A.D. Hershey and Martha Chase (1952). Independent Function of

Viral Protein and Nucleic Acid in Growth of Bacteriophage.

Journal of General Physiology. 36: 39-56.

A.D. Hershey and Martha Chase

Presented By:
Jordan Dinn
Keelia Farrell
Meghan O'Leary
Donald Shepherd

Background

Alfred Day Hershey (1908-1997) and Martha Chase (1928-2003)

Genetics timeline

1865 - Gregor Mendel- heredity is transmitted in units

1869 - Frederick Miescher - isolates DNA or “nuclein” from cells

1879- Walter Flemming - chromosome behaviour during cell division described

1902- Waltor Sutton - observed that chromosome segregate in a pattern that match Mendels segregation pattern.

1911- Thomas Hunt Morgan - use *Drosophila melanogaster* to show chromosomes carry genes.

Around this time people many people realized that chromosomes must be part of the heredity material. But, since chromosomes are made of both protein and DNA, the question still remained as to which of the two conferred heritable information.

1928- Frederick Griffith
- showed that heat killed virulent bacteria can transform a non-virulent strain.

1944- Avery, MacLeod, McCarty - report they have isolated the transforming principle in Griffiths experiment and that the principle is DNA.

1950- Erwin Chargaff - discovered one to one ratio of adenine/thymine and cytosine/ guanine

1951- Rosalind Franklin - obtained sharp X-ray diffraction photos of DNA.

Even though Avery, MacLeod, and McCarty showed that DNA was the molecule of heredity, many individuals where still skeptical. The relative complexity of proteins, with 20 amino acids and diverse configurations, compared to DNA, with 4 subunits and a linear structure, made a strong case for proteins.

So the question of the day was, once and for all….

Is DNA or protein the molecule of heredity?

The Experiment:

1. Preparation of radioactive phage
2. Osmotic shock experiments
3. Freezing and thawing experiments
4. Experiments with bacterial debris
5. Waring blender experiments
6. Transfer of parental radioactivity to progeny
7. Phage inactivation by formaldehyde

Conclusion:

"The sulfur-containing protein of resting phage particles is confined to a protective coat that is responsible for the adsorption to bacteria, and functions as an instrument for the injection of the phage DNA into the cell. This protein probably has no function in the growth of intracellular phage. The DNA has some function. Further chemical inferences should not be drawn from the experiments presented."