



Heat-Tolerant Covid-19 Vaccine by IISc

[Source: TH](#)

Why in News?

A heat-tolerant vaccine developed by the [Indian Institute of Science \(IISc\)](#) researchers is **said to be** effective against all **current strains of SARS-CoV-2** besides having the potential to be quickly adapted for future variants as well.

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The infographic is divided into two main sections. The left section, titled 'What is a viral variant?', describes a version of SARS-CoV-2 that has evolved and changed shape, specifically highlighting the 'Omicron variant' which has a different spike protein structure compared to the 'Original SARS-CoV-2'. The right section, titled 'What is immunity?', explains that vaccination or infection activates B cells (which produce antibodies) and T cells (which stimulate B cells and kill infected cells). It concludes that these cells and antibodies remain in the body to protect against future infections, though immunity can wane over time.

What is a viral variant?

A version of the SARS-CoV-2 coronavirus that has evolved & changed shape, which can alter its behaviour.

Original SARS-CoV-2

Omicron variant

What is immunity?

The immune response generated by **vaccination or infection** activates:

B cells which make highly specific antibodies that bind to the virus & stop it entering your cells.

T cells which can stimulate B cells & kill infected cells.

The cells & antibodies remain in the body to protect against future infection. This is **immunity** but immunity can wane over time.

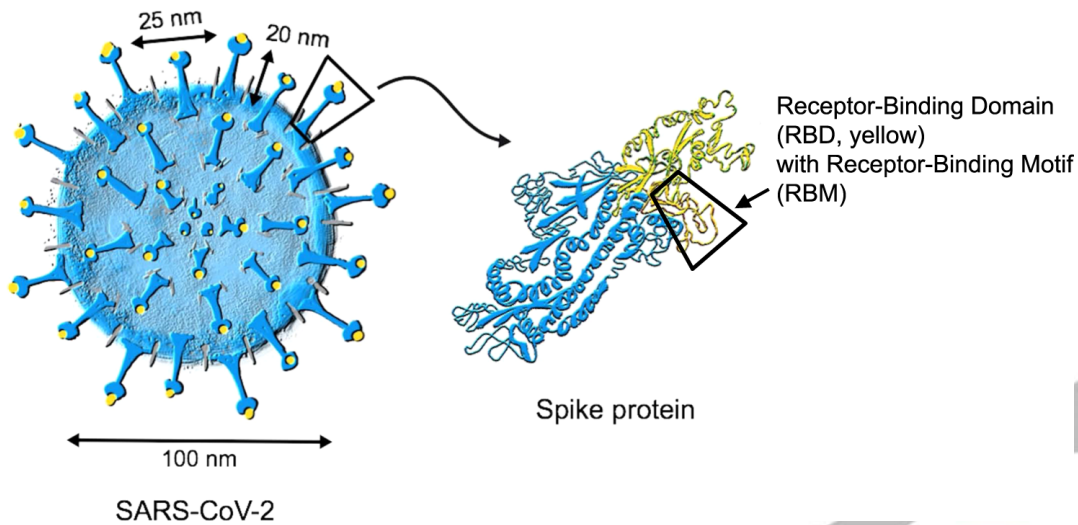
What are the Key Points Related to the Vaccine Developed by IISc?

- **Background:** According to IISc, while current vaccines are proven to be effective against most SARS-CoV-2 strains, **their efficacy has declined due to rapid mutation by the virus.**
- **Antigen Selection:** After analyzing various proteins found in the virus, the researchers selected two parts of SARS-CoV-2's spike protein, the **S2 subunit and the Receptor Binding Domain (RBD)** for designing their vaccine candidate.
 - The **S2 subunit is highly conserved.** It mutates much less than the S1 subunit, which is the target of most current vaccines and the RBD can provoke a robust immune response.
 - A hybrid protein, **RS2**, was created by **combining the selected components.**
 - The researchers then tested the effects of the protein in both mice and hamster models. They found that the hybrid protein triggered a strong immune response.

Note

A receptor-binding domain is a key part of a virus located on its 'spike' domain that allows it to dock to body receptors to gain entry into cells and lead to infection.

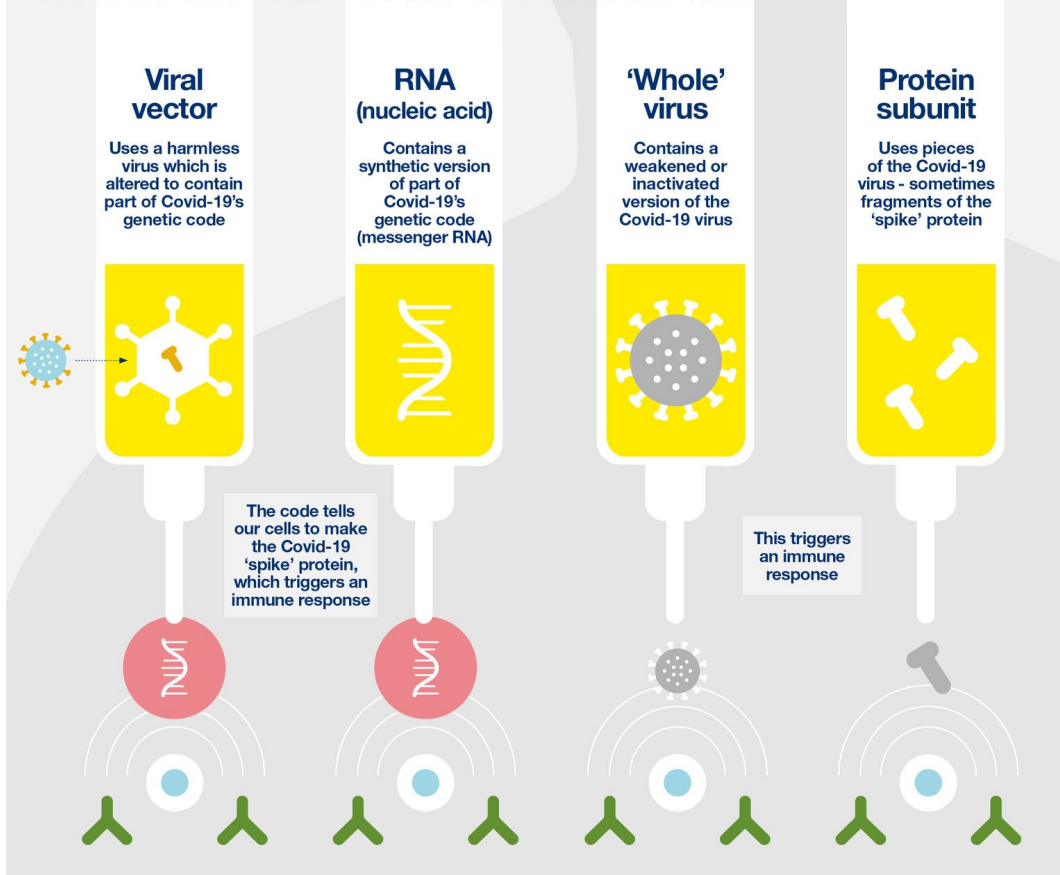
- The **spike (S) protein of SARS-CoV-2**, which plays a key role in the receptor recognition and cell membrane fusion process, is composed of two subunits, **S1 and S2**.



- **Characteristics of RS2 Antigen:**

- **Adaptability to Variants:** The RS2 antigen can be customized to incorporate the **RBD region of any new SARS-CoV-2 variant including XBB.1.5 and JN.1 variants.**
 - This adaptability addresses concerns related to the virus's rapid mutation.
- **Storage and Distribution:** RS2 antigen can be stored at room temperature for a month without requiring cold storage.
- **Economic Advantage:** Reduced production and distribution costs make it economically viable.

How do different Covid-19 vaccines work?



UPSC Civil Services Examination, Previous Year Questions (PYQs)

Q. In the context of vaccines manufactured to prevent COVID-19 pandemic, consider the following statements: (2022)

1. The Serum Institute of India produced COVID-19 vaccine named Covishield using mRNA platform.
2. Sputnik V vaccine is manufactured using vector-based platform.
3. COVAXIN is an inactivated pathogen-based vaccine.

Which of the statements given above are correct?

- (a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Ans: (b)

Reforming Organ Transplantation

For Prelims: [Transplantation of Human Organs Act, 1994](#), [National Organ Transplantation Guidelines](#), National Organ and Tissue Transplant Organisation (NOTTO)

For Mains: Organ Donation and Transplantation – related ethical concerns, Emerging Issues in Organ Transplantation.

[Source: IE](#)

Why in News?

Recently, the Delhi [High Court](#) has recommended an **optimal timeframe of 6-8 weeks for completing organ transplant processes involving living donors.**

- High Court directed the government to establish specific timelines for all stages of organ donation applications in accordance with [The Transplantation of Human Organs and Tissues \(THOT \) Act, 1994](#), and **Transplantation of Human Organs and Tissues Rules, 2014 (THOT Rules).**

What Does the THOT Act, 1994 Say?

- **About:**
 - The law governs the transplantation of human organs and tissues in India, **including the donation of organs after death.**
 - It lays down regulations governing healthcare providers and hospitals, and stipulates penalties for violations.
- **Organ Donors and Recipients:**
 - A transplant can be **either from a pool of organs of deceased persons donated by their relatives or from a living person** who is known to the recipient.
 - In most cases, **the Act allows living donations from close relatives** such as parents, siblings, children, spouses, grandparents, and grandchildren.
- **Donations From Distant Relatives and Foreigners:**
 - **Altruistic donations from distant relatives**, in-laws, or long-time friends are allowed **after additional scrutiny** to ensure there is no financial exchange.
 - Living donations from close relatives **involving Indians or foreigners** must be accompanied by documents establishing their identities, family trees, and pictures that prove the donor-recipient relationship.
 - **Donors and recipients are also interviewed.**
- **Donations from Unrelated Persons:**
 - Donations from unrelated persons **require documents and photographic evidence** to prove their long-term association or friendship with the recipient.
 - These are **examined by an external committee** to prevent illegal dealings.
- **Fines and Punishments:**
 - Offering to pay for organs or supplying them for payment; initiating, negotiating, or advertising such arrangements; looking for persons to supply organs; and abetting in preparing false documents can **attract a jail term up to 10 years and a fine up to Rs 1 crore.**
- **Formation of NOTTO:**
 - **National Organ and Tissue Transplant Organization (NOTTO)** is a National level organization set up under Directorate General of Health Services, Ministry of Health and Family.
 - This has been mandated as per the **Transplantation of Human Organs (Amendment) Act 2011.**
 - National Network division of NOTTO would function as apex centre for All India activities of coordination and **networking for procurement and distribution of Organs and Tissues** and registry of Organs and Tissues Donation and Transplantation in the country.

What Do the THOT Rules, 2014 Say?

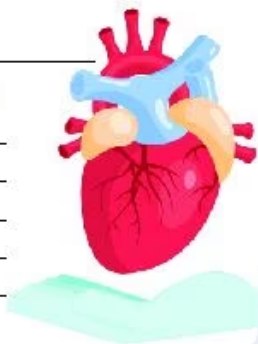
- **Authorisation Committee:**
 - Rule 7 of the 2014 Rules provides for the **constitution of the Authorisation Committee** and the nature of enquiry and evaluation conducted by it.
 - Rule 7(3) says the **Committee must ensure there is no commercial transaction involved** in cases where the donor and recipient are not near relatives.
 - Rule 7(5) says that if a recipient is in a critical condition and needs transplantation within a week, the hospital can be approached for an expedited evaluation.
- **Living Donor Transplantations:**
 - For living donor transplantations, **Rule 10 describes the application process**, which requires joint applications by the donor and recipient.
 - **Rule 21 requires the Committee to personally interview** applicants and determine their eligibility to donate.

What is the Authorisation Committee?

- **About:**
 - The Authorisation Committee **oversees and approves organ transplant procedures** involving donors and recipients who are not near relatives.
 - This approval is crucial, **especially in cases where organs are donated for reasons of affection, attachment, or other special circumstances**, to ensure ethical compliance and prevent illegal practices.
- **Composition:**
 - **Section 9(4)** of the Act, 1994 says the “composition of the Authorisation Committee shall be such as may be prescribed by the Central Government from time to time”.
 - **State government and Union Territories** “shall constitute one or more Authorisation Committee consisting of such members as may be nominated by the State Government and the Union Territories.”
- **Powers:**
 - Under Section 9(5), the Committee is **expected to conduct a thorough inquiry** while reviewing applications for transplant approval.
 - A crucial aspect of the inquiry is to **verify the authenticity of the donor and recipient**, and ensure that the donation is not driven by commercial motives.
- **Role of Parliament:**
 - Section 24 of the Act allows the Centre to make rules, **subject to [parliamentary approval](#)**, for carrying out the various purposes of the Act.
 - These can relate to the **manner and conditions under which a donor may authorise** the removal of their organs before death.
 - Also **how a brain-stem death is to be certified**, or the steps to be taken to preserve human organs removed from anyone, etc.

OVER 58,000 TRANSPLANTS IN LAST 5 YEARS

Year	Total transplants	Living donor transplants	Deceased donor transplants
2018	10,340	78.19%	21.81%
2019	12,666	83.72%	16.28%
2020	7,443	86.75%	13.25%
2021	12,259	86.78%	13.22%
2022	16,041	83.15%	16.85%



Highest number of living donor transplants*

Delhi	3,422
Tamil Nadu	1,690
Kerala	1,423
Maharashtra	1,222
West Bengal	1,059

Source: NOTTO

*In 2022

Highest number of deceased donor transplants*

Tamil Nadu	555
Telangana	524
Karnataka	478
Gujarat	398
Maharashtra	303

What did the High Court Decide?

▪ Constitution of Authorisation Committees

- The Act mandates state governments/Union Territories to form one or more authorisation committees, consisting of nominated members.
- High Court **underscores the necessity of it** to maintain the integrity and effectiveness of organ transplantation protocols.

▪ Timelines for Living Donor Transplantation Application:

- The high court stipulates that the timeline for processing living donor transplantation applications **should not exceed a maximum of 10 days** from the date of application.
- **Within a maximum of 14 days**, the **court mandates** the verification of documents concerning the domicile status of the recipient and donor.
- Any opportunity given to the donor or recipient to complete required documentation **must be communicated within the prescribed timeline** under the Rules.

▪ Scheduled Interviews and Family Meetings

- **After four to six weeks of receiving the application**, interviews should be scheduled within two weeks.
- The committee should conduct the interview, facilitate a family meeting, and convey the decision within this timeframe.
 - The court emphasizes that the entire process, **from submission to decision, should ideally not exceed six to eight weeks.**

▪ Recommendations to Government:

- The high court calls for the judgment to be presented to the Secretary, Ministry of Health and Family Welfare, ensuring the prescription of timelines for all steps in the consideration of organ donation applications, **after consulting relevant stakeholders.**