PLUTUS IAS

CURRENT AFFAIRS

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MALARIA VACCINE

This article covers "Daily Current Affairs" and the Topic details "Malaria Vaccine". This Topic has relevance in the Science and Technology section of the UPSC CSE exam.

For Prelims:
About R21 Malaria Vaccine?
About Malaria

For Mains:
GS 3: Science and Technology
Malaria Burden Worldwide?
Global Initiatives?
India's Initiatives?

Why in the news?
The R21/Matrix-M malaria vaccine, a collaborative effort between the University of Oxford and the Serum Institute of India, utilizing Novavax's adjuvant technology, has received a recommendation for usage from the World Health Organization (WHO) based on its compliance with essential safety, quality, and efficacy criteria.

About R21 Malaria Vaccine:
- The R21 vaccine, also known as the Matrix-M malaria vaccine, is the second vaccine ever developed for malaria.

Certified Malaria-Free Countries (since 2015):
- Nine countries have been certified as malaria-free by the WHO Director-General since 2015. These countries include Maldives, Sri Lanka, Kyrgyzstan, Paraguay, Uzbekistan, Argentina, Algeria, China (certified in 2021), and El Salvador (certified in 2021).

Malaria Burden Worldwide:
- In 2021, there were 247 million cases of malaria, compared to 245 million cases in 2020.
- In 2022, India reported over 45,000 cases of malaria.
- Approximately 80 percent of all malaria deaths in the WHO African Region occur in children under five years of age.

MALARIA

What is Malaria?

Malaria is disease caused by **plasmodium parasites** that is transmitted to people through the bites of infected **female Anopheles mosquitoes.**

Vector Varieties

- *Plasmodium falciparum*
- *Plasmodium malariae*
- *Plasmodium vivax*
- *Plasmodium ovole*
- *Plasmodium knowlesi*

SYMPTOMS

Headache

Fatigue

Nausea

Muscle Pain

Chills

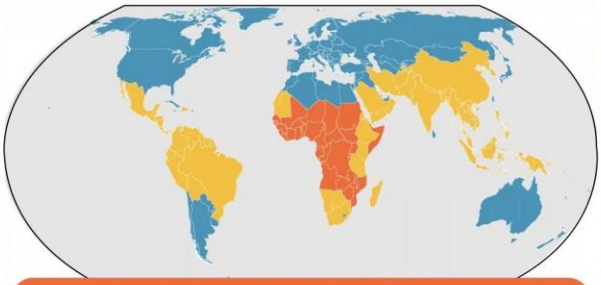
Fever

*Note: If not treated within 24 hours can progress to severe illness and **lead to death.***

Prevention

- Vector control is the best way to reduce transmission.
- Insecticide-treated mosquito nets and indoor residual spraying are effective too
- Wear full clothing so that mosquitoes have no contact with skin
- Developing non-vector carrying mosquito species have also potential to reduce threats
- RTS,S/ASOI (RTSS) is the only vaccine to Show that it can significantly reduce malaria.

Malaria Infection Regions



Most malaria cases and deaths occurs in sub-Saharan Africa.

SE Asia Mediterranean W. Pacific and the Americas are at risk.

India represents 3% of the global malaria burden. India has shown a reduction in reported malaria cases of 49% and deaths of 50.5% compared with 2017.

About Malaria:

- Malaria is a mosquito-borne blood disease caused by Plasmodium protozoa.
- It is spread via the bites of female Anopheles mosquitoes that are infected.
- The disease is life-threatening and is caused by Plasmodium parasites.
- Parasites initially multiply in liver cells and then attack red blood cells (RBCs).
- There are five parasite species that cause malaria in humans, with Plasmodium falciparum and Plasmodium vivax posing the greatest threat.

Challenges in Developing a Malaria Vaccine:

- The parasites causing malaria are prone to mutations, which can lead to resistance to treatments.

Global Initiatives:

- The WHO has pinpointed 25 countries as part of its 'E-2025 Initiative' where there is the potential to achieve malaria eradication by the year 2025.
- The WHO's Global Technical Strategy for Malaria 2016–2030 aims to reduce malaria case incidence and mortality rates by at least 40% by 2020, at least 75% by 2025, and at least 90% by 2030 against a 2015 baseline.
- WHO initiated the High Burden to High Impact (HBHI) initiative in 11 high malaria burden countries, including India.
- Implementation of the "High Burden to High Impact (HBHI)" initiative has been started in four states in India: West Bengal, Jharkhand, Chhattisgarh, and Madhya Pradesh.

India's Initiatives:

- The Government of India has set a target to eliminate malaria in India by 2027.
- It has developed a National Framework for Malaria Elimination (2016-2030) and a National Strategic Plan for Malaria Elimination for five years.
- India shifted its focus from malaria control to elimination.
- A roadmap was established to eliminate malaria in 571 out of India's total 678 districts by 2022.
- The Malaria Elimination Research Alliance-India (MERA-India) was formed under the Indian Council of Medical Research (ICMR).

Source:
https://www.thehindu.com/sci-tech/health/oxford-serum-institute-malaria-vaccine-recommended-for-use-by-who/article67373489.ece

Q.1 Consider the following statements regarding malaria:

1. Malaria is caused by a virus transmitted through the bites of infected Anopheles mosquitoes.
2. Plasmodium falciparum is the most common parasite species responsible for causing malaria.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

ANSWER: C

Q.2 Consider the following statements regarding the R21/Matrix-M malaria vaccine:

1. The R21 vaccine is a collaborative effort between the University of Oxford and the Serum Institute of India.

2. It is the first vaccine ever developed for malaria.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

ANSWER: A

Q.3 To what extent has the global effort to combat malaria succeeded in reducing its burden on public health, particularly in low-income countries? Analyze the key challenges that hinder malaria control and eradication

Rishabh

MULTIMODAL AI

This article covers "Daily Current Affairs" and the topic details "Multimodal AI". This topic has relevance in the "Science and Technology" section of the UPSC CSE exam.

For Prelims:

What is Multimodal AI?

For Mains:

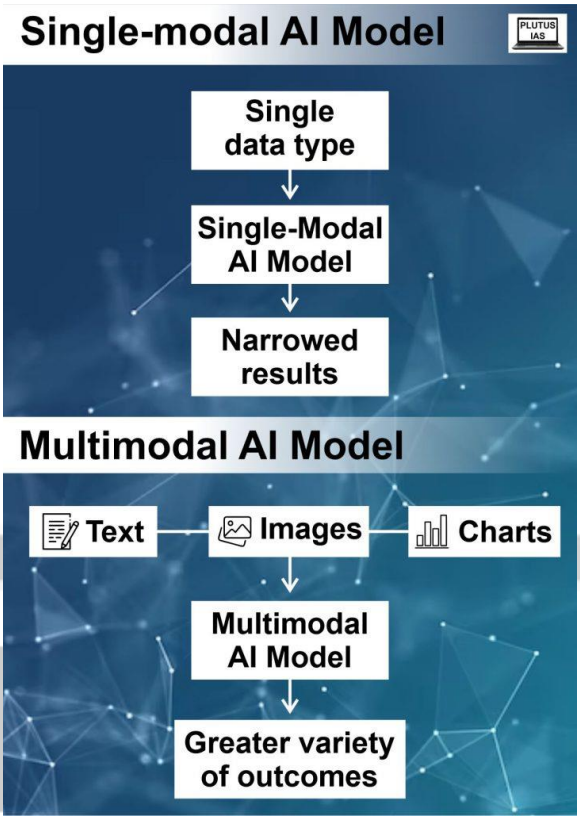
GS2: Science and Technology

Why in the news?

OpenAI recently revealed that they have extended the capabilities of their GPT-3.5 and GPT-4 models to understand and describe images in textual form. Additionally, they have integrated speech synthesis into their mobile apps, enabling users to engage in complete conversations with the chatbot.

Multimodal AI

- Multimodal AI, or multimodal artificial intelligence, is an **AI system that can understand and interact with information from** multiple sensory modalities, such as **text, images, speech,** and more.
- It combines various types of data and information to make sense of the world in a way that resembles human perception and cognition.
- Multimodal AI can be used for various applications, including natural language processing, computer vision, speech recognition, and more.



Working of Multimodal AI

- **Data Integration:** Combine text and images for a unified dataset.
- **Training:** Use diverse data for model training.
- **Cross-Modal Learning:** Teach the model to link text and images.
- **Inference & Generation:** The model performs tasks like image-to-text and speech recognition.
- **Feedback & Iteration:** Improve accuracy through iterative training.
- **Deployment:** Apply in applications like virtual assistants and content recommendation.

Examples of the use of multimodal artificial intelligence:

- **Self-Driving Cars:** They rely on multimodal AI for environment perception and safe navigation, using cameras, radar, and lidar sensors to collect data about the road and surroundings.
- **Medical Diagnosis:** Multimodal AI enhances medical diagnoses by analysing X-rays, MRI scans, and patient data to identify diseases and risk factors, resulting in more accurate and personalised assessments.
- **Education:** Multimodal AI enriches educational experiences, enabling personalised learning plans and interactive content like simulations and games to engage and inform students.

Challenges in Multimodal artificial intelligence:

- **Data Volume:** Storing and processing large, diverse datasets is costly and challenging.
- **Learning Nuance:** Teaching AI to understand context and nuanced meanings from identical inputs can be problematic.
- **Data Alignment:** Aligning data from various sources to represent the same context is difficult.
- **Limited Data Sets:** Incomplete or hard-to-find data can hinder AI training, leading to data integrity and bias issues.
- **Missing Data:** AI's reliance on multiple data sources can lead to malfunctions when one source is missing or provides incomplete information.

- **Complex Decision-Making:** Understanding how AI evaluates data and makes decisions can be challenging, making the AI unreliable and unpredictable for users.

Some examples of multimodal artificial intelligence models:

- **Meta's project CAIRaoke:** Meta, Facebook's parent company, is developing a digital assistant project based on multimodal AI, capable of human-like interactions.
- **Google's video-to-text research:** Google has recently researched a multimodal system that predicts dialogues in video clips.
- **OpenAI's GPT-3.5 & GPT-4 models:** These models can analyse images in text and feature speech synthesis in their mobile apps.
- **Google's Gemini:** Currently undergoing testing in various companies.
- **OpenAI's Gobi:** OpenAI is creating Gobi, a multimodal AI system from the ground up.

Sources:

What is multimodal artificial intelligence and why is it important?

Q1. With reference Multimodal artificial intelligence, consider the following statements:

1. Multimodal AI combines data from different sources, such as text, images, and audio, to better understand information and the world more comprehensively.
2. It is a system that can decode the thoughts and dreams of individuals by analysing brainwaves and predicting their future actions.
3. It can understand and process data from multiple sensory modalities, enabling more human-like interactions and decision-making.

Which of the statements given above is/are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) None

Answer: (c)

Q2. Consider the following:

- **CAIRaoke**
- **DALL-E**
- **SpiNNaker**
- **Gemini**

How many of the are examples of Multimodal Artificial Intelligence?

(a) Only one
(b) Only two
(c) Only three
(d) All Four

Answer: (c)

Q3. Examine the applications and importance of Multimodal AI across domains, its impact on human-computer interactions, and its challenges for researchers and developers.

Gaurav