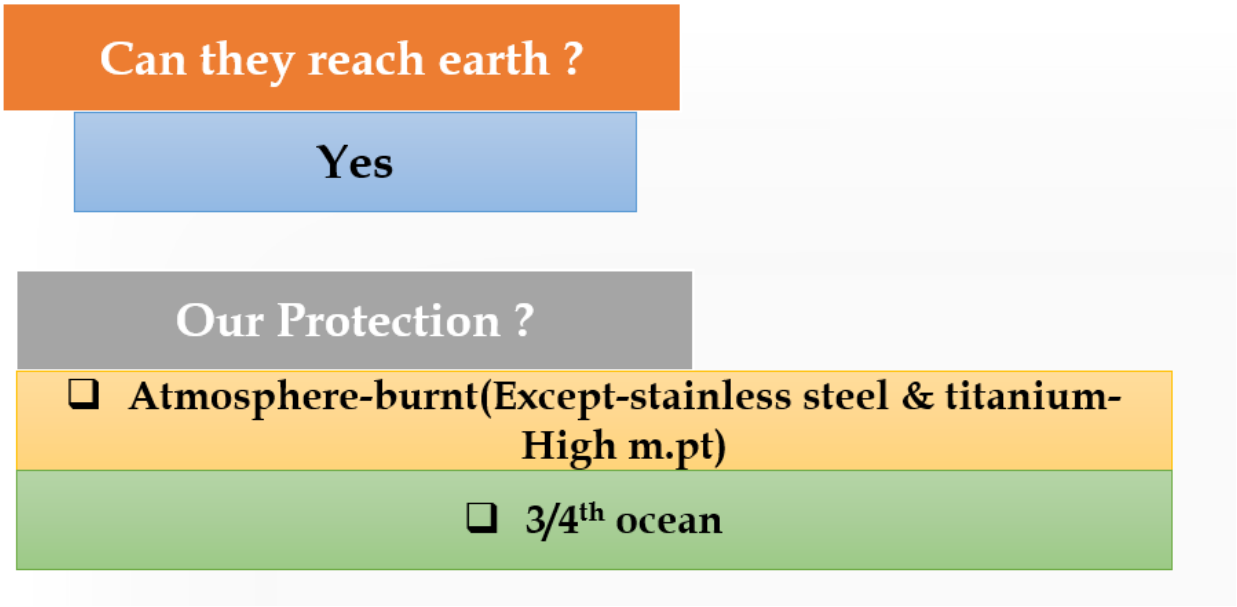
A Chinese satellite had a **near collision with one of the many chunks of debris left by the fallout of a recent Russian anti-satellite missile test**, state media reported.

About

- Moscow blew up one of its **old satellites in November in a missile test** that sparked international anger because of the space debris it scattered around the Earth's orbit.
- **Russia dismissed those concerns** and denied that the space debris posed any danger but a new incident with a Chinese satellite suggests otherwise.
- In the latest encounter, **China's Tsinghua Science Satellite came as close as 14.5 m from a piece of debris**, the state-run Global Times reported
- Last year there were close encounters between the **Chinese space station and satellites operated by Elon Musk's SpaceX**, which led to Beijing accusing the U.S. of unsafe conduct in space.







Where Does Artificial Space Debris Come From?

- Satellites that have reached the end of their life.
- Satellites and spacecraft that have failed.
- Rocket stages that have launched satellites into space.
- Solid propellant slag.
- Space activity -human waste.
- Deterioration fragments, e.g., peeling paint.
- Fragments from exploding batteries, fuel tanks (not totally empty), etc.
- Fragments from collisions, both accidental and deliberate.

The Remove DEBRIS mission

is led by the Surrey Space Centre (SSC) at the University Of Surrey, UK, and is co-funded by **the European Commission and other partners**, including prominent European space companies and institutions.

Kessler syndrome

- also called the Kessler effect, collisional cascading or ablation cascade, is a scenario in which the density of objects in Low Earth Orbit (LEO) is high enough that collisions between objects could cause a cascade where each collision generates space debris that increases the likelihood of further collisions

Remove Debris satellite	First satellite to remove space debris

Target-two CubeSat artificial sat-Debris SAT
- ❑**Release ,capture, deorbit**
- ❑**Send data about debris**

February 2022

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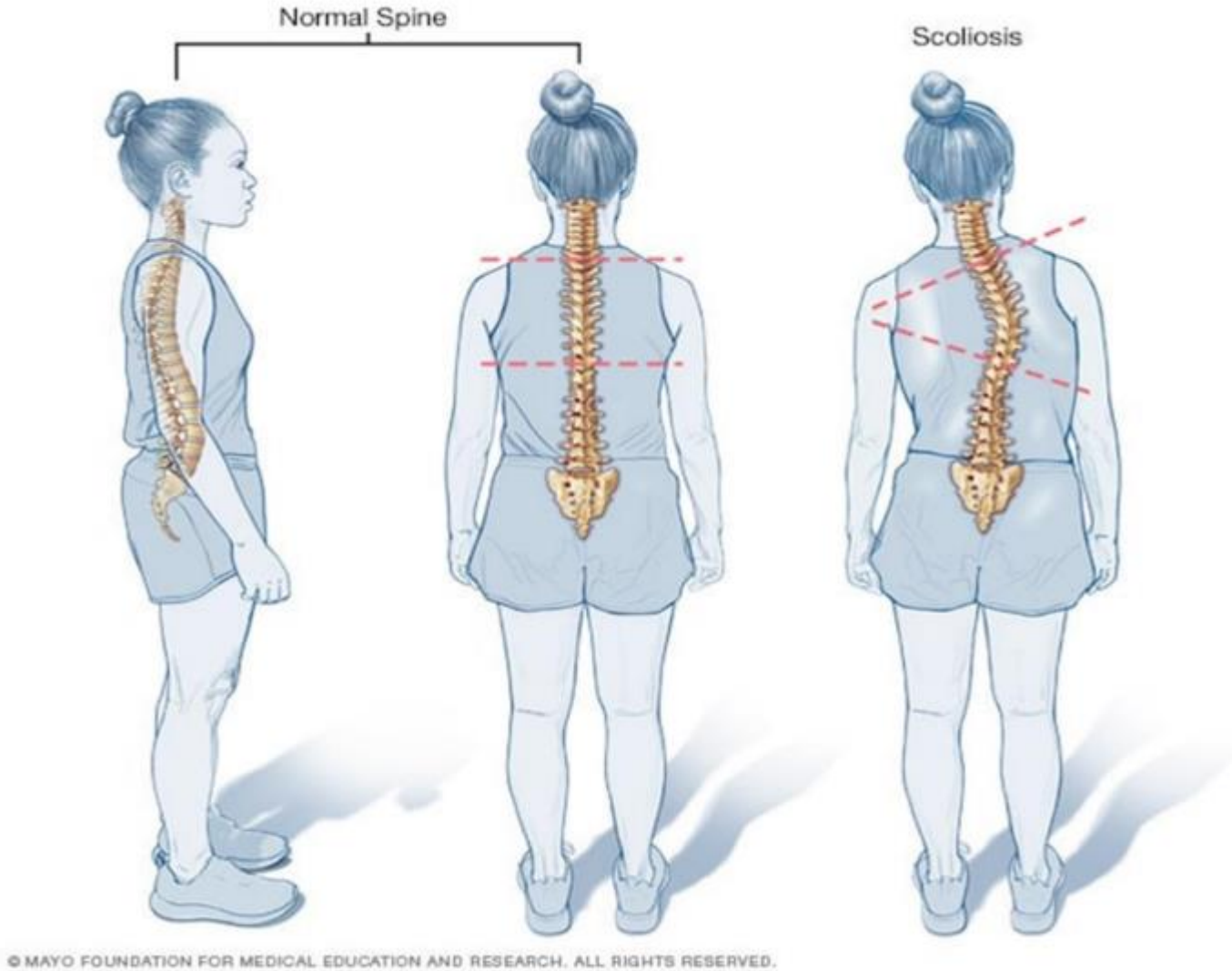
What is Scoliosis?

- Scoliosis is a sideways curve in your backbone (or spine). Often, it first shows up when you're a child or teenager.
- Anything that measures more than 10 degrees on an X-ray is considered scoliosis. Doctors may use the letters "C" and "S" to describe the curve.
- Scoliosis affects about 5 million people in India, that is 0.4% of the population. But the prevalence among children is much higher – more than 39 million or 3% of all children.



Signs and Symptoms of Scoliosis

- A visible curve in your back.
- Shoulders, a waist, or hips that look uneven.
- One shoulder blade that looks bigger.
- Ribs that stick out farther on one side of your body than the other.

Types of Scoliosis

- Idiopathic scoliosis is scoliosis without a known cause. In as many as 80% of cases, doctors don't find the exact reason for a curved spine.
- Congenital scoliosis begins as a baby's back develops before birth. Problems with the tiny bones in the back, called vertebrae, can cause the spine to curve. The vertebrae may be incomplete or fail to divide properly. Doctors may spot this rare condition when the child is born. Or they may not find it until the teen years.
- Neuromuscular scoliosis is caused by a disorder like spinal cord injury. These conditions sometimes damage your muscles so they don't support your spine correctly. That can cause your back to curve.
- Degenerative scoliosis affects adults. It usually develops in the lower back as the disks and joints of the spine begin to wear out as you age.

Treatment

- Bracing. If the scoliosis has progressed past 20 or 25 degrees, a back brace could be prescribed to be worn until the adolescent has reached full skeletal maturity.
- Surgery. If the curve continues to progress despite bracing, surgery could be considered.
- Research and medical reports have noted that there are no associations between the occurrence of scoliosis and heavy school bags. It also doesn't support the idea that heavy bag can structurally change a child's growing spine.

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Rare diseases

- Defined as a health condition of low prevalence that affects a small number of people when compared with other prevalent diseases in the general population
- While there is no universally accepted definition of rare diseases, countries typically arrive at their own descriptions, taking into consideration disease prevalence, its severity and the existence of alternative therapeutic options.
- In the **US,** for instance, a rare disease is defined as a condition that affects fewer than 200,000 people
- Prevalence of **1 or less, per 1000 population** is defined by the World Health Organization (**WHO**) as a rare disease
- According to the **ICMR**, a disease or disorder is defined rare in india if affect fewer than 1 in 2500 people

National Policy for Rare Diseases 2021

Aim

- To **lower the high cost of treatment** for rare diseases with increased focus on indigenous research
- Increased focus of **research and development** and local production of medicines will lower the cost of treatment for rare diseases
- To strengthen **tertiary health care facilities** for prevention and treatment of rare diseases

Categorization under policy

Group 1

- Disorders requiring **one-time curative treatment.**

Group 2

- Those requiring **long term treatment.**

Group 3

- Disorders for which definitive treatment is available but challenges are to make optimal patient selection for benefit, **very high cost and lifelong therapy.**

Financial Support

- Group 1 diseases will have the financial **support of up to Rs. 20 lakh**(Previously 15 lakh) under the umbrella scheme of **Rashtriya Arogya Nidhi.**

Inclusion of Beneficiaries

- **Not be limited to BPL** families, but extended to **about 40**% of the population, who are eligible as per norms of **Pradhan Mantri Jan Arogya Yojana** for their treatment in Government tertiary hospitals only

Centres of Excellence

- Government aimed at designating eight health facilities as **'Centres of Excellence'**
- Also provided **one-time financial support of up to Rs. 5 crore** for upgradation of diagnostics facilities.

Voluntary crowdfunding treatment

- Setting up a digital platform for voluntary individual contribution and corporate donors to voluntarily contribute to the treatment cost of patients of rare diseases.

National Registry

- To **ensure adequate data** and comprehensive definitions of such diseases are available for those interested in research and development.

Screening

- The Policy also focuses on **early screening and prevention through primary and secondary health** care infrastructure such as Health and Wellness Centres and District Early Intervention Centres (DEICs) and through counselling for the high-risk parents.
- Screening will also be supported by **Nidan Kendras** set up by Department of Biotechnology.

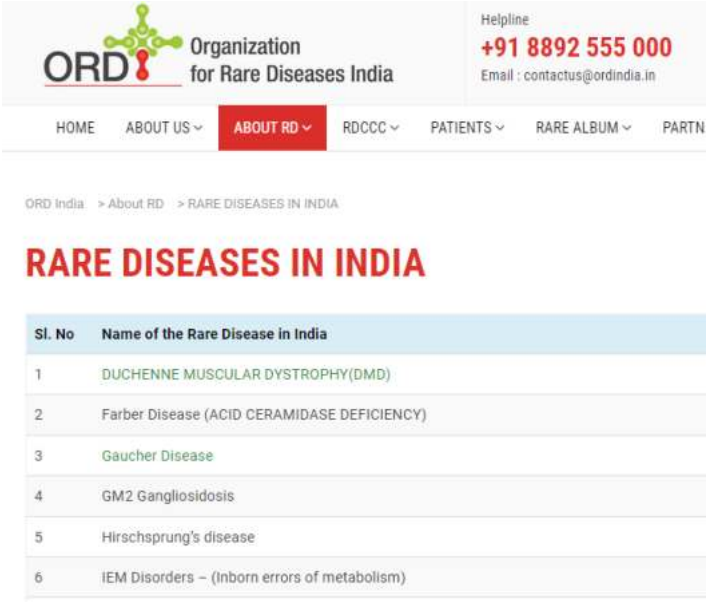
Challenges

- **Little is known about the pathophysiology** or the natural history of these diseases particularly in the Indian context.
- Rare diseases are also **difficult to research upon as the patients pool is very small** and it often results in inadequate clinical experience.
- **Availability and accessibility to medicines** are also important to reduce morbidity and mortality associated with rare disease.
- The **cost of treatment** of rare diseases is prohibitively expensive. Various High Courts and the Supreme Court have also expressed concern about lack of a national policy for rare diseases.
- It is estimated that for a **child weighing 10 kg, the annual cost of treatment for some rare diseases, may vary from ₹10 lakh to more than ₹1 crore per year** with treatment being lifelong and drug dose and cost increasing with age and weigh
- Even **Group 1 is only for few and Group 2 has been openly left for the State government**
- The new policy has absolutely **no consideration for Group 3 patients**, who require lifelong treatment support.
- In the absence of a sustainable funding support for Group 3 patients, the precious lives of all patients, mostly children, are now at risk and at the **mercy of crowdfunding**

Rashtriya Arogya Nidhi (RAN)

- Registered under the Societies Registration Act, 1860, as a **Society**.
- Provide **financial assistance to patients, living below poverty line and who are suffering from major life threatening diseases**, to receive medical treatment at any of the super speciality Hospitals/Institutes or other Government hospitals.
- **Cardiology& Cardiac Surgery**: Pacemakers, Stents

- **Cancer :** Bone Marrow Transplantation, Surgery
- **Orthopedics** Artificial prosthesis for limbs
- **Neurosurgery**
- **Mental Illness**



Sl. No	Name of the Rare Disease in India
1	DUCHENNE MUSCULAR DYSTROPHY(DMD)
2	Farber Disease (ACID CERAMIDASE DEFICIENCY)
3	Gaucher Disease
4	GM2 Gangliosidosis
5	Hirschsprung's disease
6	IEM Disorders – (Inborn errors of metabolism)

Group 1: Disorders amenable to one-time curative treatment:

a) Disorders amenable to treatment with Hematopoietic Stem Cell Transplantation (HSCT) –

i. Such Lysosomal Storage Disorders (LSDs) for which Enzyme Replacement Therapy (ERT) is presently not available and severe form of Mucopolysaccharoidosis (MPS) type I within first 2 years of age.

ii. Adrenoleukodystrophy (early stages), before the onset of hard neurological signs.

Group 1: Disorders amenable to one-time curative treatment:

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b) Disorders amenable to organ transplantation

i. *Liver Transplantation -Metabolic Liver diseases:*
   a. *Tyrosinemia,*
   b. *Glycogen storage disorders (GSD) I, III and IV due to poor metabolic control, multiple liver adenomas, or high risk for Hepatocellualr carcinoma or evidence of substantial cirrhosis or liver dysfunction or progressive liver failure,*
   c. *MSUD (Maple Syrup Urine Disease),*
   d. *Urea cycle disorders,*
   e. *Organic acidemias.*

ii. *Renal Transplantation-*
   a. *Fabry disease*
   b. *Autosomal recessive Polycystic Kidney Disease (ARPKD),*
   c. *Autosomal dominant Polycystic Kidney Disease (ADPKD) etc.*

iii. *Patients requiring combined liver and kidney transplants can also be considered if the same ceiling of funds is maintained. (Rarely Methyl Malonicaciduria may require combined liver & Kidney transplant) etc.*

Group 2: Diseases requiring long term / lifelong treatment having relatively lower cost of treatment and benefit has been documented in literature and annual or more frequent surveillance is required:

a) Disorders managed with special dietary formulae or Food for special medical purposes (FSMP)

i) Phenylketonuria (PKU)
ii) Non-PKU hyperphenylalaninemia conditions
iii) Maple Syrup Urine Disease (MSUD)
iv) Tyrosinemia type 1 and 2
v) Homocystinuria
vi) Urea Cycle Enzyme defects
vii) Glutaric Aciduria type 1 and 2
viii) Methyl Malonic Acidemia
ix) Propionic Acidemia
x) Isovaleric Acidemia
xi) Leucine sensitive hypoglycemia
xii) Galactosemia
xiii) Glucose galactose malabsorbtion
xiv) Severe Food protein allergy

b) Disorders that are amenable to other forms of therapy (hormone/ specific drugs)

i) *NTBC for Tyrosinemia Type 1*
ii) *Osteogenes isImperfecta – Bisphosphonates therapy*
iii) *Growth Hormone therapy for proven GH deficiency, Prader Willi Syndrome, Turner syndrome and Noonan syndrome.*
iv) *Cystic Fibrosis- Pancreatic enzyme supplement*
v) *Primary Immune deficiency disorders -Intravenous immunoglobulin and sub cutaneous therapy (IVIG) replacement eg. X-linked agammablobulinemia etc.*

vi) *Sodium Benzoate, arginine, citrulline, phenylacetate (Urea Cycle disorders), carbaglu, Megavitamin therapy (Organic acidemias, mitochondrial disorders)*
vii) *Others - Hemin (Panhematin) for Acute Intermittent Porphyria, High dose Hydroxocobalamin injections (30mg/ml formulation – not available in India and hence expensive if imported)*
viii) *Large neutral aminoacids, mitochondrial cocktail therapy, Sapropterin and other such molecules of proven clinical management in a subset of disorders*

Group 3: Diseases for which definitive treatment is available but challenges are to make optimal patient selection for benefit, very high cost and lifelong therapy.

3a) Based on the literature sufficient evidence for good long-term outcomes exists for the following disorders

1. *Gaucher Disease (Type I & III {without significant neurological impairment})*
2. *Hurler Syndrome [Mucopolysaccharisosis (MPS) Type I] (attenuated forms)*
3. *Hunter syndrome (MPS II) (attenuated form)*
4. *Pompe Disease (Both infantile & late onsetdiagnosed early before development of complications)*
5. *Fabry Disease diagnosed before significant end organ damage.*
6. *MPS IVA before development of disease complications.*
7. *MPS VI before development of disease complications.*
8. *DNAase for Cystic Fibrosis.*

3b) For the following disorders for which the cost of treatment is very high and either long term follow up literature is awaited or has been done on small number of patients

1. *Cystic Fibrosis (Potentiators)*

2. *Duchenne Muscular Dystrophy (Antesensce oligoneucletides, PTC)*
3. *Spinal Muscular Atrophy (Antisense oligonucleotides both intravenous & oral & gene therapy)*
4. *Wolman Disease*
5. *Hypophosphatasia*
6. *Neuronal ceroid lipofuschinosis*

March 2022

Click here to watch the following topic on YouTube

Cluster bombs and Vacuum bombs

- Russia has been accused for using cluster bombs and vacuum bombs in the ongoing war against Ukraine.

Cluster munitions

- According to the **2008 Convention on Cluster Munitions**, a **cluster munition means** a "**conventional munition that is designed to disperse or release explosive submunitions each weighing less than 20 kilograms, and includes those explosive submunitions**".
- Cluster munitions, usually called cluster bombs, were **deployed for the first time in 1943 by Soviet and German forces**. Since then, over 200 types of these munitions have been developed.
- Essentially, cluster munitions are **non-precision weapons** that are designed to injure or kill human beings **indiscriminately** over a large area, and to destroy vehicles and infrastructure such as runways, railway or power transmission lines.
- They **can be dropped from an aircraft or launched in a projectile** that spins in flight, scattering many bomblets as it travels.
- Many of these bomblets **end up not exploding**, but continue to lie on the ground, often partially or fully hidden and difficult to locate and remove, posing a threat to the civilian population for long after the fighting has ceased.
- The **Convention on Cluster Munitions** specifically identifies "**cluster munition remnants**", which include "failed cluster munitions, abandoned cluster munitions, unexploded submunitions and unexploded bomblets".

Thermobaric weapon

- Thermobaric weapons — also known as **aerosol bombs, fuel air explosives, or vaccum bombs — use oxygen from the air** for a large, high-temperature blast.
- A thermobaric weapon causes significantly **greater devastation than a conventional bomb of comparable size.**
- The weapons, which go off in **two separate stages**, can be fired as rockets from tank-mounted launchers or dropped from aircraft.
- As they hit their target, a **first explosion splits** open the **bomb's fuel container, releasing a cloud of fuel** and metal particles that spreads over a large area.
- **A second explosion** then occurs, **igniting the aerosol cloud** into a giant ball of fire and sending out intense blast waves that can destroy even reinforced buildings or equipment and **vaporise human beings**.

Is it legal to use these weapons?

- Countries that have ratified the **Convention on Cluster Munitions are prohibited from using cluster bombs**. As of date, there are 110 state parties to the convention, and 13 other countries have signed up but are yet to ratify it. **Neither Russia nor Ukraine are signatories**.
- **Vacuum bombs are not prohibited by any international law** or agreement, but their use **against civilian populations in built-up areas, schools or hospitals, could, according to a report in the BBC, attract action under the Hague Conventions of 1899 and 1907**