FAIRFAX INVITATIONAL

SCIENCE OLYMPIAD DIVISION C

Disease Detectives

Final Score: _______/48

Tiebreaker Score: _______/16

Rank Number:
1. For the following statements, determine whether each one correctly demonstrates ACTIVE immunity (a simple yes/no will suffice): (3 points total)
   a. A tribal population avoids consumption of a known poisonous mushroom and thus never experiences the effects caused by eating it.
   b. Individuals inflicted with sickle-cell disease have natural immunity to the human immunodeficiency virus due to the inability of the virus to reproduce on the afflicted blood cells.
   c. Children living in the United States rarely develop meningococcal disease due to vaccines given at a young age.
   d. A man regularly eats a healthy diet and exercise and thus is at reduced risk for heart disease.
   e. A tribe in one location is never subjected to diseases of another location and thus never experiences the effects of that disease.

2. Briefly describe the chain of infection epidemiological triad (5 points):

3. Many individuals in a nation reported symptoms of the (fictional) disease Heloniogitis, a larger number than occurred in the past five years. A study was conducted in the area and found that there was not a statistically significant difference between the number of afflicted individuals and the expected number of afflictions in the area.
   a. Is this an outbreak? (yes or no only) (2 points)
4. In a separate case, there was a confirmed salmonella outbreak in an elementary school. A study was performed and found that 17 out of the 20 of the afflicted students had eaten the tomato salad served by the school cafeteria. In the study, an odds ratio of 1.01 was found using a confidence interval of 95%. No other common risk factors were able to be identified.

   a. With the information provided by the study, can the school’s tomato salad be pinpointed as the source of the outbreak? Why or why not? (3 points)
   b. What does the odds ratio tell us about a possible connection between the tomato salad and the salmonella outbreak? (4 points)

5. Name 3 possible ways a pathogen may enter the human body (5 points).

6. Give TWO examples of each of the following:
   a. Biological cause for disease (2 points)
   b. Chemical cause for disease (2 points)
   c. Physical cause for disease (2 points)
7. List and describe 5 ways to prevent the spread of food-borne illness *(10 points)*.

8. Calculate the odds ratio for the following fictional disease and vaccine *(5 points)*:

<table>
<thead>
<tr>
<th>Hemiacetal Vaccine</th>
<th>Incidence of Hemiacitalia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>139 58</td>
</tr>
<tr>
<td>No</td>
<td>550 953</td>
</tr>
</tbody>
</table>

9. Fill in the chain of infection diagram below *(5 points)*:
10. TIEBREAKER (ONLY grade to resolve ties. DO NOT include this in final score of exam)
List the 10 steps for investigating an outbreak (1 point each, 10 points total):

STUDENTS: Points will be assigned based on writing the steps IN THE CORRECT ORDER. No points will be given for a correct step written in the wrong position.

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10. 

11. TIEBREAKER #2 (DO NOT include in final score of exam): Define random error, systematic error, selection bias, and confounding bias (2 points each, 6 points total).