

Question 4

You are isolating new viruses, one of which you set aside to study further. You measure the amounts of each nucleotide in this virus and determine the following...

A=20%, G=30%, T=0%, C=30% and U=20%

a) What does this suggest about this viral genome?

You find a very interesting virus that can infect *E. coli* that you name *Soxrule* bacteriophage. You measure the amounts of each nucleotide in the *Soxrule* viral genome and determine the following...

A=18%, G=32%, T=18%, C=32% and U=0%

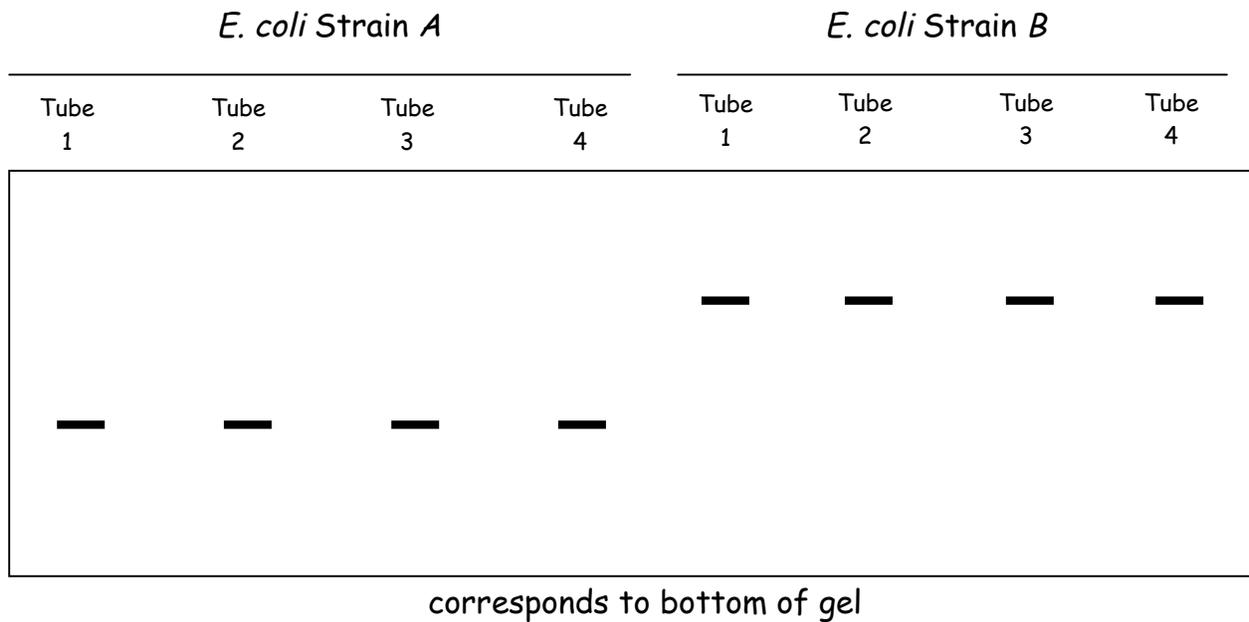
b) What does this suggest about this *Soxrule* genome?

c) After infecting *E. coli* with the *Soxrule* virus, you don't see any lysis until after many rounds of cell division. What is going on and why is it advantageous for the virus?

You perform the following experiment:

- 1) Dilute a culture of *E. coli* strain A into four test tubes.
- 2) Dilute a culture of *E. coli* strain B into four test tubes.
- 3) Infect all eight test tubes having the two different bacterial strains with the *Soxrule* bacteriophage and incubate them for several generation times.
- 4) Wash the cells in each tube to remove unattached bacteriophage particles.
- 5) Purify the **chromosomal** DNA from the cells in each tube and cut with *Cla* I restriction enzyme. (You've already determined that the *Soxrule* genome has no *Cla* I restriction sites.)
- 6) Load the chromosomal DNA digests onto an agarose gel and perform electrophoresis.
- 7) Transfer the separated DNA fragments from the gel to a nitrocellulose filter.
- 8) Probe the filter with radioactively labeled viral DNA.
- 9) Place the filter on X-ray film and develop after overnight exposure.

You observe the following autoradiogram that you label with corresponding information from how you loaded the gel:



d) Does the *Soxrule* genome integrate into the bacterial genome?

In strain A? yes / no

In strain B? yes / no

e) If the *Soxrule* genome integrates into the bacterial chromosome, does the integration occur randomly or at specific site?

In strain A? random / specific

In strain B? random / specific

f) Explain the differences in the data derived from the two strains that is highlighted in the autoradiogram above.

Question 4

You are isolating new viruses, one of which you set aside to study further. You measure the amounts of each nucleotide in this virus and determine the following...

A=20%, G=30%, T=0%, C=30% and U=20%

a) What does this suggest about this viral genome?

That it has a double stranded RNA genome.

You find a very interesting virus that can infect *E. coli* that you name *Soxrule* bacteriophage. You measure the amounts of each nucleotide in the *Soxrule* viral genome and determine the following...

A=18%, G=32%, T=18%, C=32% and U=0%

b) What does this suggest about this *Soxrule* genome?

That it has a double stranded DNA genome.

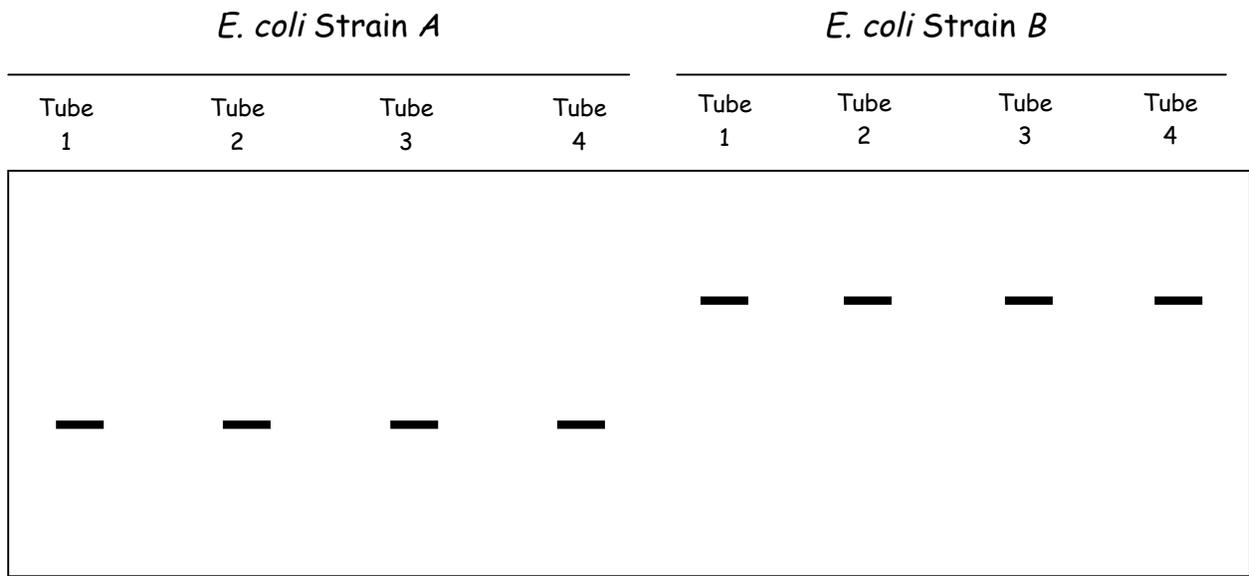
c) After infecting *E. coli* with the *Soxrule* virus, you don't see any lysis until after many rounds of cell division. What is going on and why is it advantageous for the virus?

The virus is undergoing lysogeny, remaining dormant until a later time. After the cell divides, each time now as a lysogen, when the virus becomes lytic there will be many more viral particles emerging as there will be many more infected cells. For instance, the bacteriophage can choose lysogeny in a cell as long as there are nutrients available but it may choose later to lyse the cells when the environment becomes less nourishing and thus jump ship and be released into the surroundings looking for new host cells.

You perform the following experiment:

- 1) Dilute a culture of *E. coli* strain A into four test tubes.
- 2) Dilute a culture of *E. coli* strain B into four test tubes.
- 3) Infect all eight test tubes having the two different bacterial strains with the *Soxrule* bacteriophage and incubate them for several generation times.
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- 7) Transfer the separated DNA fragments from the gel to a nitrocellulose filter.
- 8) Probe the filter with radioactively labeled viral DNA.
- 9) Place the filter on X-ray film and develop after overnight exposure.

You observe the following autoradiogram that you label with corresponding information from how you loaded the gel:



corresponds to bottom of gel

d) Does the *Soxrule* genome integrate into the bacterial genome?

In strain A? yes / no

In strain B? yes / no

e) If the *Soxrule* genome integrates into the bacterial chromosome, does the integration occur randomly or at specific site?

In strain A? random / specific

In strain B? random / specific

f) Explain the differences in the data derived from the two strains that is highlighted in the autoradiogram above.

Because all four tubes from each strain show the same size Cla I fragment that hybridizes to the viral genome, this indicates that the viral genome integrates into the same locus in the chromosome. Although the virus goes into a very specific site, this site is either located differently between the two E. coli strains, or more likely, one of the E. coli strains has either lost (Strain B) or acquired (Strain A) a new Cla I site. This is reflected by the viral genome showing up in two different sized Cla I fragments.