Current Affairs 1st August 2025 by Right IAS

Advanced Guided-Missile Frigate Himgiri

Event: Indian Navy received the advanced guided-missile frigate Himgiri on Thursday. Built by: Garden Reach Shipbuilders and Engineers (GRSE), Kolkata. Significance: Major step toward self-reliance (Aatmanirbharta) in warship design and construction. Reflects advancement in indigenous naval capabilities

An advanced guided-missile frigate is a warship that is both a frigate (a type of naval warship) and equipped with guided missiles. "Advanced" indicates that the frigate has modern features, enhanced capabilities, and cutting-edge technology, such as advanced radar, combat systems, and missile technology.

Class & Project Details: Himgiri is the third ship of the Nilgiri-class (Project 17A). First of its class built at GRSE. Project 17A frigates are multi mission capable, designed to tackle future maritime challenges. Design Inspiration: Named after and modelled on the erstwhile INS Himgiri, a Leander-class frigate. The original INS Himgiri was decommissioned on May 6, 2025, after 30 years of service.

The Hindu

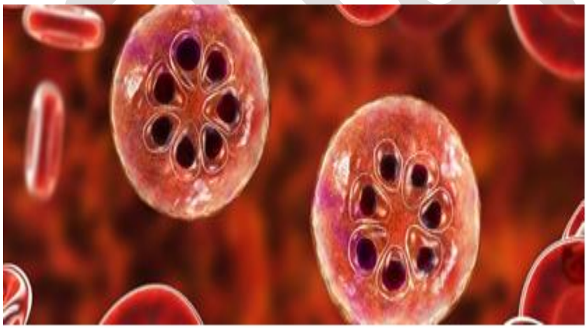
Malaria's new frontlines: vaccines, innovation, and the Indian endgame

Global Burden of Malaria (2023) Nearly 294 million infections and about 6 lakh deaths globally. After initial progress, global malaria control has stalled. Key challenges: Drug resistance in malaria parasites. Mosquito resistance to insecticides.

India's Malaria Landscape India reduced malaria cases by over 80% between 2015–2023. Despite national progress, tribal districts remain vulnerable: Lawngtlai (Mizoram): 56 cases/1,000 people. Narayanpur (Chhattisgarh): 22 cases/1,000 people.

India faces a dual parasite threat: Plasmodium falciparum (severe disease, common in Africa). Plasmodium vivax (causes relapse by hiding in liver). Mixed infections (both species) complicate elimination efforts Jharkhand: 20% cases are mixed.

Approved Malaria Vaccines a) RTS,S Vaccine (2021) First WHO-approved malaria vaccine. ~55% efficacy in the first year. Requires four doses due to reduced effectiveness after 18 months.

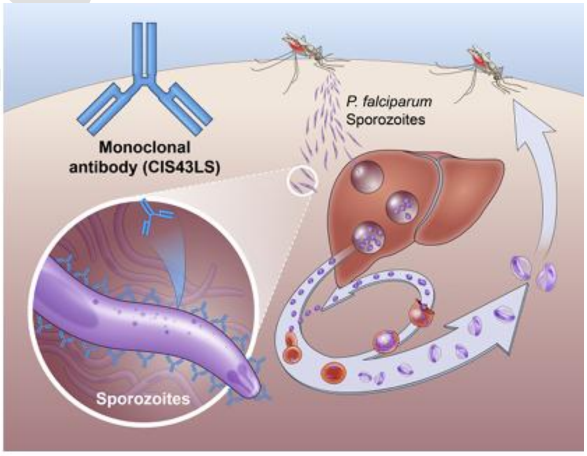


b) R21/Matrix-M (Oxford–Serum Institute) WHO-approved in 2023. Up to 77% efficacy in Phase 3 trials. Lower cost, fewer doses, produced in India promising for LMICs.

Next-Gen Vaccine Innovations a) Whole-Parasite Vaccines Target the entire parasite, not just one protein. PfSPZ Vaccine (Sanaria): Uses radiation-weakened sporozoites. 79% protection after third dose

PfSPZ-LARC2: Modified version with potential one-dose efficacy. Useful for migrants and outbreak-prone areas

Blood-Stage Vaccine – PfRH5 Targets red blood cell invasion stage. Cross-strain protection as RH5 is a stable protein. Trials in UK, Gambia, Burkina Faso showed good results. Can complement early-stage vaccines to prevent severe disease. Transmission-Blocking Vaccines (TBVs) Target malaria in mosquitoes, preventing further spread. Key Developments: Pfs230D1 TBV: 78% reduction in transmission (Mali Phase 2 trial). Pvs230D1M (Thailand): 96% reduction in P. vivax mosquito transmission.

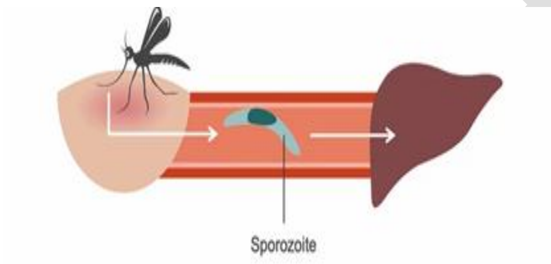


India's Initiative – AdFalciVax (2025) Developed by ICMR. (TBVs – Transmission-Blocking Vaccines) Pvs230D1M –India's first dual-stage vaccine: Pre-erythrocytic (PfCSP) + Transmission-blocking (Pfs230 & Pfs48/45). Room temperature stable for 9 months. Strong immune response in mice (equivalent to ~10 years in humans).

Vaccine Platforms & Immune Enhancers a) Adjuvants & Protein-Based Vaccines Ferritin + CpG cut liver-stage parasites by 95% in mice. AdFalciVax worked well with mild adjuvant (alum), similar to hepatitis B vaccines. b) mRNA Vaccine Technology mRNA vaccines enable rapid, adaptable production.

Key Projects: CureVac–NIH Vaccine: Encoded Pfs25 antigen, fully blocked transmission in mice. BioNTech BNT165e: Targeted blood-stage; paused by FDA in 2025 for undisclosed reasons.

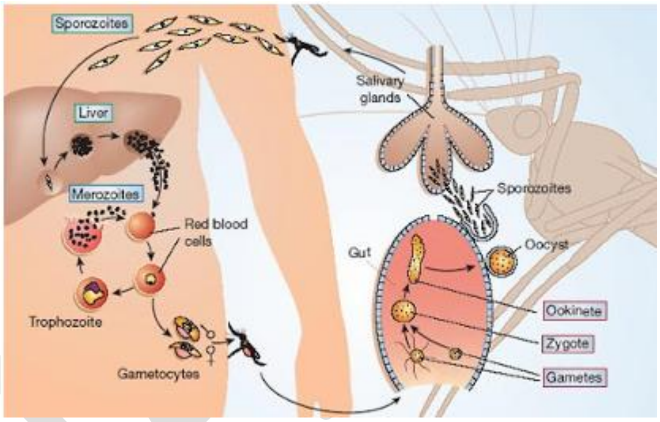
Targeted Antigen Modification PfCSP + MIP3 fusion vaccine: Attracts immune cells to the antigen site. Induced 88% reduction in liver-stage infection in mice. Not yet tested in humans.



Engineered Antibodies Against Immune Evasion RIFIN proteins help P. falciparum suppress immune system by binding to LILRB1 receptors. New antibody D1D2.v-IgG blocks this interaction 110x stronger than natural receptor. Still in early lab stages — untested in animals

Gene-Editing & Vector Control Tools a) CRISPR Gene Drives Insert fertility-disrupting genes in mosquitoes. Wiped out mosquito colonies in lab within 1 year (Anopheles gambiae). Risks: Irreversible impact, ethical concerns, resistance evolution.

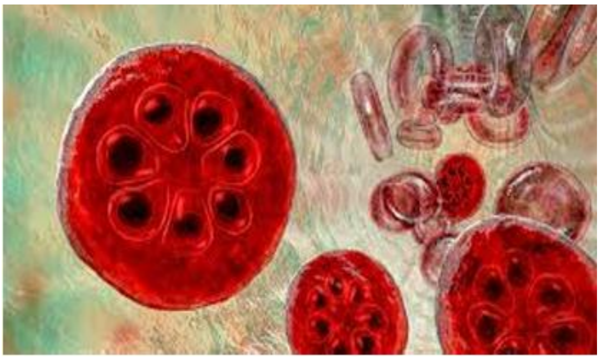
b) Safer Genetic Alternatives FREP1 gene edit: Prevents parasite development inside mosquito. Spread to 90% mosquitoes in 10 generations. Self-killing mosquitoes: Infected mosquitoes die sooner, reducing spread. Alters immune genes to trigger self-limiting cycle.



India’s Road to Malaria Elimination (By 2030) Challenges: Asymptomatic carriers hard to detect. P. vivax relapse cycle makes treatment harder. Tribal, forested, and remote regions have persistent malaria. Past delays: P. cynomolgi (monkey malaria) model research stalled due to animal access laws

Current Strategy: Indigenous vaccines (like AdFalciVax) progressing through preclinical trials. 7–8 years expected to complete full trial and approval cycle. ICMR invited industry partners for mass production and further trials.

Infrastructure Needs: Trained healthcare workers. Resistance surveillance. Improved diagnostics and vector control. Strong coordination among government, scientists, pharma, and regulators.



Conclusion: A Complex but Winnable War India's malaria challenge is not uniform pockets of high incidence remain. Fight needs: Multi-pronged vaccine approach (early-stage + blood-stage + TBVs). Innovative R&D, domestic production, faster approvals. Strong political will and COVID-style urgency. Elimination by 2030 is possible, but only with sustained science policy-community coordination.

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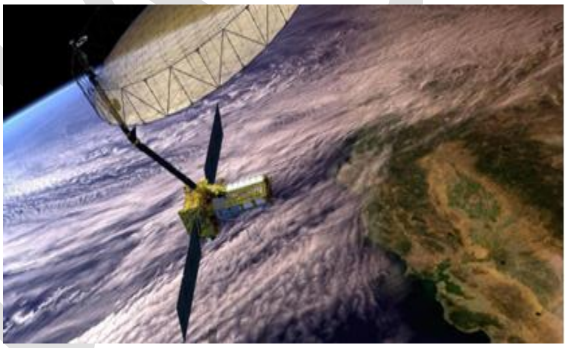
GSLV-F16 & NISAR Mission

Launch Date: July 30 Launch Site: Sriharikota Rocket Used: GSLV-F16 (Mk II variant) Payload: NISAR satellite (NASA ISRO Synthetic Aperture Radar) Orbit: Sun-synchronous dawn dusk orbit

Bilateral Collaboration NISAR is a joint Earth observation satellite mission by NASA and ISRO. Represents over a decade of Indo-US collaboration in space science. Combines: NASA-built L-band radar ISRO-developed S-band radar First mission to combine two SAR frequencies (L & S) on one platform

Scientific Capabilities & Objectives Can detect surface deformations of a few centimetres, even through clouds and vegetation. Repeats orbit every 12 days under near-identical lighting — enables time-series analysis.



Provides freely available global data on: Earthquakes, landslides, glacial movements Mangrove mapping Urban land subsidence Crop–soil interactions Sea ice and polar ice shelf changes

Global Relevance Supports: Sendai Framework for Disaster Risk Reduction IPCC climate models Enhances global Earth observation capabilities and scientific cooperation. ISRO's Milestone Launching such a major payload on GSLV Mk II is a confidence booster. GSLV once dubbed the "naughty boy" for past failures — now more reliable.

Engineering & Technological Milestones S-band radar: Required high precision RF electronics, thermal control, data throughput. Imported components: 12-metre reflector Ka-band downlink. Flight software stacks Many key design reviews were led by NASA.

Challenges and Future Opportunities a) Technological Dependence India still depends on foreign partners for: Advanced materials Flight systems Deep-space communication Need for more domestic R&D investments

b) Data Infrastructure Needs NISAR's high data rate via Ka band needs: Expansion of Ka-band ground stations Automated, cloud-based data processing Fast public release of analysis-ready data

Policy and Continuity India must: Pre-authorise follow-up SAR missions before 2030. Develop balanced data sharing policies: Encourage private-sector analytics Protect sensitive data (e.g., defence, strategic zones)

Geopolitical & Strategic Implications Enhances India's credibility as a trusted space partner. Could enable smoother technology transfers in future. India must strive for equal footing in future global missions by: Early involvement in mission design Leading scientific objectives and payload decisions

Conclusion: NISAR is a landmark in India–US space cooperation and Earth science. Realising its full potential will depend on: Technical capacity building Timely data management Balanced regulatory frameworks Domestic innovation and follow-up investments

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Solar Energy, Green Hydrogen, and the Need for Smarter Technologies

Growing Need for Clean Energy As the world moves towards clean energy and reducing emissions, solar power has become the most popular source. Silicon solar panels are widely used seen on rooftops, farms, and open lands

These panels have been reliable for decades but are less efficient (15–21%). Newer solar technologies offer up to 47% efficiency, which means they need less space to produce the same power. In a world where land is limited and the energy demand is rising; this is a serious concern. China makes 80% of global solar panels; India produces about 6 GW annually and plans to expand.

Connection to Green Hydrogen Green hydrogen is made by using electricity (ideally from solar) to split water into hydrogen and oxygen. If the electricity comes from solar, it's "green" hydrogen clean and carbon-free. However, the process uses a lot of energy, more than what hydrogen gives back. Hydrogen is also hard to store and transport due to its low density and high leakage risk

Alternatives: Green Ammonia & Methanol Experts suggest turning green hydrogen into ammonia (NH_3) or methanol (CH_3OH) for easier transport. But converting it back into hydrogen takes more energy, again lowering overall efficiency. So if solar energy itself is not efficient (like with silicon panels), the whole green fuel cycle becomes less effective.

Artificial Photosynthesis – A Future Solution Like plants do naturally, scientists are trying to create artificial photosynthesis (APS) to produce fuel from water, sunlight, and CO_2. Though still in the research stage, it holds promise for making cleaner fuels directly without multiple steps.

India's Energy Independence Challenge India still imports 85% of its energy needs (coal, oil, gas). To be self-reliant, it must invest in new and better technologies like APS, green fuels, and efficient solar panels. Europe is already moving forward with advanced fuels called RFNBOs (Renewable Fuels of Non-Biological Origin).

Final Message: Prevention is Better than Cure Spending more now on clean energy innovation will save huge costs from pollution and climate damage later. While silicon panels and green hydrogen are good, we now need better, faster, and more efficient solutions to fight climate change and meet future energy needs.

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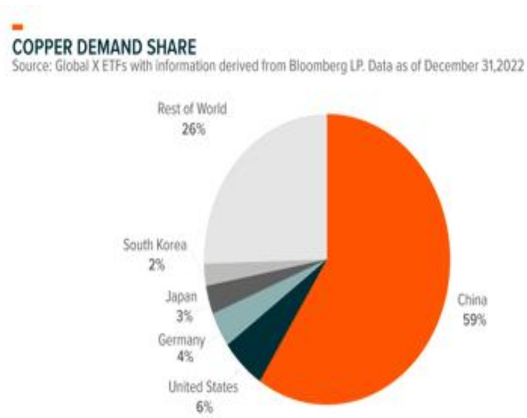
Rising Global Copper Demand

Surge in Demand Copper demand is rising faster than expected, driven by global investment in modernising and expanding electricity grids. This is primarily due to the digital revolution, clean energy transition, and the growing need for data centers and electric vehicles.

Supply Constraints Major copper producers like Chile and the Democratic Republic of Congo are facing supply bottlenecks due to low investment in new mines. This supply-demand imbalance is likely to lead to higher prices. Analysts expect copper prices to exceed $12,000/ton by 2030 (up from $9,700/ton now).

Why Copper is Irreplaceable Copper is preferred because of: High electrical conductivity Durability Versatility Despite exploring alternatives, copper remains difficult to replace in power infrastructure.



Grid Investment

According to the International Energy Agency, $400 billion+ will be invested in grid infrastructure in 2025. This includes grid upgrades in U.S., U.K., and China, especially due to clean energy needs

AI, Data Centres & Power Growth in AI and machine learning has spurred demand for data centres, which require: Higher computing power, hence more electricity. Resulting in greater copper demand for electrical infrastructure. CRU Consultancy forecasts: Copper use in data centres will rise from 78,000 tonnes (2020) to 650,000 tonnes (2030).

Other Key Drivers of Copper Demand Electric Vehicles (EVs) need much more copper than petrol/diesel vehicles: EV copper demand will rise from 1.2 million tonnes (2025) to 2.2 million tonnes (2030). Other contributors include: Wind and solar energy projects Offshore energy infrastructure.

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Mapping

Chasiv Yar is a city in Bakhmut Raion, Donetsk Oblast, Ukraine

Heisaura Beach in Japan is a 5km stretch of sandy beach located on the southern tip of the Boso Peninsula in Chiba Prefecture.

Sun-Synchronous Orbit A sun-synchronous orbit (SSO) is a near-polar orbit where the orbital plane precesses (rotates) at the same rate as the Earth's revolution around the Sun. This precession ensures that the satellite crosses any given latitude at the same local time each day. Dawn-Dusk Orbit: A dawn-dusk orbit is a special case of SSO where the local time of ascending node (LTAN) is either 6 AM or 6 PM. This means the satellite crosses the equator at approximately sunrise or sunset.