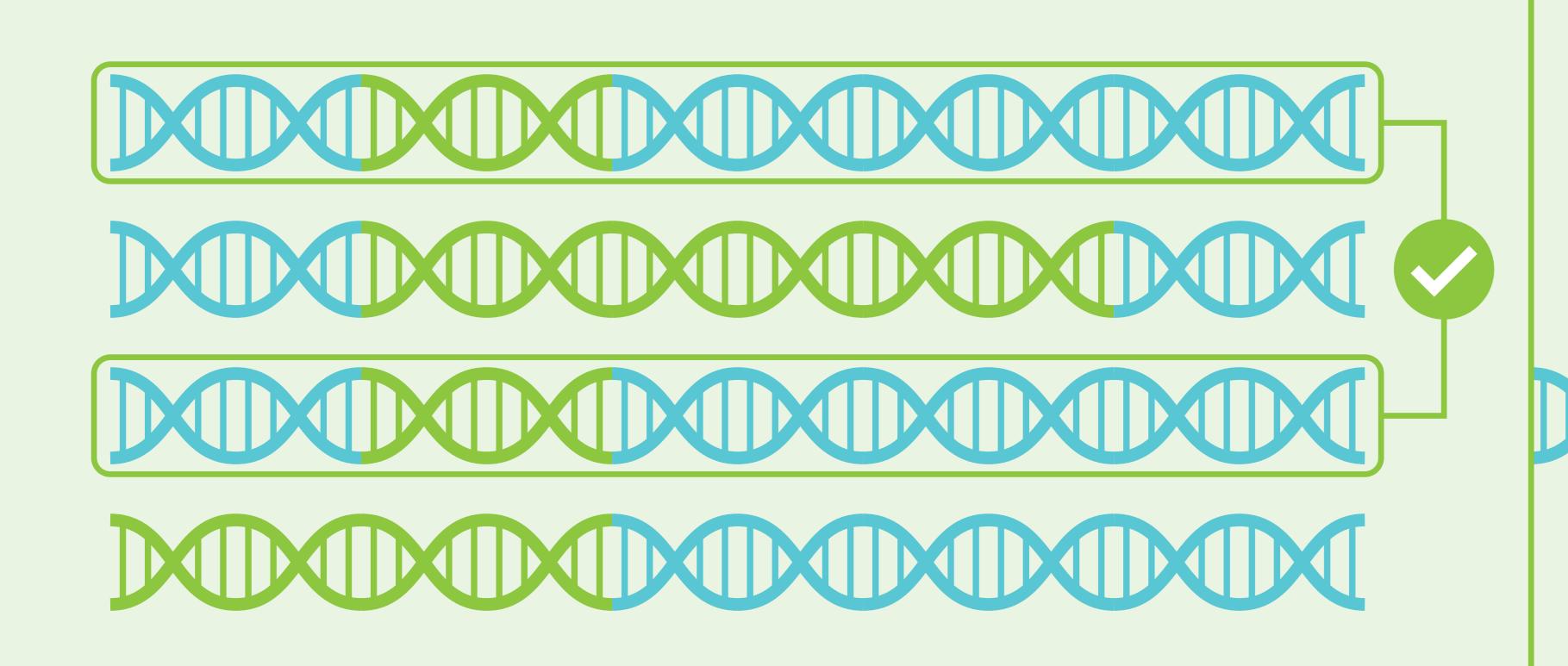
# TOOLS & TECHNIQUES

Speeding Up Advancements in Biology

Detection of viral infection in individuals and vaccine development both involve technological tools to complete the processes quickly and correctly.

### Biological Tools and Techniques



#### **Basic Local Alignment Search Tool (BLAST)**

BLAST is a program that compares genetic materials and proteins to determine similarities between samples obtained from different species.



BLAST can be used to identify species and determine relationship between species, for example, determining the relationship between SARSCoV-2 and other coronavirus with bat origin!

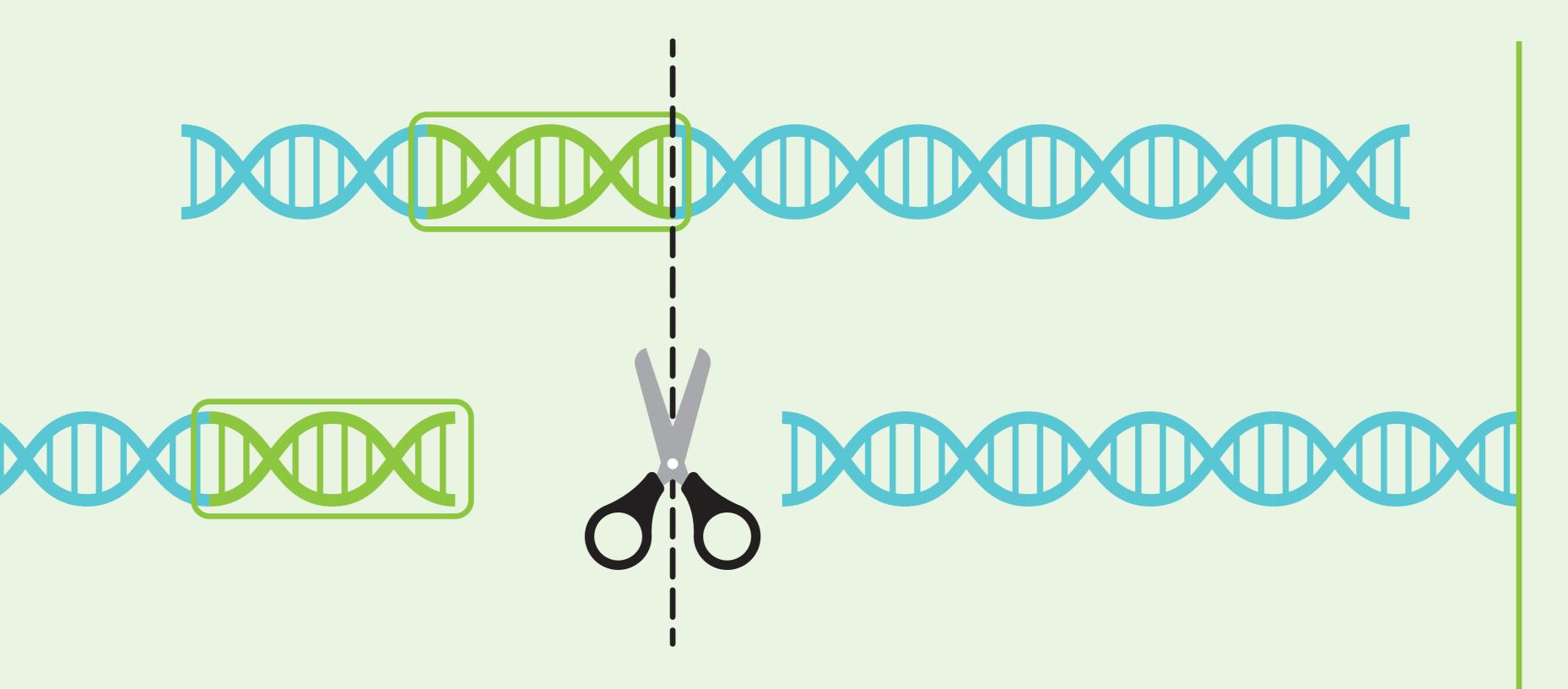


BLAST can speed up vaccine development by providing information on target proteins required in the process, and filtering out other unwanted information.



#### **Pocket Fact:**

BLAST program utilizes database that contains information on a vast range of species including mammals, insects and bacteria!



## Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)

CRISPR is a tool used to target and remove specific sections in genetic material.



CRISPR can be used to develop rapid tests for virus detection, including SARS-CoV-2 infection!



In order to produce dead or weakened viruses to be added into vaccines, viruses are grown in cells. The antiviral properties of living cells can potentially be deactivated using CRISPR.



#### **Pocket Fact:**

CRISPR exists naturally in many unicellular organisms as part of their defense mechanism, which also destroys viruses!



#### Virus Hunter Icon:

Jennifer Doudna, a biochemist, won a Nobel prize for her discovery of CRISPR. She shares her honour with Emmanuelle Charpentier, making them the first all-female team in history to win a Nobel science prize!





## Reverse Transcription-Polymerase Chain Reaction (RT-PCR)

RT-PCR is a method used to produce DNA using RNA, and making multiple copies from a limited amount of DNA.



#### **Try This:**

Fill in the blank: DNA and RNA are different forms of \_\_\_\_\_.



RT-PCR is currently in use globally to detect COVID-19 infection!

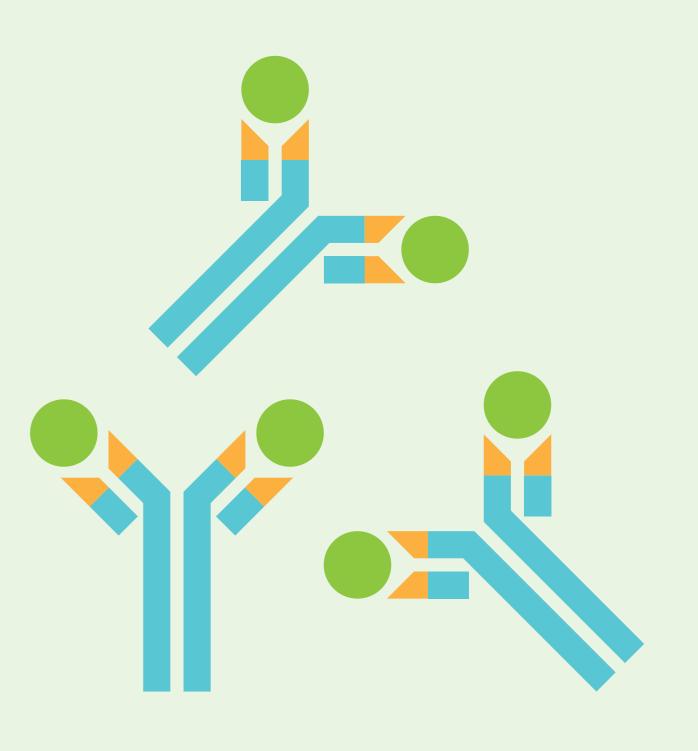


RT-PCR can be used to control quality of vaccines by determining the amount of viruses they contain!



#### **Pocket Fact:**

RT-PCR was also previously used to detect virus in body fluids to determine Nipah virus infection in Malaysia!



#### Enzyme-linked Immunosorbent Assay (ELISA)

ELISA is a highly specific test used to determine the presence of a particular substance.



Similarly, ELISA can be used to measure antibodies in the body to determine virus infection in the body!



ELISA is used to measure antibodies produced in response to the vaccine, during vaccine development process.



#### **Pocket Fact:**

ELISA is used to detect antibody and determine viral infection because our bodies produce antibodies in response to viral infection and disease!



#### What's Next?

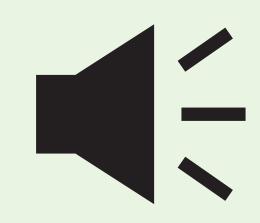
From virus identification, diagnosis of infectious diseases, to vaccine development, there are multiple pathways to contribute as a virus hunter.

Let's continue virus hunting!

### Learn about CRISPR technology!

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The ODIN CRISPR kit was created by Josiah Zayner, a biohacker, who believes in the importance of access to scientific experimentation for everyone. This kit includes everything needed to make precision genome edits in bacteria including Cas9, tracrRNA, crRNA and Template DNA template. This CRISPR technology and its future advances will enable treatment for individual patients (personalised medicine) and most importantly, the discovery of new drugs for dozens of intractable diseases.



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