An inventory of the vaccine candidates to SARS-CoV-2

Over 90 vaccine candidates are being developed as part of the global response to the COVID-19 pandemic. A snapshot of the eight different ways to elicit host immunity with vaccines under development is given in a guide by Ewen Callaway in a recent Nature article. Candidates can take the form of inactivated virus, viral vectors, nucleic acid, protein/peptide based and virus like particles. Some have already entered phase I and others remain in the exploratory stage. There is also a concerted effort to form public-private partnerships to speed up the process.
VACCINE BASICS: HOW WE DEVELOP IMMUNITY

The body’s adaptive immune system can learn to recognize new, invading pathogens, such as the coronavirus SARS-CoV-2.

1. Virus enters the body

Coronavirus

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Coronavirus infection

The virus uses its surface spike protein to lock onto ACE2 receptors on the surface of human cells. Once inside, these cells translate the virus’s RNA to produce more viruses.

2. Virus enters a cell

Virus ingested by antigen-presenting cell (APC)

Immune response

Specialized ‘antigen presenting cells’ (APCs) engulf the virus and display portions of it to activate T-helper cells.

3. Virus fuses with vesicle and its RNA is released

T-helper cells enable other immune responses:

B cells make antibodies that can block the virus from infecting cells, as well as mark the virus for destruction.

Cytotoxic T cells identify and destroy virus-infected cells.

4. Virus assembly

Viral RNA translated into proteins

Viral peptide

B cell

Anti-coronavirus antibody

Virus from binding, or tags it for destruction

Cytotoxic T cell

Destroys infected cells

5. Virus release

Long-lived ‘memory’ B and T cells that recognize the virus can patrol the body for months or years, providing immunity

*Simplified

Graphics: Nik Spencer/Nature
Source: Callaway 2020 Nature

References

- Thanh Le et al., 2020. The COVID-19 vaccine development landscape, Nature

*Article by Clive Gray*