The Immune System Game

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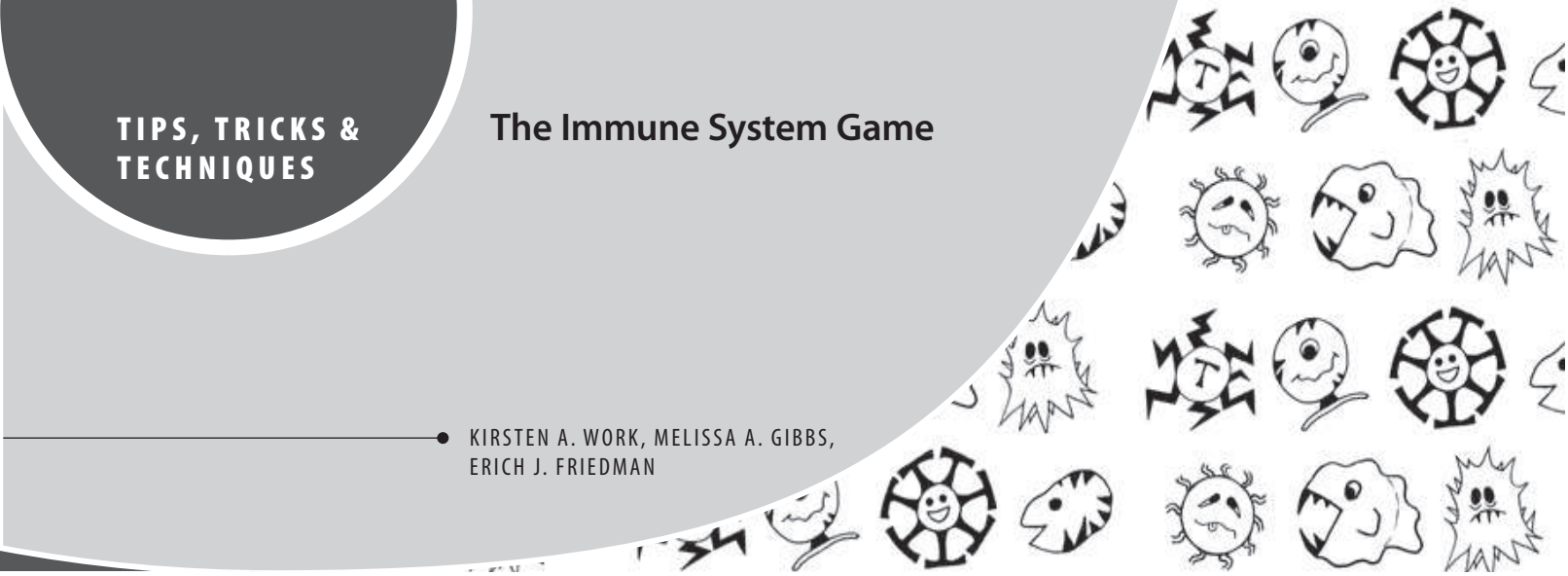

Abstract

We describe a card game that helps introductory biology students understand the basics of the immune response to pathogens. Students simulate the steps of the immune response with cards that represent the pathogens and the cells and molecules mobilized by the immune system. In the process, they learn the similarities and differences between the immune responses to viral and bacterial pathogens and why the primary and secondary responses differ.

Key Words: *Immune system; card game; pathogen.*

Biological literacy is a commonly desired goal of biological education; however, there are multiple levels of biological literacy that represent different levels of mastery of material (Uno & Bybee, 1994). A student who is nominally literate may recognize terms but have major misconceptions. A student who is functionally literate may have memorized terms and processes but cannot explain processes in his or her own words. A structurally literate student, on the other hand, has a conceptual knowledge of biological processes that includes an understanding of how these processes proceed (Uno & Bybee, 1994). Subjects such as the immune system are of interest to many students but are sufficiently complicated – with many cells with different functions activated at different times during an immune response – that structural literacy and self-efficacy eludes many or most students in introductory biology courses.

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Here, we describe a game designed to simulate a simplified human immune response to bacteria and viruses. The immune system is often given short shrift in the typical introductory biology courses, so we created a game that students can play either during or outside of class. The game simulates a simplified immune response to viral and bacterial infections (both primary and secondary exposures). Before playing the game, students should be familiar with the concepts of innate and adaptive (specific) immune responses, but the game will teach them about the basic components and actions of the specific immune response (only the key immune cells of each system are included in this simulation), as well as emphasize the similarities in the immune responses to viruses and bacteria. The game is also useful as a pre-exam review of material covered during lecture.

To play the game, students can work alone or in groups of two or three, and they should be able to complete all four simulations within 1 hour. Some students may kill off the pathogen before their specific immune system is fully functional, and a few others may find their immune systems quickly overwhelmed (death or at least in need of medical attention), while most students will activate a normal, robust immune response that eventually overwhelms the pathogen. If time permits, students can reset and restart the game if they immediately kill or are killed by the pathogen. If class time is limited, those exceptions can illustrate varying degrees of response of the immune system to pathogens.

Each kit contains all of the materials needed to model both the primary and secondary responses to both viral and bacterial pathogens. After completing the exercise, presentation of a review sheet can reinforce the concepts presented in the game. See the Appendix for game cards and review sheets.

Materials for Each Kit

- Playing cards printed on different colors of card stock (plus some extras)
- Body bag (paper lunch bag with body outline attached)
- Coin
- Paperclip (to attach a memory cell to the body bag)
- Snack-size Ziploc bags to keep each type of playing card organized
- Gallon Ziploc bag for storing each kit

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