10.1: General Characteristics of Viruses

Skills to Develop

1. State 2 living and 2 nonliving characteristics of viruses.
2. List 3 criteria used to define a virus.
3. Discuss why bacteria can be cultivated on synthetic media such as nutrient broth whereas viruses cannot.
4. Define bacteriophage.

Viruses are infectious agents with both living and nonliving characteristics. They can infect animals, plants, and even other microorganisms. Viruses that infect only bacteria are called bacteriophages and those that infect only fungi are termed mycophages. There are even some viruses called virophages that infect other viruses.

<table>
<thead>
<tr>
<th>Living Characteristics of Viruses</th>
<th>Nonliving Characteristics of Viruses</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. They reproduce at a fantastic rate, but only in living host cells.</td>
<td>a. They are acellular, that is, they contain no cytoplasm or cellular organelles.</td>
</tr>
<tr>
<td>b. They can mutate.</td>
<td>b. They carry out no metabolism on their own and must replicate using the host cell's metabolic machinery. In other words, viruses don't grow and divide. Instead, new viral components are synthesized and assembled within the infected host cell.</td>
</tr>
<tr>
<td></td>
<td>c. The vast majority of viruses possess either DNA or RNA but not both.</td>
</tr>
</tbody>
</table>

Recently, viruses have been declared as living entities based on the large number of protein folds encoded by viral genomes that are shared with the genomes of cells. This indicates that viruses likely arose from multiple ancient cells.
The vast majority of viruses contain only one type of nucleic acid: DNA or RNA, but not both. Virus are totally dependent on a host cell for replication (i.e., they are strict intracellular parasites.) Furthermore, viral components must assemble into complete viruses (virions) to go from one host cell to another. Since viruses lack metabolic machinery of their own and are totally dependent on their host cell for replication, they cannot be grown in synthetic culture media. Animal viruses are normally grown in animals, embryonated eggs, or in cell cultures where in animal host cells are grown in a synthetic medium and the viruses are then grown in these cells.

Summary

1. Viruses are infectious agents with both living and nonliving characteristics.
2. Living characteristics of viruses include the ability to reproduce – but only in living host cells – and the ability to mutate.
3. Nonliving characteristics include the fact that they are not cells, have no cytoplasm or cellular organelles, and carry out no metabolism on their own and therefore must replicate using the host cell’s metabolic machinery.
4. Viruses can infect animals, plants, and even other microorganisms.
5. Since viruses lack metabolic machinery of their own and are totally dependent on their host cell for replication, they cannot be grown in synthetic culture media.

Contributors

- Dr. Gary Kaiser (COMMUNITY COLLEGE OF BALTIMORE COUNTY, CATONSVILLE CAMPUS)