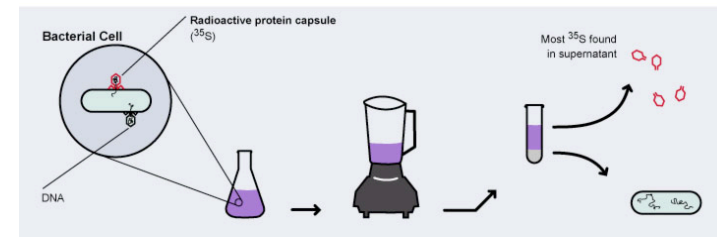


## The Hershey-Chase Blender Experiment

- a simple and classic experiment!
- performed by Alfred Hershey and Martha Chase at Cold Spring Harbor Laboratory in New York in 1952
- published: AD Hershey and M Chase "Independent functions of viral protein and nucleic acid in growth of bacteriophage" *Journal of General Physiology* 36: 39-56 (May 1952)
- using *Escherichia coli* (*E. coli*) bacteria and T-group bacteriophages (phages or bacterial viruses)
- cultures of *E. coli* were grown in media that contained as the only source of sulfur, radioactive S-35 sulfur in sulfate form
- and cultures of *E. coli* were grown in media that contained as the only source of phosphorus, radioactive P-32 phosphorous in phosphate form
- such bacterial cells will have all their sulfur and phosphate, respectively, radioactive
- infect these radioactive bacteria with phages
- progeny phages will be radioactive
- phages radioactive with S-35 will have all the radioactivity confined to proteins, since sulfur occurs in two amino acids (cysteine and methionine) but not in DNA
- phages radioactive with P-32 will have all the radioactivity confined to DNA, since phosphorus occurs in DNA but not in protein
- now, new cultures of *E. coli* are infected with S-35 and P-32 phages, respectively
- allow a few minutes post-infection for phages to attach to bacteria and begin the infection process
- do low-speed centrifugation to separate any unattached phages and discard the supernatant (this step is not shown in figure)
- whirr for several minutes in blender
- the shearing forces of whirring in the blender break the virus particles away from the bacterial surface
- centrifuge to separate virus into supernatant and bacteria into pellet
- found:
  - for S-35 radioactive preparation, the radioactivity is in the supernatant
  - for P-32 radioactive preparation, the radioactivity is in the pellet

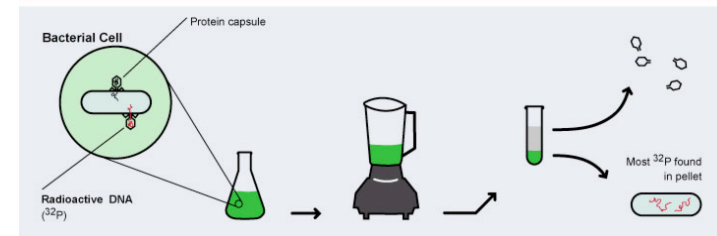
- conclusions:
  - viral DNA enters the bacterial cell during infection
  - viral protein does not enter the bacterial cell during infection
  - therefore, DNA must be the viral genetic material



Labeled phages infect bacteria.

Blender separates phages outside the bacteria from the cells and their contents

Cells and Phages are separated by centrifugation.



"... Al Hershey had sent me a long letter summarizing the recently completed experiments by which he and Martha Chase established that a key feature of the infection of a bacterium by a phage was the injection of the viral DNA into the host bacterium. Their experiment was thus a powerful new proof that DNA is the primary genetic material."

*The Double Helix* by James Watson (page 72)