

Immune Wars

Resource Type: Curriculum: Classroom

Publication Date: 4/29/2002

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Absin a worksheet assigning point values (out of 10 points total) to five categories of pathogen, in class, the interaction is simulated as the teams confront each other comparing the results over the course of the infection. For each of the five categories the team assigning the greater number of stages wins the immune war. This exercise provides an opportunity to analyze, integrate, and discuss course material on virulence factors in a casestudygame format.

Activity

Invitation for User Feedback. If you have used the activity and would like to provide feedback, please send an e-mail to MicrobeLibrary@asmusa.org. Feedback can include ideas which complement the activity and new approaches for implementing the activity. Your comments will be added to the activity under a separate section labeled "Feedback." Comments may be edited.

INTRODUCTION

Time Required. 15 to 30 minutes outside of class; 30 minutes per "interaction" in class.

Learning Objective.

Students will evaluate factors of pathogenicity and host defense in specific host-parasite interactions which will enable them to understand the interplay of specific virulence factors and appropriate host defense mechanisms over time.

Student handouts.

Student Version.

[Immune Wars Student Worksheet - Host](#)

[Immune Wars Student Worksheet - Pathogen](#)

[Immune Wars Grading Rubric](#)

Instructor Version.

1. This activity will follow classroom presentation and reading assignments of background materials in immune response and pathogen virulence. It may be held during lecture or lab. Homework assignments requiring research are necessary. Simulations will allow students to experience integration of theoretical material on virulence and the immune response.

2. *Session 1 (15 to 30 minutes)*

- Assign two teams, one for the host and one for the pathogen.
- Explain the rules:
 1. Each team member researches the assigned pathogen or host as a homework assignment.
 2. In class, as a team, the group allots 100 points among the five categories listed on the pathogen or host defense worksheet.
- Review available resources for individual homework assignments.
Make the specific assignment of hosts and pathogens. In some cases, a short case presentation might be useful in

than 60 minutes) and that they would get 15 minutes at the beginning of the next class to compile results within each team and decide on the allotment of the 100 points to the categories on their worksheet. The instructor was available during the in-class research time to answer questions and the sample interaction was posted in the laboratory for student examination. (The sample interaction, *Staphylococcus aureus* on the skin of a healthy human, was intentionally kept simple. At this stage of the semester I did not want my students to spend more than one hour of out-of-class time on this. One could encourage a more in-depth analysis by posting a more complicated sample interaction.)

Session 2 (1 hour; 15 minutes of compilation time and 45 minutes of presentations)

Students compiled their results and allotted their points among the categories. Each table of students then presented its assignment to the class. I found the easiest way to do this was to use a blackboard reproducing the table forms of both worksheets side-by-side with the category totals in the middle of the board (see illustration). I had the pathogen team give me their point totals for each category and explain their decisions. I wrote each category on the blackboard along with a synopsis of their category factors. Then I had the host group follow with their point allotments and explanations. Both point allotments stood side-by-side allowing easy scoring of the "immune wars." For each matched category (e.g., "Mechanical barriers" versus "Portal of entry"), the team with the higher total allotted points won; the team winning the higher number of categories won the "war." There was discussion among the teammates when they gave their presentations with participation from the other class members. The blackboard tally was more effective than a simple oral discussion involving the other class members and allowed the instructor to comment, clarify, and occasionally verbally add information. The actual interactions each took about 10 to 15 minutes. The results were ties in three out of five interactions. This was surprising, but there is an element of chance in the point allotment as there is an element of chance in each host-parasite interaction.

I am enthusiastic about this activity. The in-class discussion was informal but informed and included members outside the presenting team. As this assignment must be given late in the semester (for background information), the students had developed good team working relationships and appeared to enjoy the team interactions. No student grumbled about under-participation by a teammate although that may have been due to the low credit awarded the activity. I did not grade the students individually or as teams but gave a 5-point bonus for participation (out of 525 total points for the semester). Two out of three students who missed Session 1 chose not to participate and one wrote a report on an assigned pathogen using the worksheet as a format. I will use this activity each semester, time permitting. However, as I am only able to allot one or two hours for this exercise I am disinclined to assign more than 5 to 10 points for the project. I would like to try a 10-point assignment and then use the grading rubric for each team.

The learning objective of this exercise is to evaluate and integrate the factors of pathogen virulence and host defense in specific host-parasite interactions. I believe this exercise meets that learning objective. The worksheets served as a guide for in-depth discussion and, therefore, for review of the course material. However, the integration of material was most evident during the class presentations and discussions. I believe the students gained a better perspective on host-parasite interactions through evaluating the relative significance of host and parasite factors. I had students write evaluations of this activity on the backs of their worksheets. The average time spent out-of-class was 63 minutes.

Student comments are listed below:

- "informative"
- "good review"
- "great review of pathogens"
- "entertaining"
- "fun"
- "[found some] excellent websites"
- "helpful to understand diseases"
- "easier to participate than just reading"
- "[helps us] understand how pathogen and host react together"
- "learn without thinking"
- "results were worth it"
- "since we had a lot of the information in class prior I understood what I was reading"

I had one negative comment:

- "It was time consuming."

Student Data.

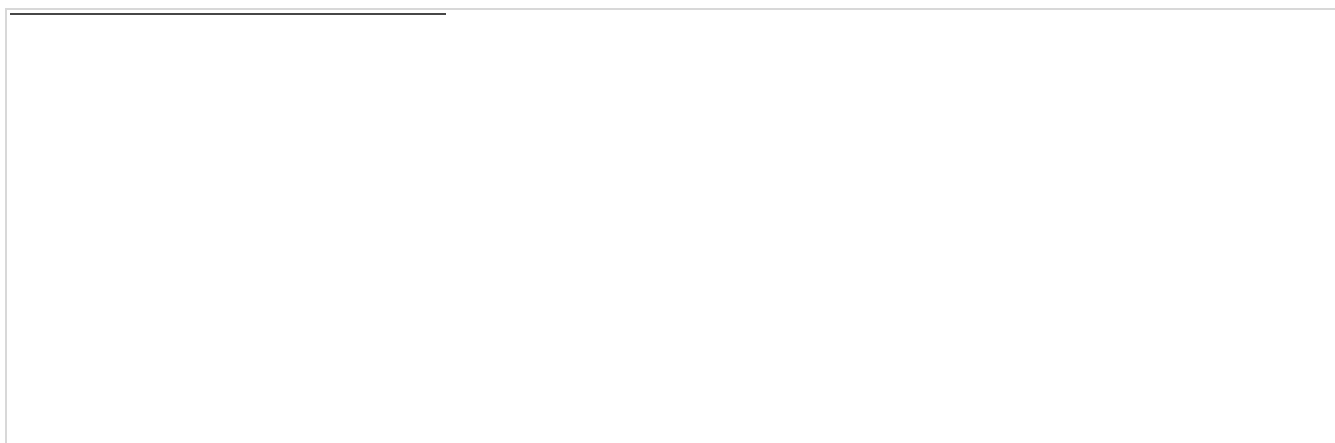
I have included several of the student worksheets. Some of the worksheets are insightful; a few are less so and would have been graded down. The quality of each sheet reflects the mastery of course material previously exhibited by the authors. Had I assigned more time to this activity or assigned more points, the results would have been more detailed. But this was a review-and-synthesis exercise not a new research topic, so I was satisfied with the results.

[Student Example - Pathogen Worksheet](#)

[Student Example - Host Worksheet](#)

Sample team outcomes

Pathogen team wins by overcoming host immune system: pathogen total points scored are greater than host total



Grading Rubric for “Immune Wars”



Sample Grading Sheet for Immune Wars

Team Members:

Pathogen or Host Assignment:

% Given

Accuracy of worksheet information (50%) _____

- Depth of information obtained (quantitative) (25%)
- Accuracy of information (qualitative) (25%)

Strategy of worksheet point allocation (30%) _____

- Has the team justified or explained the relative importance of each category in their point allocation?

Team class presentation (20%) _____

- Does this appear to be a team effort? (10%)
- Has the team provided a clear exposition of their reasoning in class? (10%)

Team total: _____





Immune Wars Worksheet - HOST

Group Members: EXAMPLE

Assigned Host: healthy adult

Pathogen: *Staphylococcus aureus*

Using your textbook, web, library and CD resources characterize host defense factors by filling in the chart below. Then, in consultation with your group, assign points (out of 100) to the categories. You may find that your point assignment varies from 0 points up depending upon the characteristics of your assigned host. If you assign 0 points to a category, remember to justify your decision in the box provided.

Category	Factors in host defense	Point value
1. Mechanical and chemical barriers	<i>intact skin</i> <i>lysozyme, secretory antibody</i> <i>fatty acids of skin</i>	35
2. Normal flora:	<i>may include <u>S. aureus</u> as normal flora</i>	5
3. Nonspecific immunity	<i>acute inflammation at site of entry</i> <i>pyogenic response</i>	20
4. Humoral and cell mediated immunity	<i>common organism</i> <i>memory B and T cells</i> <i>IgAs</i>	35
5. Artificial acquired immunity	<i>AAI – none</i> <i>antimicrobial therapy available</i>	5

Strategy: explain the strategy your group used in assigning the 100 points. You may continue your discussion on the back of this sheet. *Skin integrity and established humoral immunity most important here.*