

# **Infection-derived and Vaccine-derived Immunity to SARS-CoV-2**

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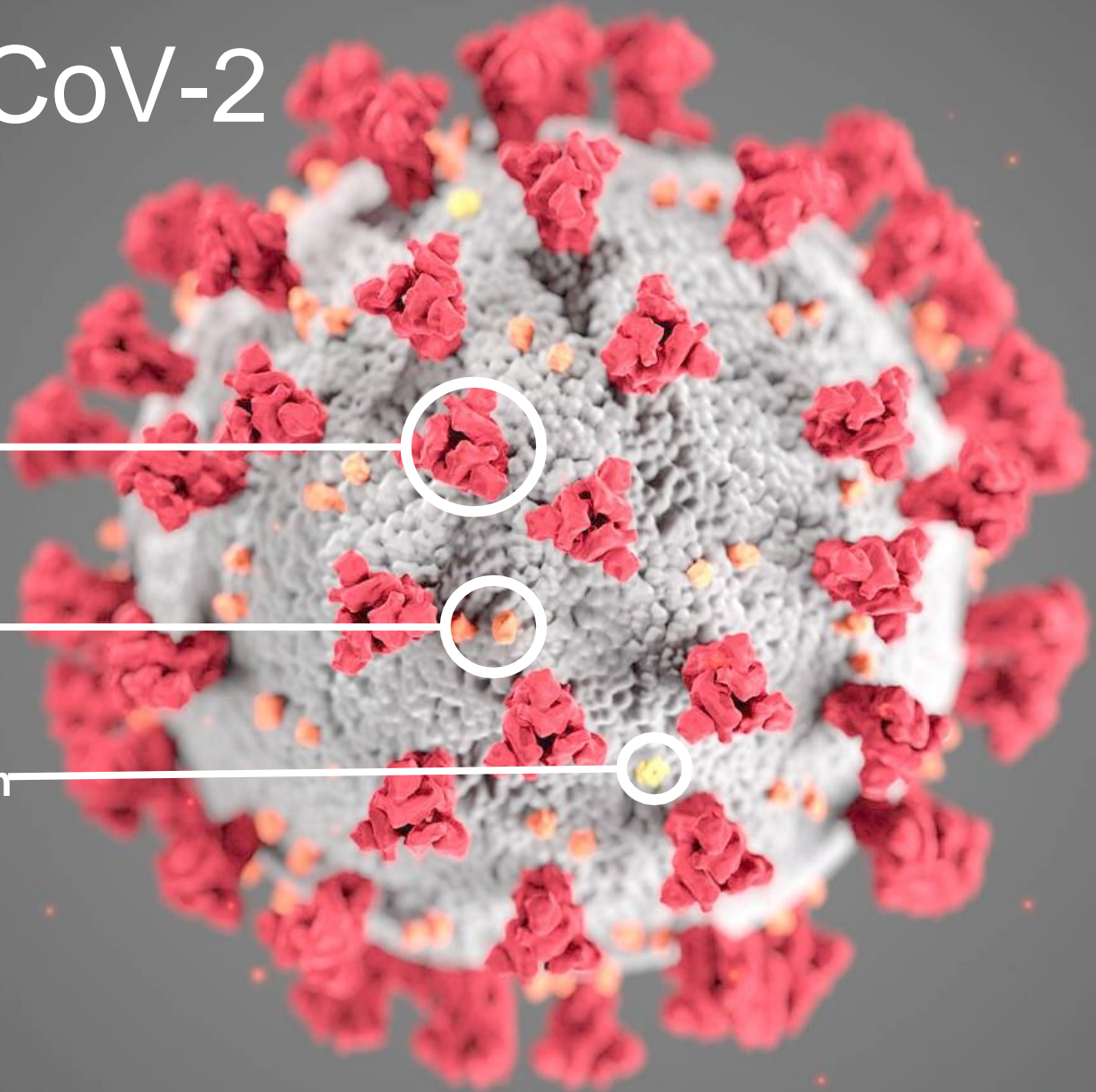
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# SARS-CoV-2

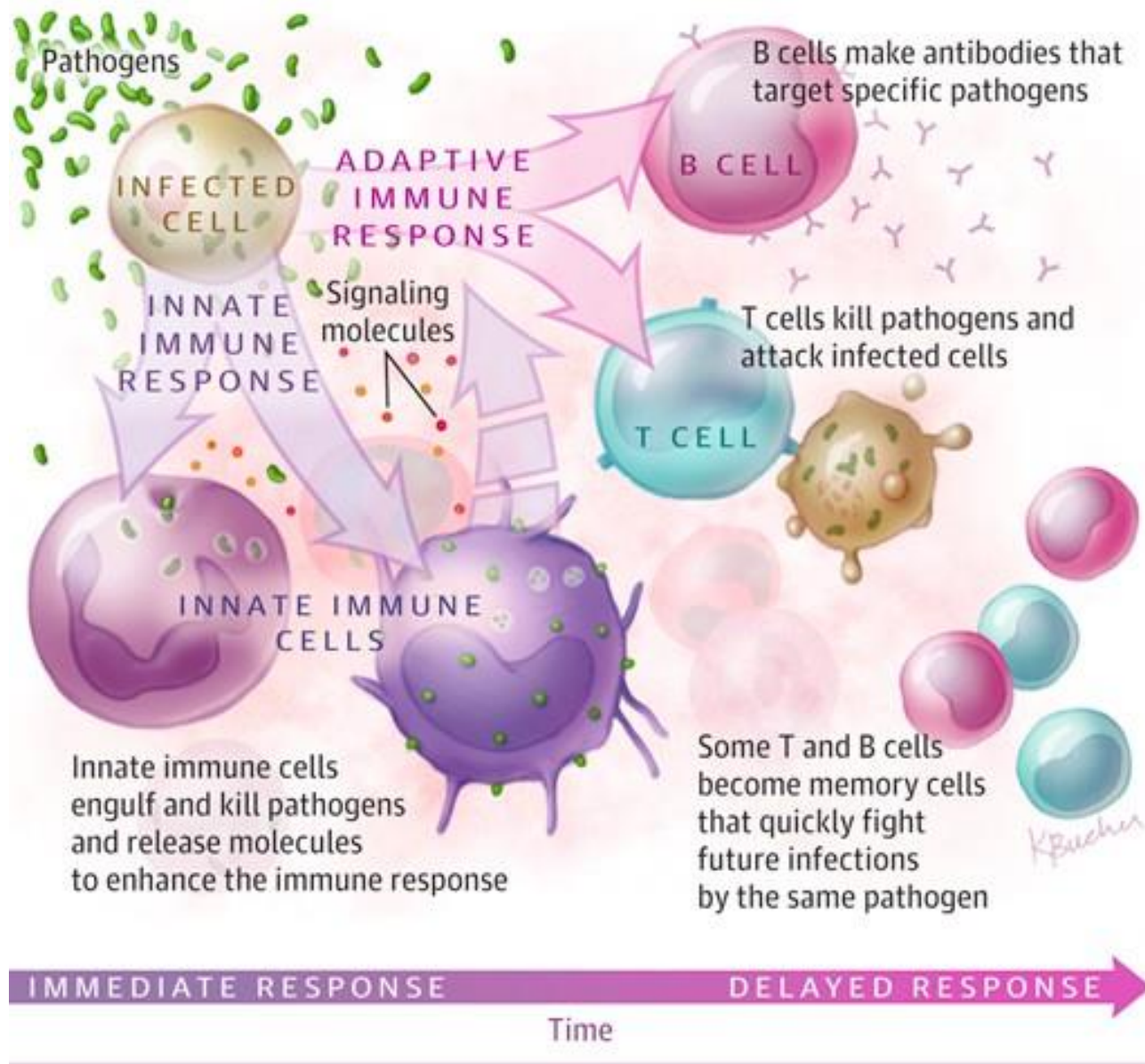
S protein

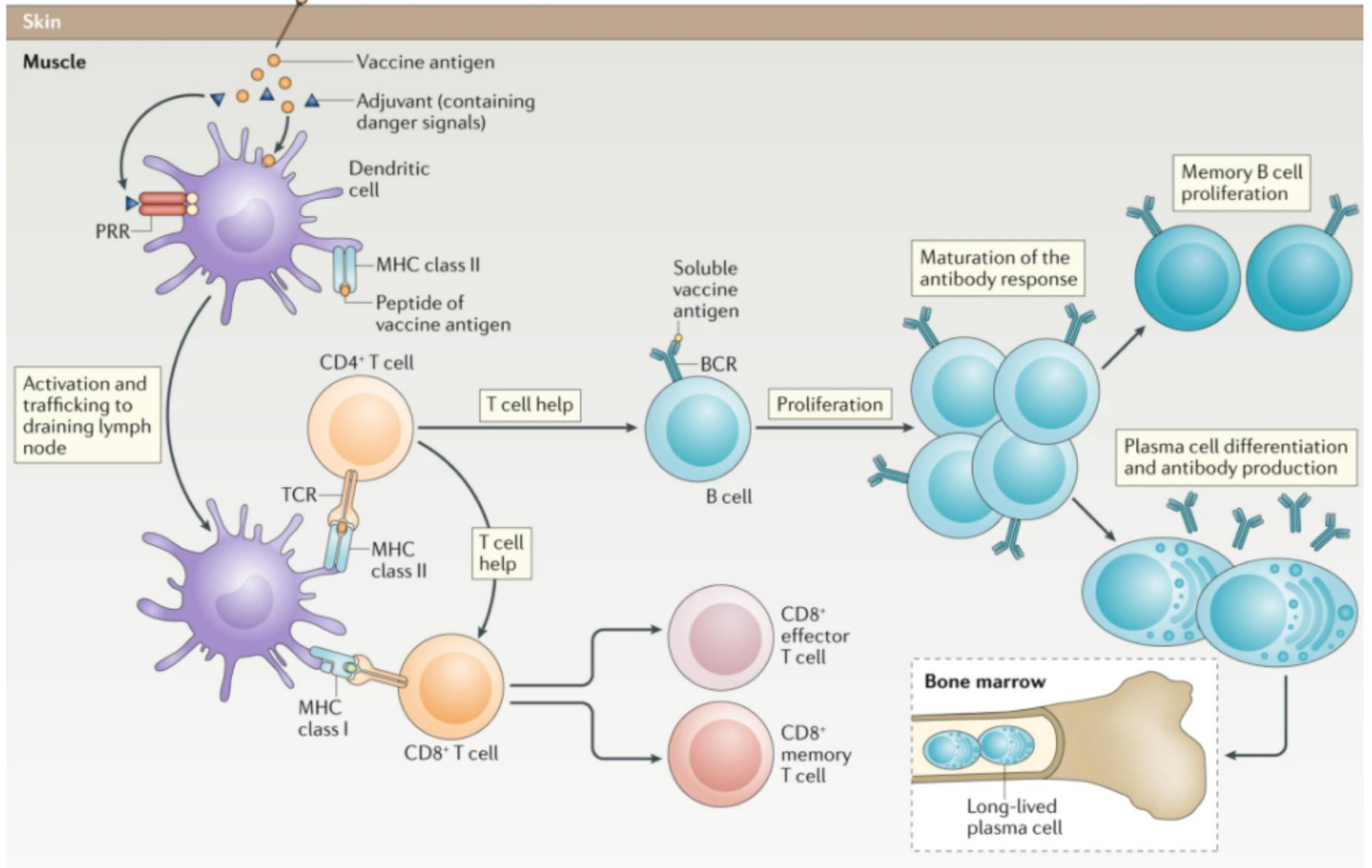
M protein

E protein



# The Immune Response



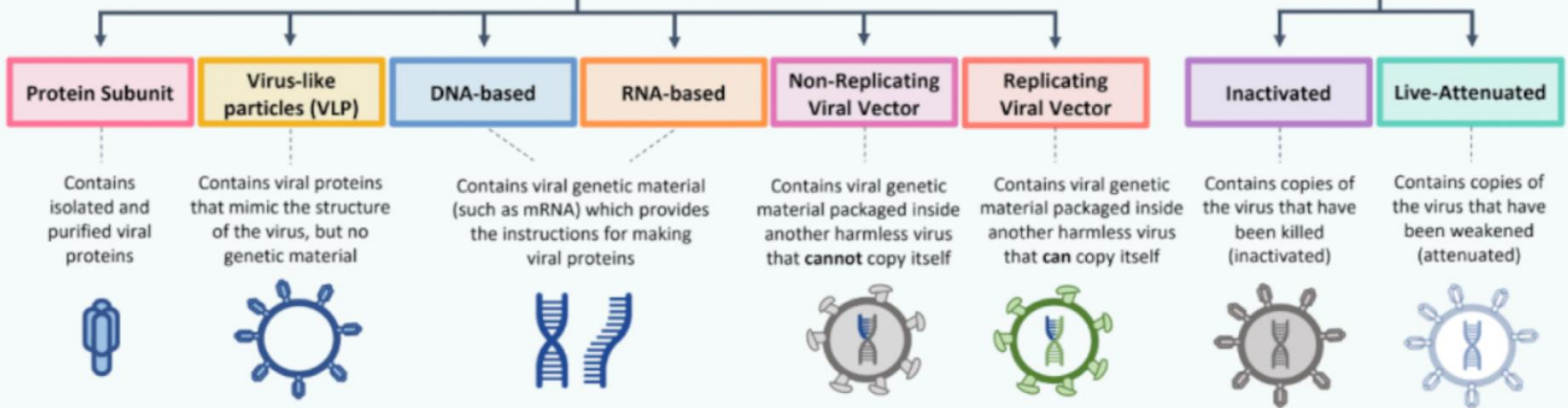




Vaccine platforms designed to train our immune system

TYPES OF COMPONENT VIRAL VACCINES

TYPES OF WHOLE VIRUS VACCINES



**SARS-CoV-2** is the **virus** that causes COVID-19. The **spike protein** on the surface of SARS-CoV-2 is an example of an **antigen**.

**Vaccines** are the best way to train our immune system to recognize viruses, or pieces of viruses, called **antigens**. Our immune system creates **antibodies** and other defenses to protect us.

When a vaccinated person is exposed to **SARS-CoV-2**, their immune system will recognize the viral antigens and spring into action to keep them healthy. There are many different types of vaccines, as shown above.

# COVID-19 Correlates of Protection

- Protection depends on the coordination of B-cell and T-cell responses
  - Antibody response includes total, neutralizing, and binding
- Antibody test results provide only a partial picture of an individual's immune response and protection
- The level of antibody, memory B-cell and T-cell response associated with protection against severe disease is unknown
- At this time there is no specific antibody test or antibody threshold that can clearly determine an individual's risk of infection or serious illness

# Immune Protection against SARS-CoV-2 after Vaccination and/or Infection

- How does the immune response against SARS- CoV-2 compare between vaccination and previous infection?
- How quickly does immunity wane over time?
- How do variants of concern impact the protection provided by vaccination, previous infection, or both?

# Immune Protection against SARS-CoV-2 after Vaccination and/or Infection

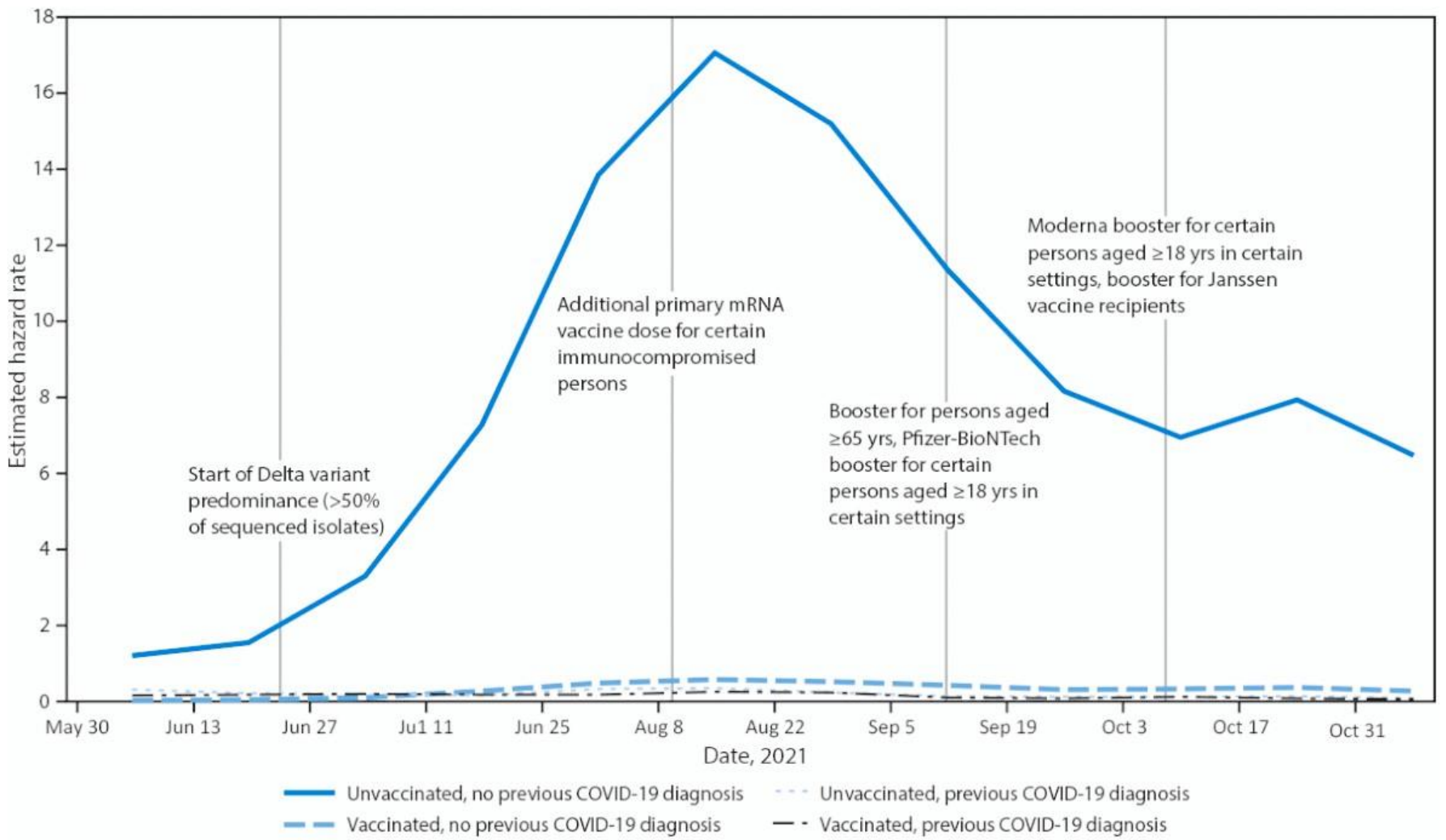
Date	Location	Dominant Variant	Main Finding(s)
Jan – Sept 2021	9 US States	Alpha, Delta	Unvaccinated people with a previous infection were over <b>5 times more likely</b> to have a positive COVID-19 test compared to vaccinated people with no previous infection
May – June 2021	Kentucky	Alpha	Among people with a previous infection, unvaccinated people were <b>2.3 times more likely</b> to be reinfected compared to fully vaccinated people



# Immune Protection against SARS-CoV-2 after Vaccination and/or Infection

Date	Location	Dominant Variant	Main Finding(s)
May 30- June 5, 2021	California	Alpha	COVID-19 cases were <b>2.5-fold higher</b> among unvaccinated people with a previous diagnosis compared to vaccinated people with no previous diagnosis
May 30- June 5, 2021	New York	Alpha	COVID-19 cases were <b>1.6-fold higher</b> among unvaccinated people with a previous diagnosis compared to vaccinated people with no previous diagnosis
Nov 14 – Nov 20, 2021	California	Delta	COVID-19 cases were <b>3.5-fold lower</b> among unvaccinated people with a previous diagnosis compared to vaccinated people with no previous diagnosis
Nov 14 – Nov 20, 2021	New York	Delta	COVID-19 cases were <b>4.7-fold lower</b> among unvaccinated people with a previous diagnosis compared to vaccinated people with no previous diagnosis

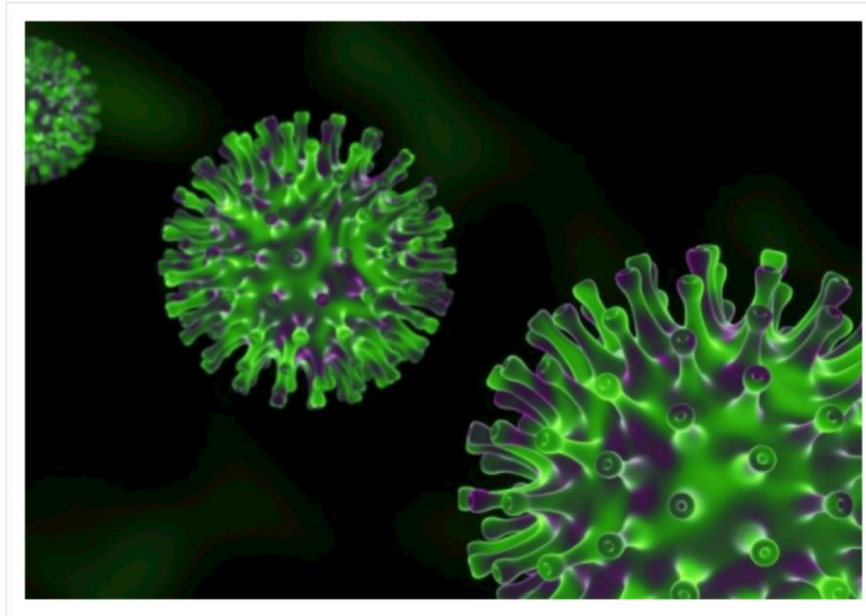
# Rate of COVID-19 Hospitalization, by Vaccination and Previous Diagnosis



# Omicron largely evades immunity from past infection or two vaccine doses

by [Emily Head](#), [Dr Sabine L. van Elsland](#)

17 December 2021

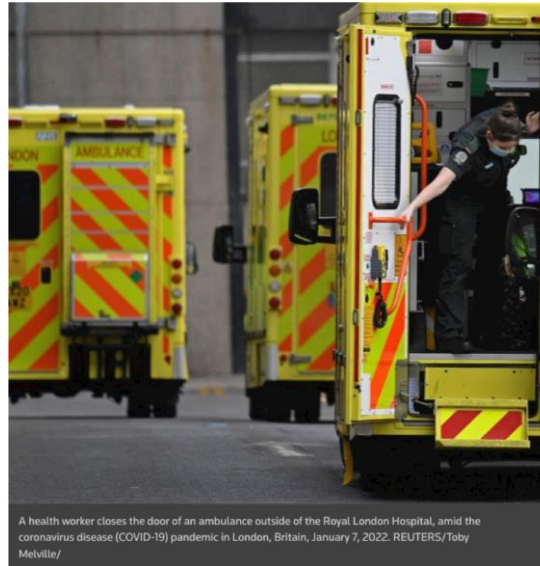


**The Omicron variant largely evades immunity from past infection or two vaccine doses according to the latest Imperial modelling.**

The [new report \(Report 49\)](#) from the Imperial College London COVID-19 response team estimates that the risk of reinfection with the Omicron variant is 5.4 times greater than that of the Delta variant. This implies that the protection against reinfection by Omicron afforded by past infection may be as low as 19%.

# A tenth of England's 2022 COVID cases suspected reinfections, data suggests

February 1, 2022



A health worker closes the door of an ambulance outside of the Royal London Hospital, amid the coronavirus disease (COVID-19) pandemic in London, Britain, January 7, 2022. REUTERS/Toby Melville/

LONDON, Feb 1 (Reuters) - Suspected reinfections account for around 10% of England's COVID-19 cases so far this year, a Reuters analysis suggests, after the UK Health Security Agency (UKHSA) changed how it calculates coronavirus data.

With increased numbers of people catching the disease again since the Omicron variant began to predominate at the end of 2021, Britain on Monday started incorporating possible COVID-19 reinfections into its daily data.

# Immune Protection against SARS-CoV-2 after Vaccination and/or Infection

- The immune response following vaccination and/or infection is complicated
- We are still trying to understand what it means
- Clearly, both play a role in immunity and clinical outcome is dependent on which variant
- SARS-CoV-2 immunology in humans is really more complicated than rocket science