Electronic Supplementary Material (ESI) for Faraday Discussions.

Video games might make school better, or they might make it worse. We can only tell if we collect honest answers from students who play them.

Please, do not change your answers once you have left a page. **DO NOT GO BACK.**

This is not like a normal test. This is an experiment.

If you do not know the correct answer, PLEASE GIVE US YOUR BEST GUESS.

All of your answers are confidential.

THANK YOU!

1 What is your first name?

2 * What is your last name?

3 Who is your teacher?

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THANK YOU!

1 What is your first name?

2 * What is your last name?

3 Who is your teacher?

SUBMIT

4 What is your gender?

- Male
- Female

5 * What is your zip code?

SUBMIT

6 What grade do you usually get in math classes?

- A+/A/A-
- B+/B/B-
- C+/C/C-
- D+/D/D-
- F
- Other, please specify

7 What grade do you usually get in science classes?

- A+/A/A-
- B+/B/B-
- C+/C/C-
- D+/D/D-
- F
- Other, please specify

8 What grade do you usually get in reading/English classes?

- A+/A/A-
- B+/B/B-
- C+/C/C-
- D+/D/D-
- F
- Other, please specify

SUBMIT

9 What is your favorite class?

- Reading/English
- Math
- Science
- Social studies/History
- Other, please specify

10 How many hours a week do you play video games?

- 0
- 1-5
- 5-10
- 10-15
- 15-20
- 20-25
- 25-30
- 35-40
- 45-50

11 Have you ever played...

1 No, not at all	2 Yes, I have played one example of this game style, just a little bit.	3 Yes, I have played several examples of this game style.	4 Yes, I play this type of game frequently.	5 Yes, this is my favorite type of game.

Flight simulator video games?

1 2 3 4 5

Role playing video games?

1 2 3 4 5

Tower defense video games?

1 2 3 4 5

First/third person shooter video games?

1 2 3 4 5

Multiplayer online games?

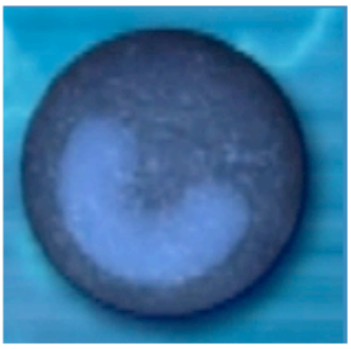
1 2 3 4 5

Learning games?

1 2 3 4 5

SUBMIT

12



What kind of cell is this?

- Amoeba
- Bacteria cell
- White blood cell
- A skin cell

13 Which cells are the first to respond to a bacterial infection?

- T-Cells
- Monocytes
- B-Cells
- White blood cells generally respond at the same time.

14 When there is an infection near a vein, what happens?

- The vein becomes sticky to red blood cells.
- The vein starts attracting monocytes.
- The vein begins to make antibodies.
- The vein becomes wider to let more white blood cells through.

15 What causes this change?

- The vein cells make a chemical signal.
- The vein cells make new proteins on their surface.
- The vein cells cells grow bigger.
- Nearby cells make new protein.

SUBMIT

16 When a white blood cell leaves the blood stream what is the process called?

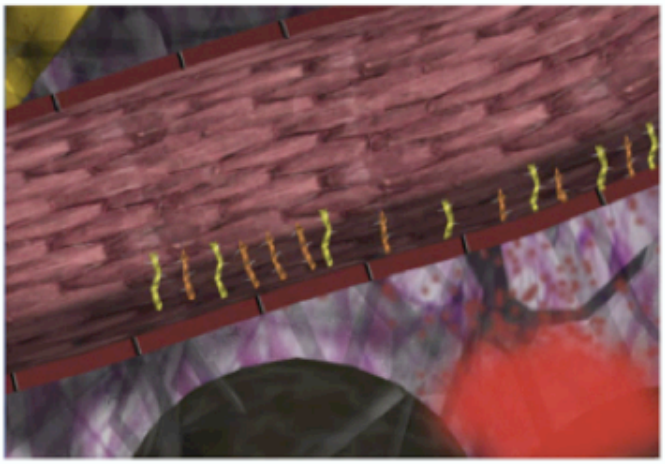
- Transvessel movement
- Transportation
- Transferrance
- Transmigration

17 Of the things listed below, which is the first line of defenses the body employs against potential pathogens?

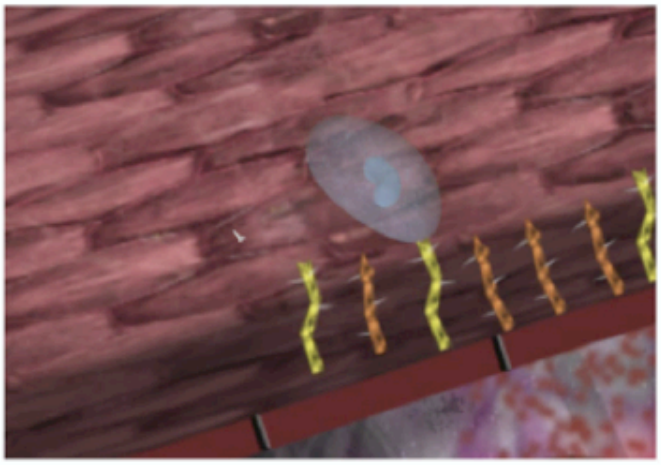
- Antibodies
- Monocytes
- T-Cells
- Platelets

SUBMIT

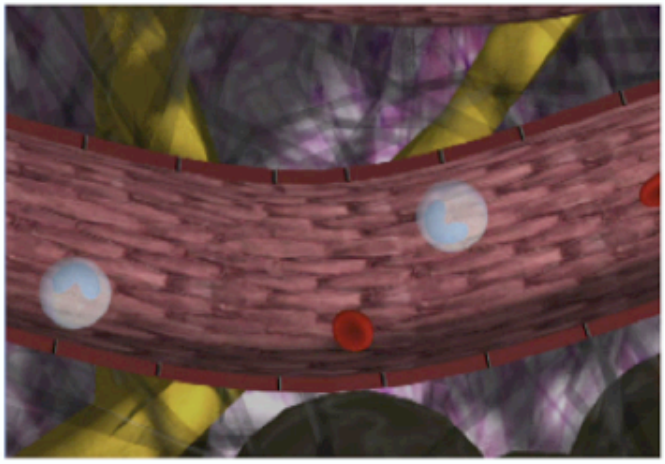
18



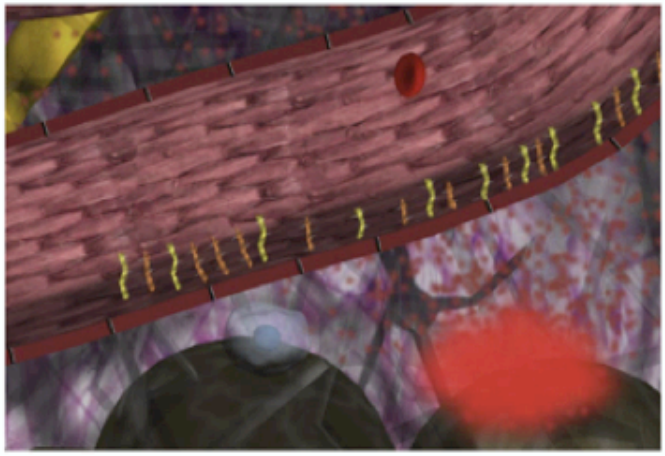
A Proteins made by vessel cells



B Monocyte slips through vessel wall



C Monocytes flow through vessel



D Macrophage is in the connective tissue

Transmigration of Monocytes (white blood cells) is a multi-step process. Please refer to the picture above, and choose the answer that lists the steps in the correct order.

- C, B, D, A
- C, A, B, D
- A, D, B, C
- D, A, B, C

SUBMIT

19 What is C3a (cytokine)?

- C3a is a signal used by Macrophages to alert Red Blood Cells of a pathogen.
- C3a is a chemical signal that tells the white blood cells that the infection is near.
- C3a is a by-product of antibiotic metabolism.
- C3a is an chemical signal produced by B-Cells.

20 How do Macrophages hunt bacteria?

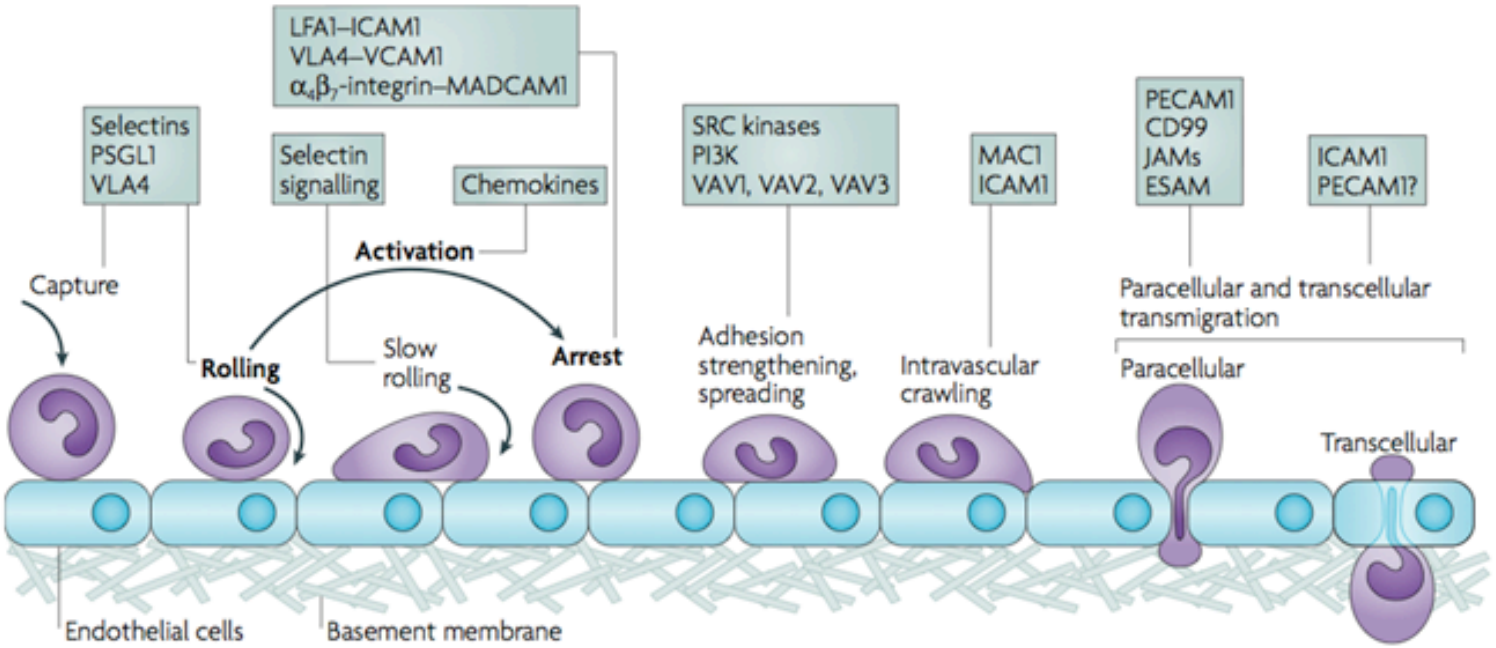
- Macrophages follow the C3a signal that diffuses away from the bacteria.
- Macrophages are called to the infection by Neutrophils.
- T-Cells guide Macrophages to the infection.
- The brain releases Cytokines like C3a that help Macrophages locate the bacteria.

21 How do Macrophages recruit other cells to help fight an infection?

- They send a chemical signal to the lymph nodes.
- They relay a general alarm through red blood cells.
- They send a chemical signal that certain cells can follow.
- They send a chemical signal that activates carrier proteins.

SUBMIT

22

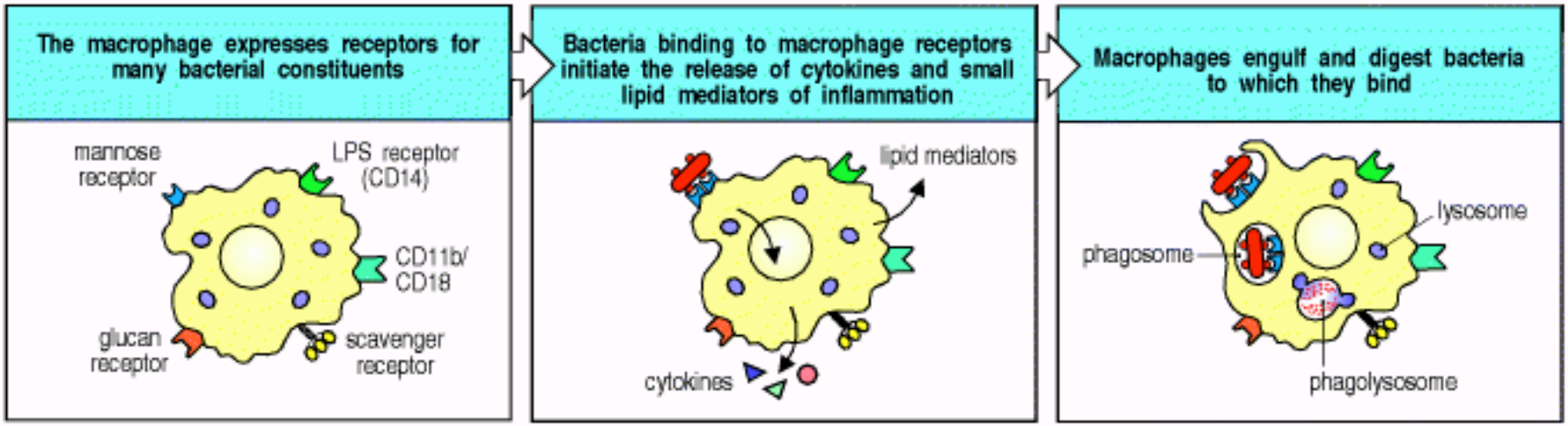


I would be able to understand this diagram if I read it and thought about it.

- I disagree definitely.
- I disagree somewhat.
- I am neutral.
- I agree somewhat.
- I agree definitely.

SUBMIT

23



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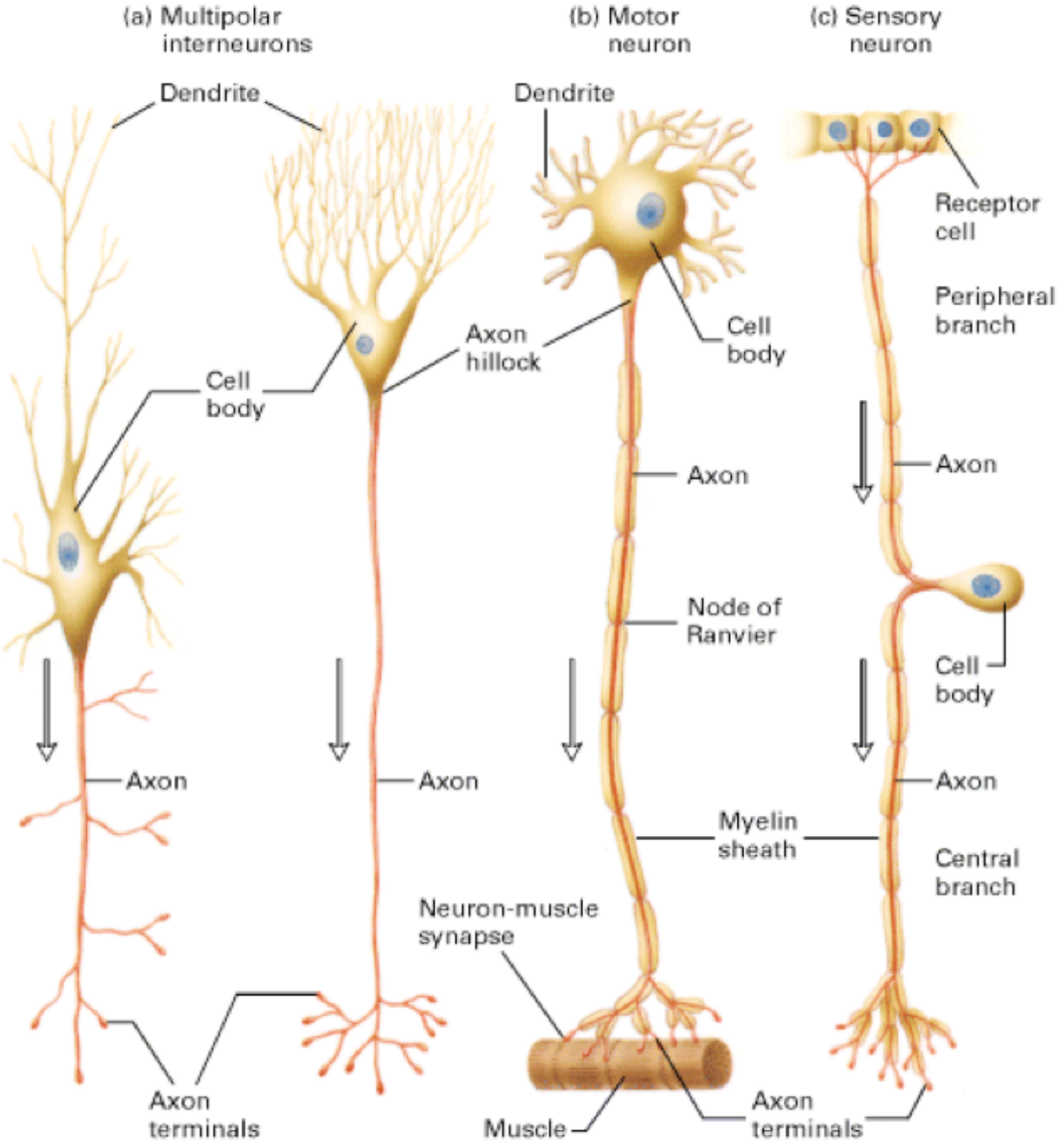
SUBMIT



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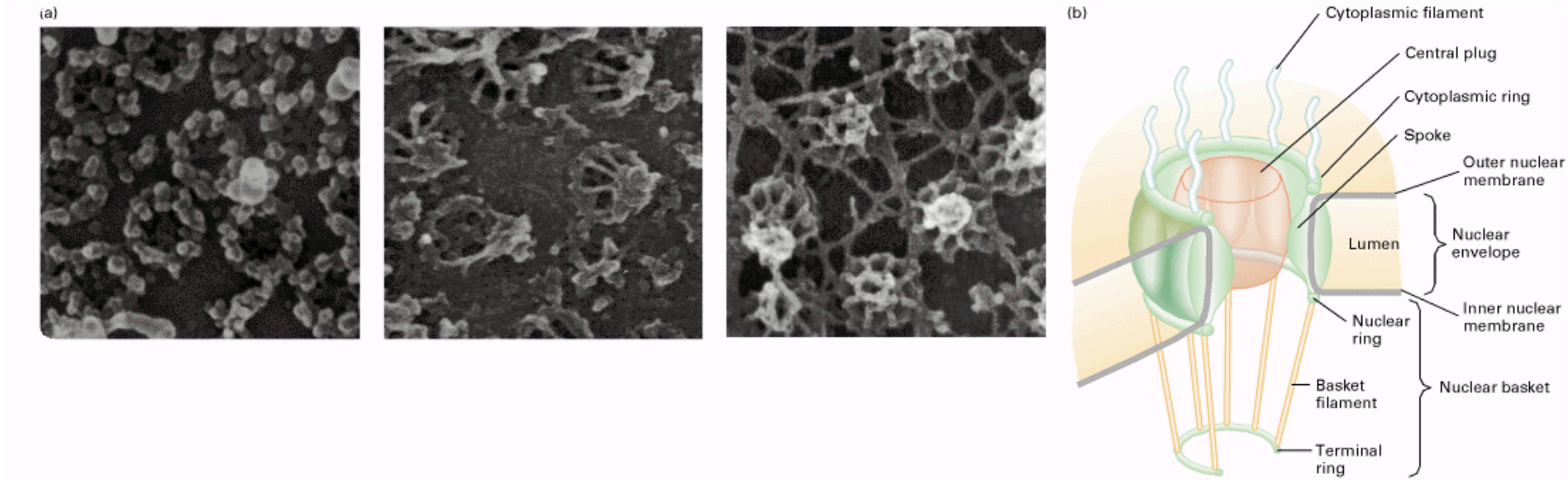
25



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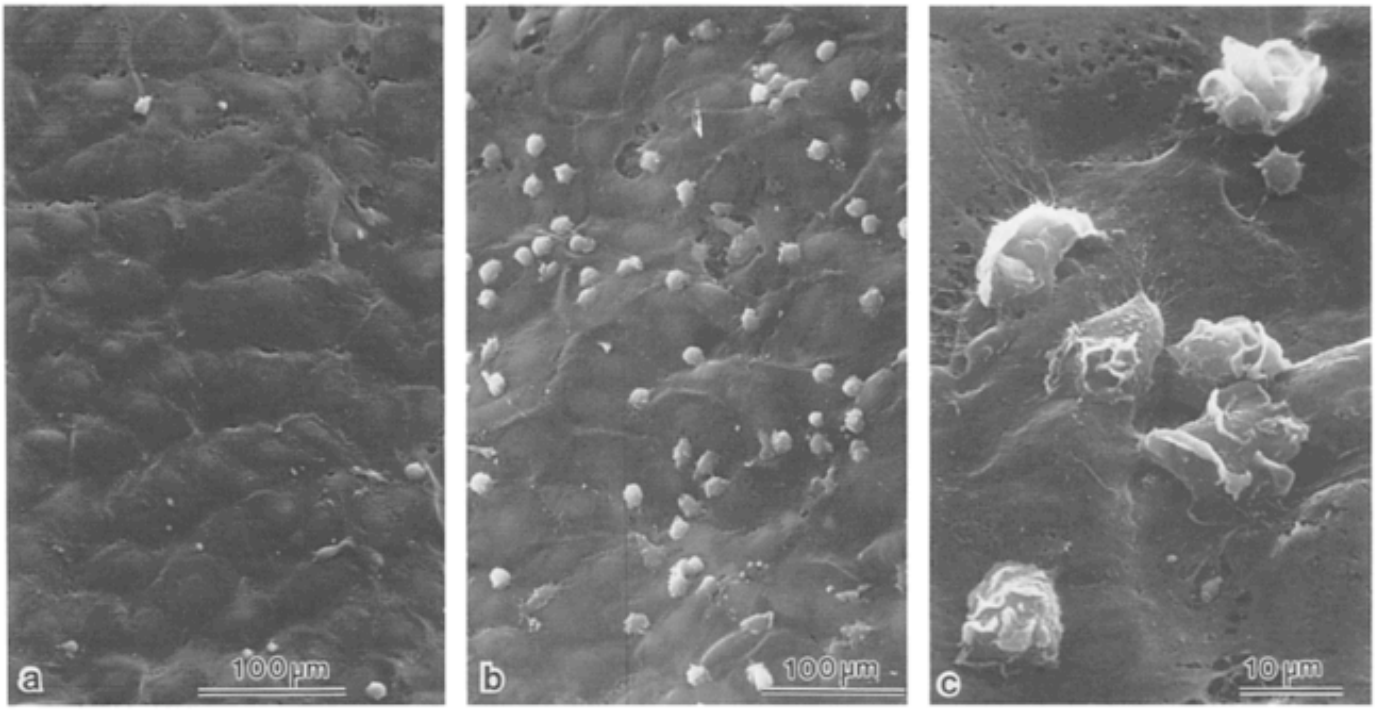
26



White blood cells cling to cells that have Selectin protein on their surface. Panel A shows cells that do not express Selectin and were washed in a solution of white blood cells. Panel B shows cells that do express Selectin and were washed in a similar solution of white blood cells. Panel C shows the same cells as in panel B, but magnified to show the white blood cells that remain on the surface due to Selectin proteins.

I would be able to understand this diagram if I read it and thought about it.

- I disagree definitely.
- I disagree somewhat.
- I am neutral.
- I agree somewhat.
- I agree definitely.

SUBMIT

27 What is the name of the protein that will make a slowed Monocyte come to a stop?

- Selectin
- Pseudomonas
- ICAM
- Peptin

28 When there is an infection near a vein, what happens to the cells of the vein wall?

- The cells make a chemical signal that attracts red blood cells.
- The cells change their surfaces so that they become sticky to white blood cells.
- The cells make new antibodies that attack the bacteria.
- The cells become more rigid, keeping the infection out of the bloodstream.

SUBMIT

29 What is the name of the protein that will make a monocyte slow down?

- Selectin
- Pseudomonas
- ICAM
- Peptin

30 How do cells of the immune system get to the site of an infection?

- They travel along lymph nodes to the infected tissue.
- They exit veins at the site of inflammation and follow signals to the infection.
- They circulate randomly and then diffuse to the infection.
- They are brought to the infection by the carrier proteins on red blood cells.

31 What role do Macrophages play when the immune system is fighting an infection?

- Macrophages activate the liver which filters bacteria from the bloodstream.
- Macrophages track down and eat bacteria.
- Macrophages activate carrier proteins on Red Blood Cells.
- Macrophages make antibodies that help kill bacteria.

SUBMIT

32 Why do Monocytes start rolling on vein walls?

- Because some vein walls make proteins that stick to Monocytes.
- Monocytes always roll along vein walls.
- Because some veins are very small.
- Monocytes roll along vein walls when blood pressure is high.

33 Rank the following in order (1-4) from LARGEST to SMALLEST:

	1	2	3	4
Pseudomonas (bacteria)				
Monocyte (cell)				
Vein (diameter)				
C3a (protein)				

SUBMIT

34 To fight an infection, white blood cells must reach the site of infection. Which answer choice below correctly orders the stages and processes that the white blood cell goes through to reach the infection site and fight the bacteria.

- phagocytosis, Monocyte, transmigration, Macrophage
- Monocyte, transmigration, Macrophage, phagocytosis
- Macrophage, Monocyte, phagocytosis, transmigration
- transmigration, Monocyte, phagocytosis, Macrophage

35 Which of the following would be seen on normal healthy vein cells?

- Selectin
- ICAM
- C3a
- All of the above
- None of the above

SUBMIT

36 A monocyte rolls along the vein wall, but does not stop to transmigrate. What went wrong?

- No antibodies were produced.
- The monocyte did not find an ICAM.
- The B-Cells were not activated.
- The T-Cells sent the wrong signal.

37 If a Macrophage had no LPS Receptors what would happen?

- The antibodies produced by B-Cells would be less effective.
- The patient will be sensitive to viruses.
- The macrophage would function normally.
- The macrophage would follow C3a but not eat bacteria.

38 If a patient has no Selectin proteins in their body, what would their symptoms be?

- The patient would be a mutant, but his immune system can function properly.
- The patient would not fight bacteria infections.
- The patient would be fine because the antibodies still work.
- The patient would have T-Cells that do not function.

SUBMIT

39 If you learned that the plastic bottle factory next door was making a chemical that acts like C3a, would you be worried?

- Yes, because more C3a might mislead macrophages.
- Yes, because any chemical is bad.
- No, because C3a is helpful for T-Cells.
- No, because C3a is not water soluble.

40 What might happen if a cell is missing one kind of protein?

- Nothing, cells have many other kinds of proteins.
- The cell will not be able to do certain things.
- The cell may die because its ratio of cholesterol to protein is too high.
- The cell will get replacement proteins from another cell.

41 If a person was missing Selectin protein on her veins, what would help her?

- A blood transfusion to replace blood cells.
- More exercise to increase antibodies.
- Gene therapy to replace the Selectin gene.
- Allergy medication to activate white blood cells.

SUBMIT

42 What makes macrophages different from T-cells?

- Their DNA.
- The shape of their membranes.
- The proteins they have on their surfaces and insides.
- Their ATP requirements.

43 Macrophages track down bacteria and T-Cells do not. Why are they act differently?

- Macrophages and T-Cells are not in the same veins.
- T-Cells do not have LPS Receptors.
- Macrophages are bigger than T-Cells.
- T-Cells and macrophages have different DNA.

44 If a patient is missing the chemical signal C3a, what would her symptoms be?

- Nothing, the patient has many other kinds of chemical signals.
- The patient would exhibit inappropriate emotions.
- The patient's connective tissue would be weak.
- The patient would not fight bacteria infections.

SUBMIT

Questions marked with an asterisk (*) are mandatory.

66 * Did you play a game called CSI: The Experience??

- Yes
- No

SUBMIT

67 *

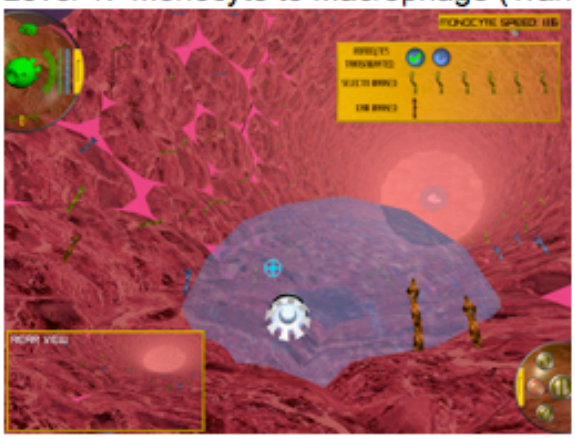
Did you play a game called Immune Attack?

- Yes
- No

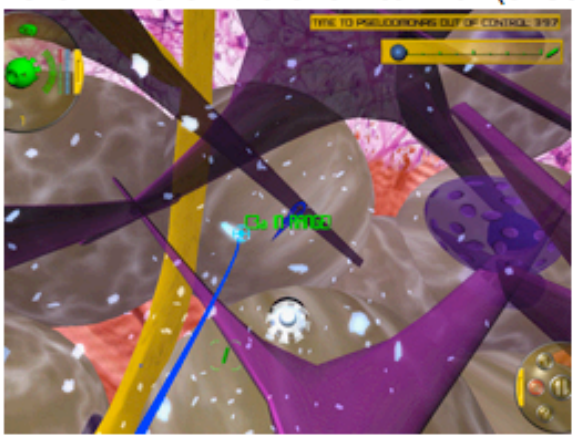
SUBMIT

68 * How far did you get in the game Immune Attack?

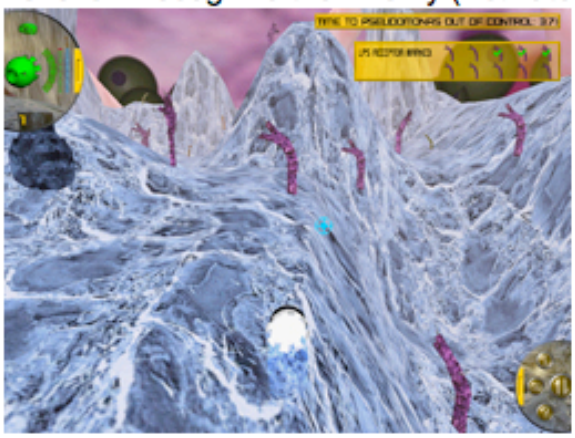
Level 1: Monocyte to Macrophage (Transmigration)



Level 2: Follow the Chemical Trail (of C3a)



Level 3: Recognize the Enemy (Activate LPS Receptors)

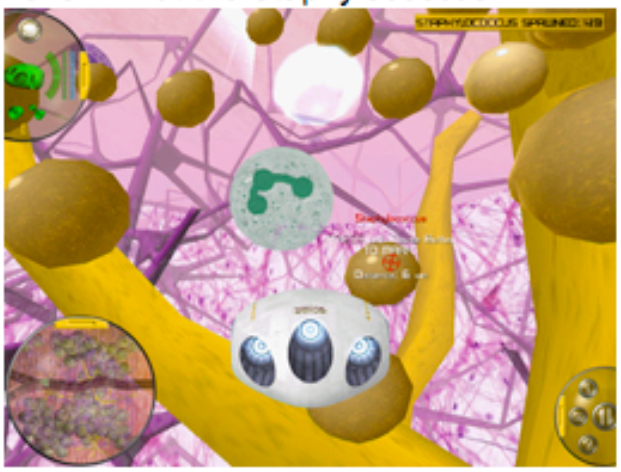


Level 4: Eat the Pseudomonas

Level 5: Activate CXCL8 to call for Neutrophils

Level 6: Train the Neutrophil (Transference)

Level 7: Eat the Staphylococcus!



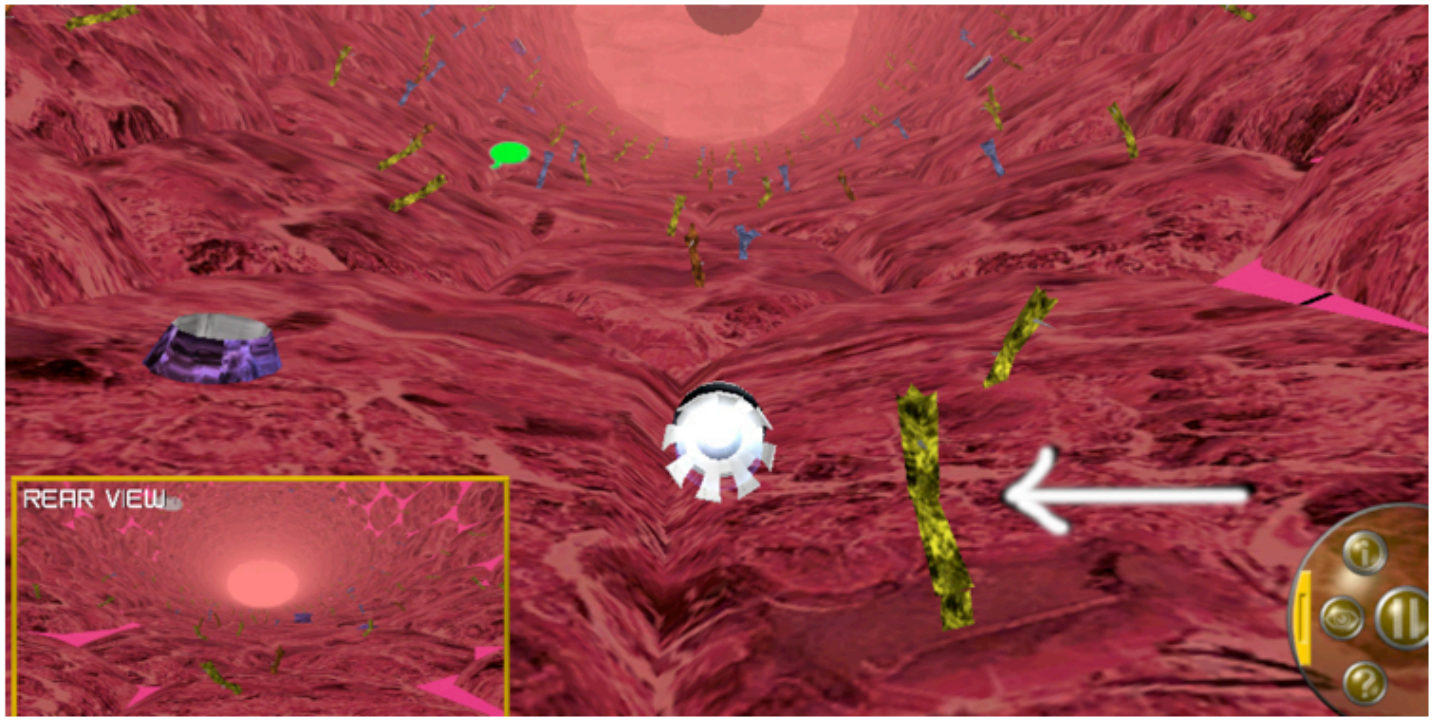
69 Why did you stop playing at this level?

SUBMIT

70 What color were the Monocytes in the Game Immune Attack?

- Red
- Blue
- Yellow
- Green

71



What is the arrow pointing to?

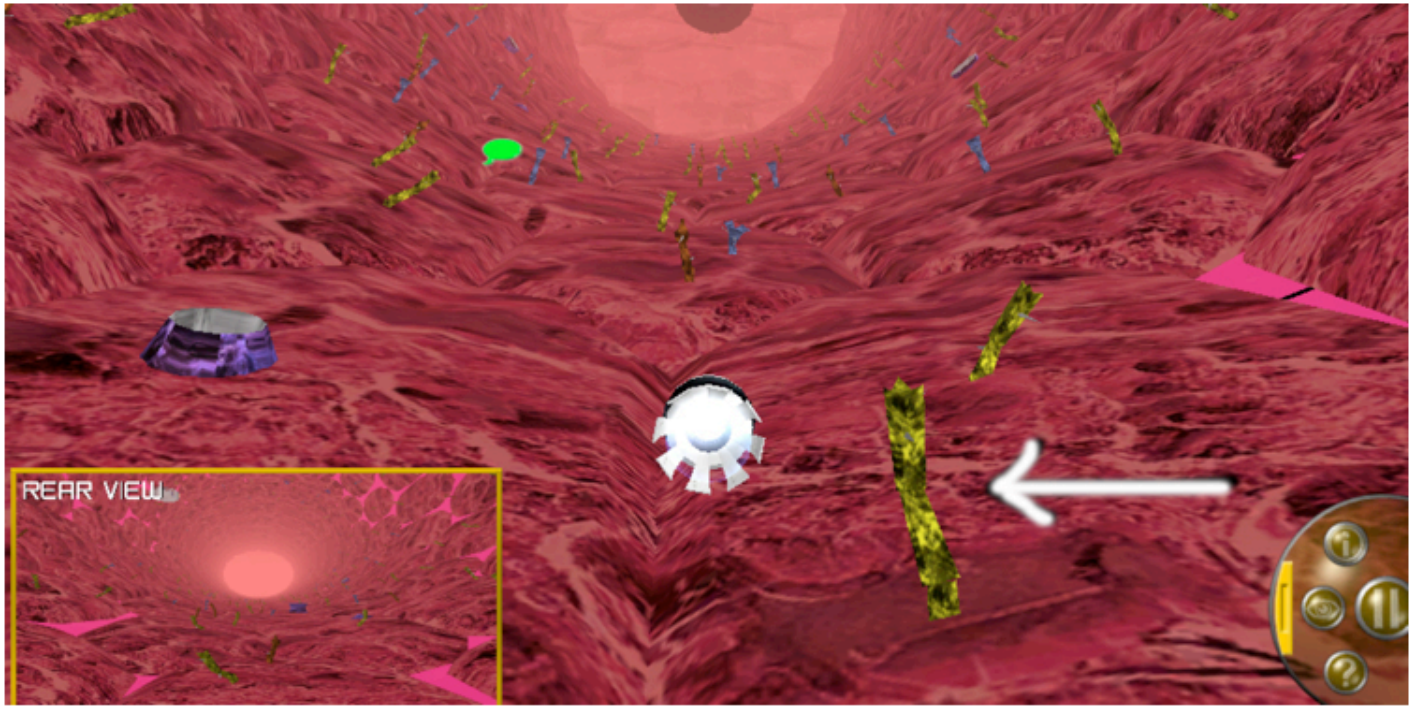
- An object you need to avoid.
- A wiggly thing that you need to shoot to win.
- A wiggly thing that is the wrong target.
- Something that will damage your ship.

SUBMIT

72 What color were the Pseudomonas bacteria in the game Immune Attack?

- Red
- Blue
- Yellow
- Green

73



In the above picture, what is the arrow pointing to?

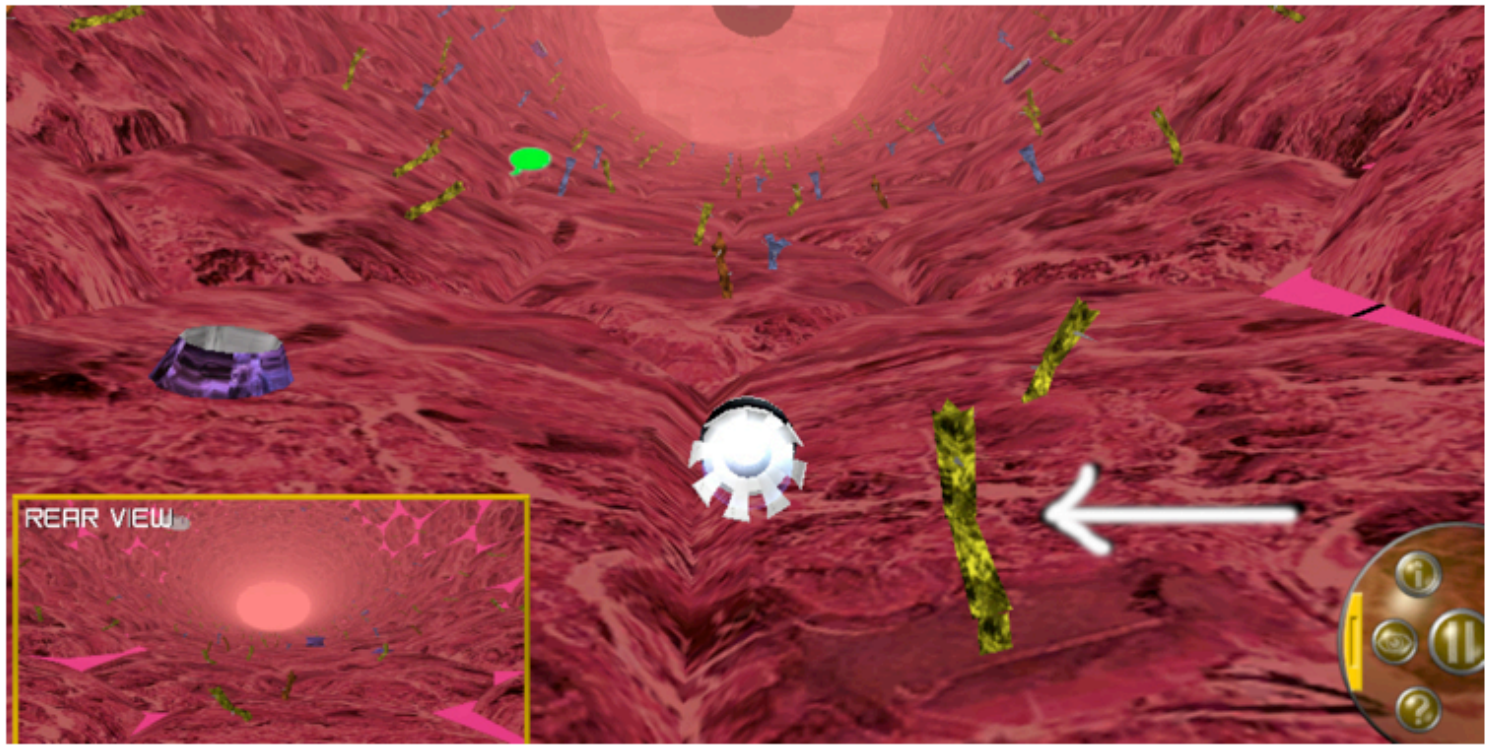
- A lipid
- A complex carbohydrate
- A protein
- An amino acid

SUBMIT

74 What color are were the Neutrophils in the game Immune Attack?

- Red
- Blue
- Yellow
- Green

75



In the above picture, what is the arrow pointing to?

- A protein that will make Monocytes slow down.
- A protein that stops Monocytes.
- A protein that makes Monocytes exit the blood vessel.
- A protein that does not interact with Monocytes.

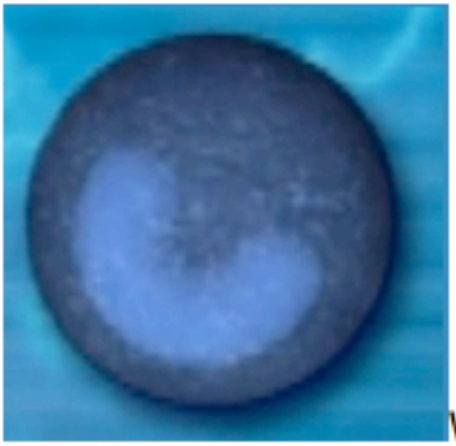
SUBMIT

76

Which color object above will make monocytes stop?

- Blue
- Yellow
- Purple
- Brown

77



What is the function of this cell?

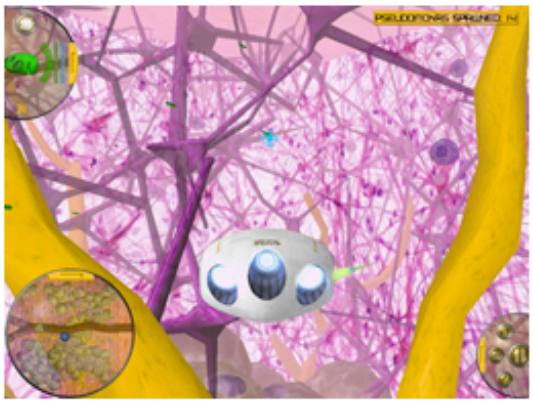
- This cell eats viruses.
- This cell eats bacteria.
- This cell makes antibodies.
- This cell makes antibiotics.

SUBMIT

78 Please match the following pictures (1-3) with the locations below:

1

2



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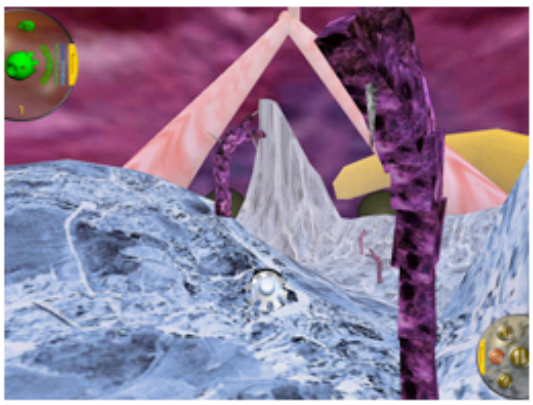

	1	2	3
Connective Tissue	●	●	●
Blood Vessel	●	●	●
Cell Surface	●	●	●

SUBMIT

Let us know what you think about Immune Attack!

79 Immune Attack is easy to play.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

80 Did you find navigating the microbot or nanobot easy?

- Yes
- No

81 Did you have any computer problems while playing Immune Attack?

- Yes
- No

82 If you answered "YES" to the above question, tell us about the problem. (If you answered "NO," type in "N/A")

83 Playing Immune Attack clearly taught science to me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

84 I would be interested in playing a game such as Immune Attack as part of my science classes.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

85 Playing Immune Attack was highly enjoyable to me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

85 Playing Immune Attack was highly enjoyable to me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

86 I would recommend Immune Attack to my friend.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

87 Did you have any computer trouble while taking this survey?

- Yes
- No

SUBMIT