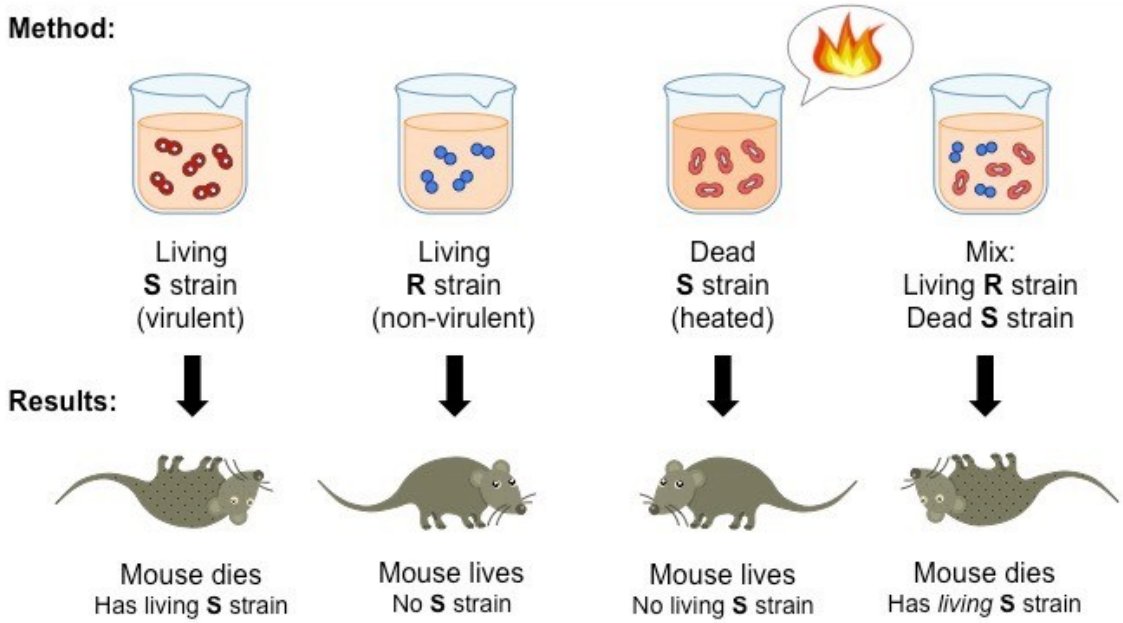
DNA is the genetic material

Griffith's experiment : Conducted in 1928 by Frederick Griffith; was the first experiment suggesting that bacteria are capable of transferring genetic information through a process known as transformation. Griffith's findings were followed by research in the late 1930s and early 40s that isolated DNA as the material that communicated this genetic information.

Griffith was studying the possibility of creating a vaccine for pneumonia. He used two strains of pneumococcus (*Streptococcus pneumoniae*) bacteria which infect mice – a type III-S (smooth) which was virulent (causing disease), and a type II-R (rough) strain which was non virulent. The III-S strain synthesized a polysaccharide capsule that protected itself from the host's immune system, resulting in the death of the host, while the II-R strain did not have that protective capsule and was defeated by the host's immune system.

In this experiment, bacteria from the type III-S strain were killed by heat, and their remains were added to type II-R strain bacteria. While neither alone harmed the mice, the combination was able to kill its host. Griffith was also able to isolate both live II-R and live III-S strains of pneumococcus from the blood of these dead mice. Griffith concluded that the type II-R had been "transformed" into the lethal III-S strain by a "transforming principle" that was somehow part of the dead III-S strain bacteria. He had no idea of that transforming agent. (Today, we know that the "transforming principle" Griffith observed was the DNA of the III-s strain bacteria. While the bacteria had been killed, the DNA had survived the heating process and was taken up by the II-R strain bacteria. The III-S strain DNA contains the genes that form the smooth protective polysaccharide capsule. Equipped with this gene, the former II-R strain bacteria were now protected from the host's immune system and could kill the host.)



Griffith's experiment discovering the "transforming principle" in pneumococcus bacteria.

The exact nature of the transforming principle (DNA) was verified in the experiments done by Avery, McLeod and McCarty and by Hershey and Chase.

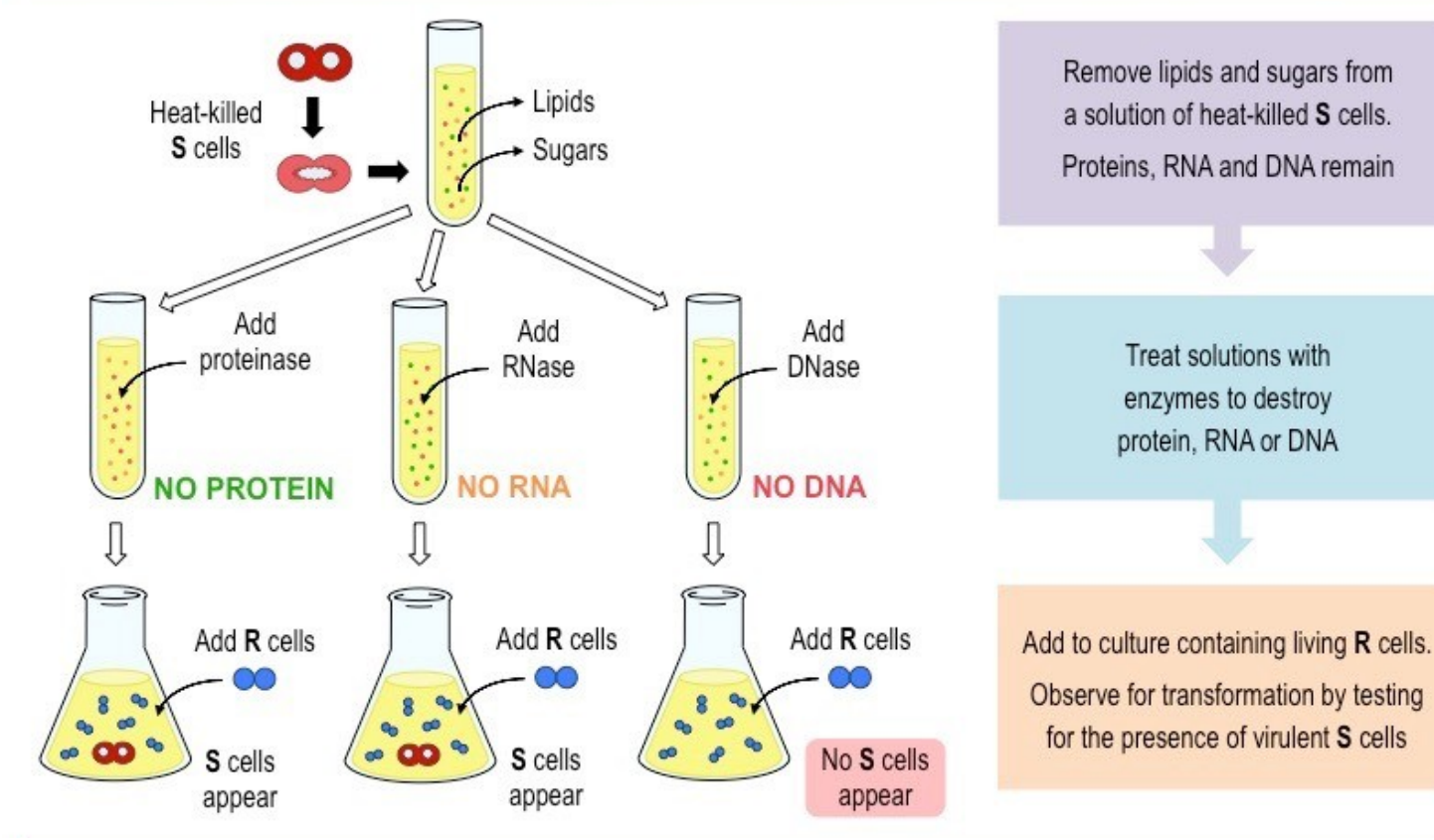
Avery, MacLeod and McCarty Experiment :

Oswald Avery and colleagues expanded upon the findings of Frederick Griffith to demonstrate that DNA is the genetic material

- They prepared cultures containing the heat-killed **S** strain and then removed lipids and carbohydrates from the solution
- Next they treated the solutions with different digestive enzymes (DNase, RNase or protease) to destroy the targeted compound
- Finally, they introduced living **R** strain cells to the culture to see which cultures would develop transformed **S** strain bacteria.
  Only in the culture treated with DNase did the **S** strain bacteria fail to grow (i.e. no DNA = no transformation)
- This indicated that DNA was the genetic component that was being transferred between cells

Despite this finding, the scientific community was reluctant to accept the role of DNA as a genetic material

- It was only 8 years later, when Hershey and Chase conducted their experiment, that the concept gained attention and support.



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