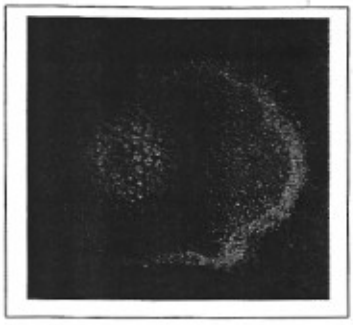


The Game of Immunology

Introduction

Disease is a probability. It's a game of risk and chance. It's essentially a battle between two forces and no one is certain of the outcome. What is the ultimate outcome: life, or the lack of it. Win and you live; lose and you die. It's just that simple.

Who are the opponents in the game of immunology?

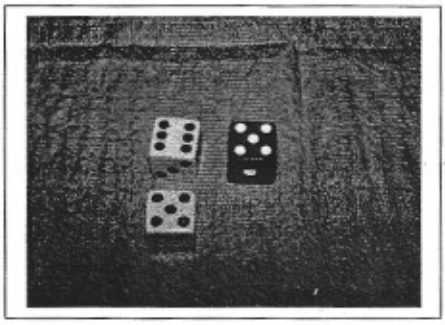
- **Pathogens** such as virus, bacteria, prions or fungi which are capable of causing disease. (Opposing team)
- **Immune system:** Composed of an army of cells and physical barriers your immune system functions to capture and destroy all foreign material. (Our team)

The following exercise is a short dice game designed to expose students to fundamental concepts of immunology. In addition to demonstrating probabilities, each case scenario exemplifies a unique property of the immune system. Pairs of students, one designated virus, the other horse, are asked to complete the game in 20 minutes. Upon completing the game, students should examine scores and reflect upon the results. Using their results and general knowledge, students should answer the accompanying seven question sets. Although questions may appear "non-scientific" in nature, they are designed to exemplify specific immune concepts, and permit students to apply a "real life" understanding to immunology.

Rules of the Game

- The Influenza virus is represented by the red dice.
- Mr. Ed, the horse, is represented by the white dice.
- Each case scenario provides a description and a specified number of dice that should be used by Mr. Ed (white) and the Virus (red). Be certain to use the number of dice specified.
- Players roll dice simultaneously. Dice are then aligned against one another from highest to lowest in value. A point is awarded to the higher die of the match up.
- No points are awarded on a tie.
- Continue rolling dice for each scenario until a total of ten points have been awarded for each case.
- Bring individual team results to the instructor for total class tabulation. Record both team and class results on the accompanying score card.
- Answer accompanying question sets.

Example One

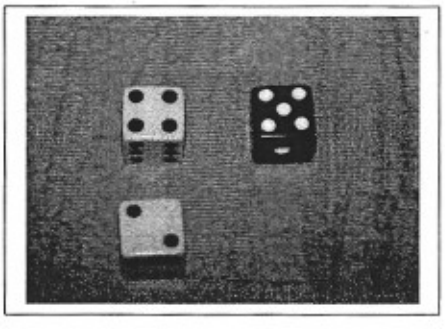


Mr. Ed rolls 6, 5 and Virus rolls 5.

Mr. Ed	Virus	Comments
6	5	Give 1 point to Mr. Ed
5		

Cases	Mr. Ed	Virus
Case Two: Mr. Ed received his first vaccine for the virus. Give Mr. Ed 1 more dice. (Mr. Ed 2 dice, virus 1 dice)	1	

Example Two



Mr. Ed rolls 4, 2. Virus rolls 5.

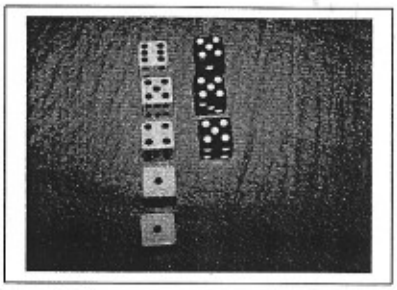
Mr. Ed	Virus	Comments
4	5	Give 1 point to Virus
2		

Cases	Mr. Ed	Virus
Case Two: Mr. Ed received his first vaccine for the virus. Give Mr. Ed 1 more dice. (Mr. Ed 2 dice, virus 1 dice)		1

Example Three

Mr. Ed rolls 6, 5, 4, 1, 1. Virus rolls 5, 5, 5.

Mr. Ed	Virus	Comments
6	5	Give 1 point to Mr. Ed and 1 point to Virus. Remember no points are awarded on tie dice.
5	5	
4	5	
1		
1		

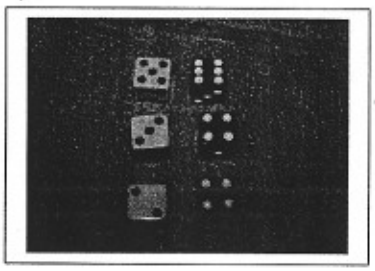


Cases	Mr. Ed	Virus
Case Four: An exceptionally virulent strain of the virus has arrived at Mr. Ed's barn. Give 2 dice to the virus. (Mr. Ed 5 dice, virus 3 dice)	1	1

Example Four

Mr. Ed rolls 5, 3, 2 Virus rolls 6, 4, 4

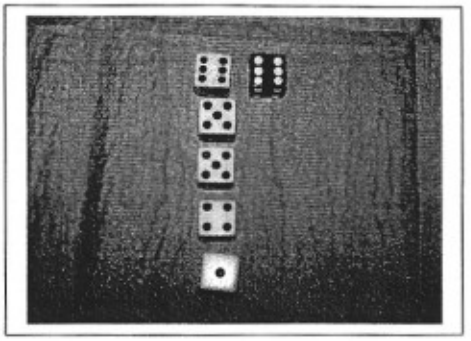
Mr. Ed	Virus	Comments
5	6	Give Virus 3 points
3	4	
2	4	



Cases	Mr. Ed	Virus
Case Two: Mr. Ed received his first vaccine for the virus. Give Mr. Ed 1 more dice. (Mr. Ed 2 dice, virus 1 dice)		1, 1, 1

Example Five

Mr. Ed rolls 6, 5 ,5, 4, 1. Influenza rolls 6.



Mr. Ed	Virus	Comments
6	6	Tie. No points awarded to Mr. Ed or Virus
5		
5		
4		
1		

Cases	Mr. Ed	Virus
Case Three: Mr. Ed received his 2nd booster for the virus. Give Mr. Ed 3 more dice. (Mr. Ed 5 dice, virus 1 dice)		

Example Six

You are finished with each case when a total of 10 points have been awarded. For example, if Mr. Ed won 9 times and the virus won once it would look like this:

Cases	Mr. Ed	Virus
Case Three: Mr. Ed received his 2nd booster for the virus. Give Mr. Ed 3 more dice. (Mr. Ed 5 dice, virus 1 dice)	1,1,1,1,1, 1,1,1,1	1

Immunology Score Card

Cases	Mr. Ed	Virus
Case One: "Mr. Ed" is a healthy yearling who is immunologically naïve Mr. Ed is exposed to a mild strain of virus. Give the virus 1 dice and Mr. Ed 1 dice.		
Case Two: Mr. Ed received his first vaccine for the virus. Give Mr. Ed 1 more dice. (Mr. Ed 2 dice, virus 1 dice)		
Case Three: Mr. Ed received his 2nd booster for the virus. Give Mr. Ed 3 more dice. (Mr. Ed 5 dice, virus 1 dice)		
Case Four: An exceptionally virulent strain of the virus has arrived at Mr. Ed's barn. Give 2 dice to the virus. (Mr. Ed 5 dice, virus 3 dice)		
Case Five: One month prior to the virus's arrival Mr. Ed required surgery (it was a surgery to correct a "twisted gut") Mr. Ed has lost a lot of weight since the surgery. Take 2 dice from Mr. Ed. (Mr. Ed 3 dice, virus 3 dice)		

Question Sets

Question Set One: A ten year old girl from Idaho stands next to a forty five year old cocktail waitress from Las Vegas. Who would you label as naive? What does immunologic ally naive mean to you? Why would an immunologically naive horse get less dice than a vaccinated horse? (Case one)

Question Set Two: You are playing in the Super Bowl. You really need to win. Identify an effective way of increasing the odds in favor of your team? (PS it doesn't need to be ethical). Medically speaking, why is vaccinating cheating? Compare the results from case one to case two. What do you see? Why would a vaccination increase the probability for success for an animal? What are essentially the 2 basic ways to get immunological "experience" or exposure? (Case two)

Question Set Three: I showed you how to solve math problem one on Monday morning. I showed you how to solve math problem two on Monday, Wednesday, and Friday. The test is on Saturday, which problem do you think you will answer correctly? Why? How do we get the immune system ready for a test? Compare the results from case one to case three. After receiving a booster vaccination what happened to Mr. Ed's odds, why? (Case three)

Question Set Four: You are a gladiator for the new reality TV show "Roman Empire." You have been given the opportunity to select your next opponent. Opponent one is equipped with a slingshot. Opponent two has a semiautomatic, night goggles and two knives. Which opponent is likely to be the most virulent? What is the meaning of virulence? Why did a virulent virus get more dice? Compare the results of case three to case four. What happened to Mr. Ed's odds when he was exposed to a highly virulent strain of virus? Were the odds changed as a result of an activity from the horse or the virus (Case four)

Question Set Five: When countries compete to produce more efficient, lethal weapons it is referred to as an "arms race." Which case scenario illustrates an arms race? Describe a scenario in which an animal and a virus / bacteria engage in an arms race of sorts. Hint: each competitor is getting more dice.

Question Set Six: The 2002 Winter Olympics gold medalist of the 1,000 m speed skating was Steven Bradbury. (Bradbury was from Australia and defeated USA's Apolo Ohno and many other superior skaters) In sports this type of victory is now referred to as "pulling a Bradbury." What does "pulling a Bradbury" mean? Examine each case scenario and identify an incident where the virus was able to "pull a Bradbury." Provide a plausible reason as to why this type of immunological scenario could occur. Hint: when a virus "pulls a Bradbury" we often refer to it as a vaccine failure.

Question Set Seven: Two horses are running in a derby series. In the first race, horse one wins by 5 lengths. Prior to the next race, it is decided that horse one must carry an additional 20 pounds. (This is called a handicap). Which horse will win the second race? Identify the case scenario which illustrates this phenomenon and reflect upon why the allotted number of dice was given to the virus and horse State 3 potential ways of handicapping an immune system. Hint: Were dice given or taken away?