Conclusion: A chemical substance from one cell is genetically transforming another cell

Avery - MacLeod - McCarty Experiment:

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

→ They prepared cultures containing the heat killed S strain and then removed lipids and carbohydrates from the solution.

→ Next they treated the solution with different digestive enzymes (DNase, RNase or protease) to destroy the targeted compounds.

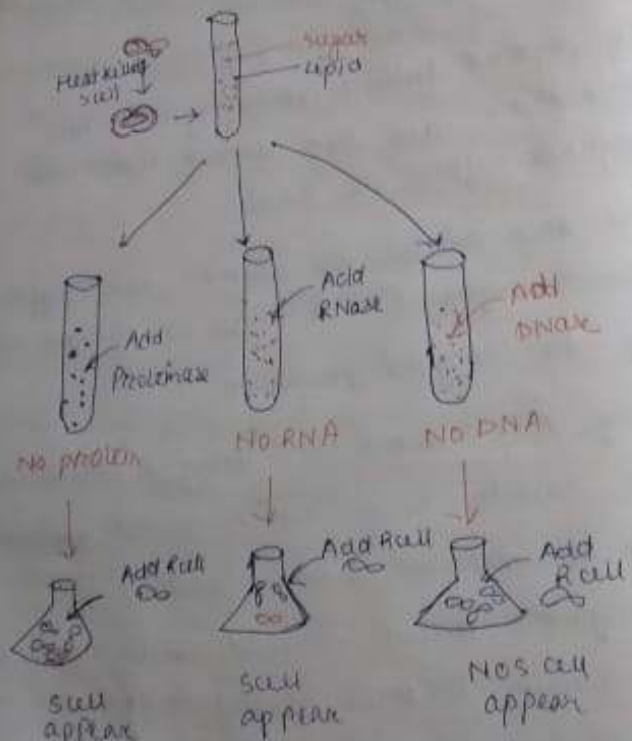
→ Finally, they introduced living R strain cells to the culture to see which culture (or would develop transformed S strain bacteria.

Only in the culture treated with DNase did the S strain bacteria to fail to grow (ie, no DNA = no transformation)

→ This indicated that DNA was genetic

component that was being transferred between cells.

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



Remove lipids and sugars from a coat of heat killed S cells. Proteins, RNA and DNA remain

↓

Treat solutions with Enzyme to destroy protein, RNA and DNA

↓

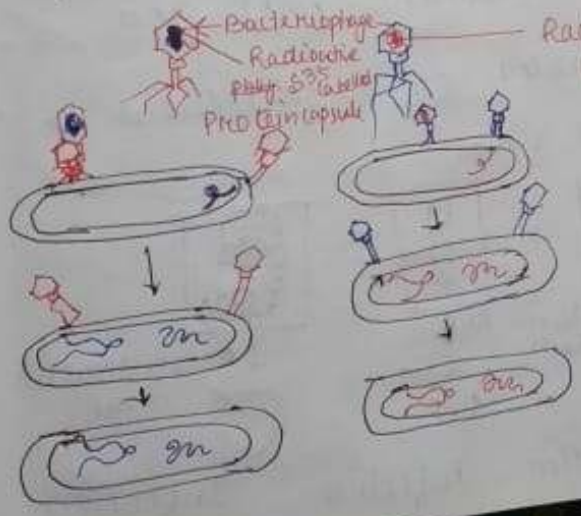
Add to culture containing living R cells. Observe for transformation by testing for presence of virulent S cells.

Conclusion: Transformation requires DNA therefore it is genetic material of all

contained radioactive protein but not radioactive DNA because DNA doesnot contain sulphur.

Radioactive phages were allowed to attach to E. coli bacteria. Whether infection proceed, the viral coats were removed from the bacteria by agitating them in a blender. The virus particles were separated from bacteria by spinning them in a centrifuge.

Bacteria which was infected with virus that had radioactive DNA were radioactive, indicating that DNA was the material that passes from bacteriophage virus to bacteria. Bacteria which were infected with virus that had protein but not radioactive. This indicates that protein donot enter the bacteria from virus. So, this proved that DNA is genetic material passes from virus to bacteria.



1. Infection
2. Blending
3. Centrifugation

obtained.

In one experiment, two viruses used were tobacco mosaic virus (TMV) and Holmes rib-grass virus (HRV). Reciprocal hybrid using RNA of one strain and protein of the other strain is obtained. It was found that when these hybrids were used for infection, the progeny had proteins which corresponded to virus from which RNA infecting virus particles was derived.

DNA (Deoxyribonucleic Acid)

Occurence: DNA is found in the cells of all living organism except plant virus. In bacteriophages and virus there single molecule of DNA found, which remain coiled and is

Viruses with single stranded genome (RNA) use a single strand as a template and synthesize a complementary single strand of DNA. This complementary single strand DNA in turn, they synthesize its complementary strand and forms a double stranded DNA.

Techniques were first developed for separating TMV particles into RNA and proteins. Later by using RNA and protein separately in tests for infectivity it could be shown that RNA alone was able to cause infection. Such property was not found in the protein fraction.

When the cell debris (protein coat) of the virus was introduced into tobacco leaf, the leaf remained healthy. When all filtrate (nucleic acid) was injected into tobacco leaf, it was infected with the virus and died. This shows that the RNA is causing the infection and not the protein. The progeny viruses produced were always found to be phenotypically and genotypically identical to the parent strain from which the RNA had

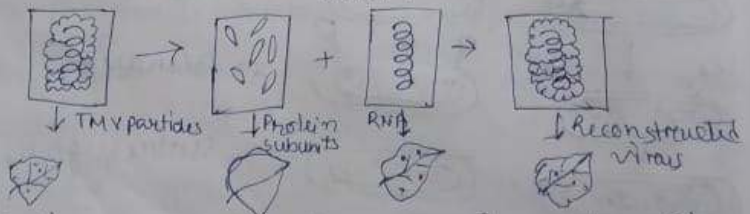
No Radioactive ^{35}S detected in cells
+
Radioactive ^{35}S detected as supernatant

Radioactive ^{32}P detected in cells
+
No Radioactive detected as supernatant

Fig: Hershy-Chase experiment

Fraenkel-Conrat's Experiment:

* They were working with TMV in 1957 to prove that RNA can act as genetic material. They performed this experiments with Tobacco Mosaic Virus (TMV). TMV doesnot contain DNA. It only consist of RNA surrounded by hollow cylinder of protein subunits. They found that the virus could be broken into component part and they could resembled or reconstituted to form a functional virus.



Hershey - chase experiment :

It is basically for proffing the DNA is a genetical material came from the experiment of Alfred Hershey and Martha Chase (1952). They worked with virus that infect bacteria called bacteriophage.

Bacteriophage enters within bacteria and their genetic material enters also. The bacterial cell treats the viral genetic material as if it was its own and subsequently manufac-ture more virus particles. They (scientist) work to discover whether it was protein or DNA from the viruses that entered to bacteria. They grew some virus on a medium that contained radioactive phosphorus and some others on medium that contained radioactive sulphur. Virus grow in presence of phosphorus contained radioactive DNA but not radioactive protein because DNA contain phosphorus but protein does not. Similarly, viruses grown on radioactive sulphur

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