

Bringing Immune Cell Migration into the High School Classroom

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Overview of My Fellowship

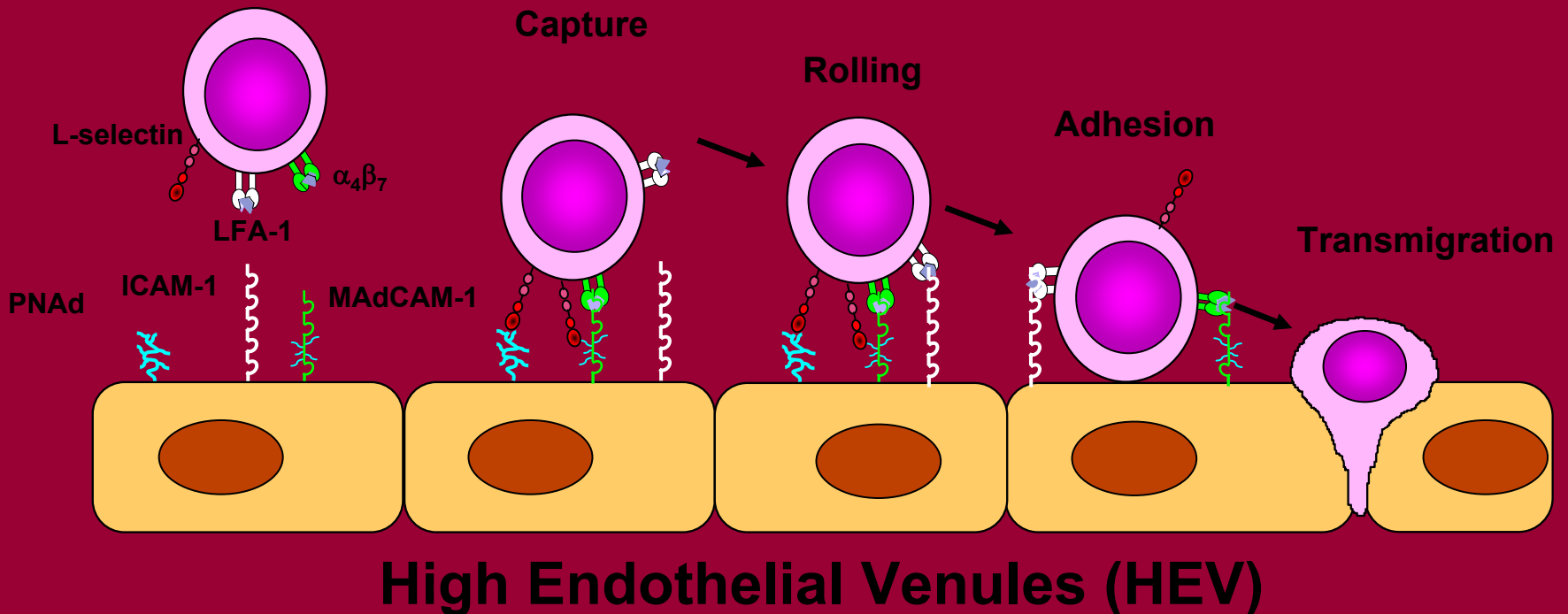
Timeline

- **4 weeks in lab**
 - June 13-July 17 2005
- **Create and implement lesson plan**
 - Fall 2005
- **Present**
 - AAI Convention 2006



Lymphocyte Migration

- Lymphocytes specifically respond to invading pathogens.
- Lymphocytes monitor the body by migrating among various lymphoid tissues such as lymph nodes and spleen.
- Lymphocyte migration into lymph nodes is regulated by expression of specific receptors.



Research Design: In Vivo Cell Tracking

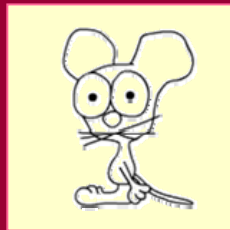
Isolation of Splenocytes



CSFE labeling of Splenocytes



Injection of labeled Cells



In vivo Incubation



Harvesting of Tissue

Research Design: Labeling and Analysis

Prepare frozen sections



Antibody labeling of HEV ligands:

Peripheral node addressin (MECA-79)

Mucosal addressin cell adhesion molecule-1 (MECA-367)



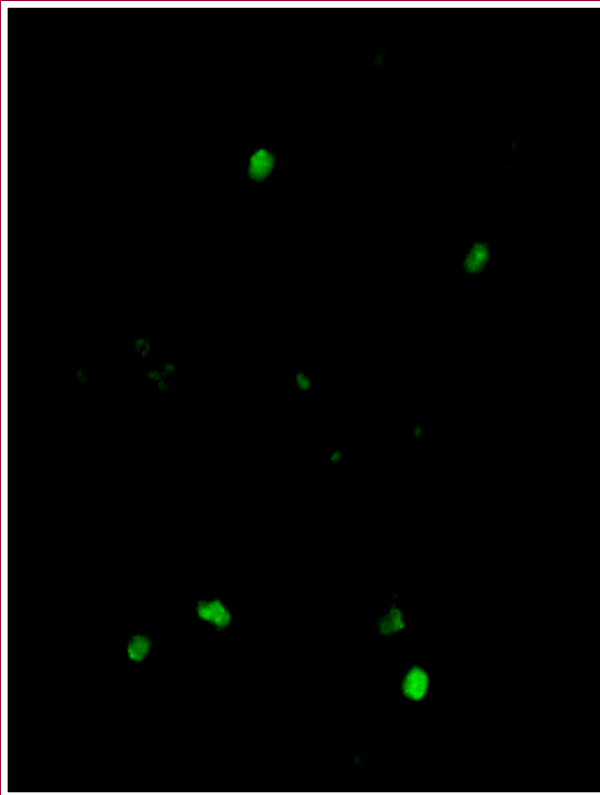
Viewed by fluorescence microscopy



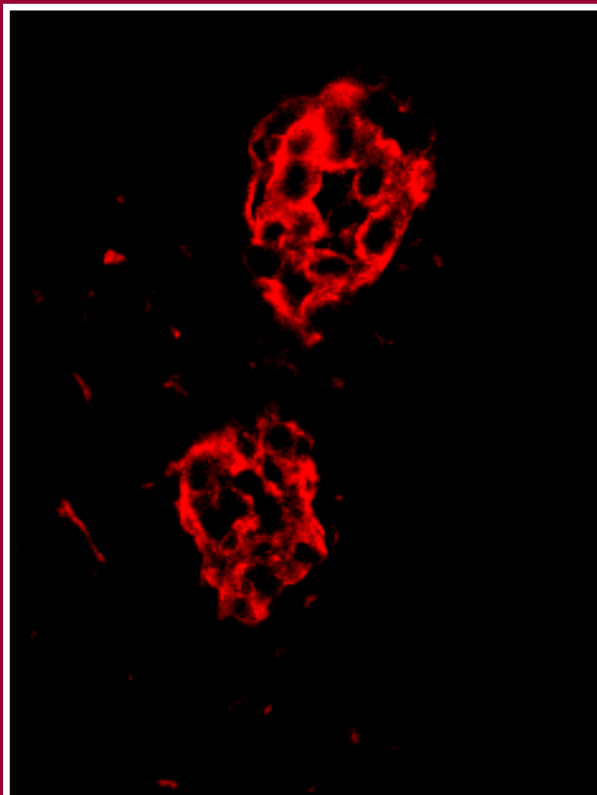
Digital Images Collected

Staining and Analysis of Section

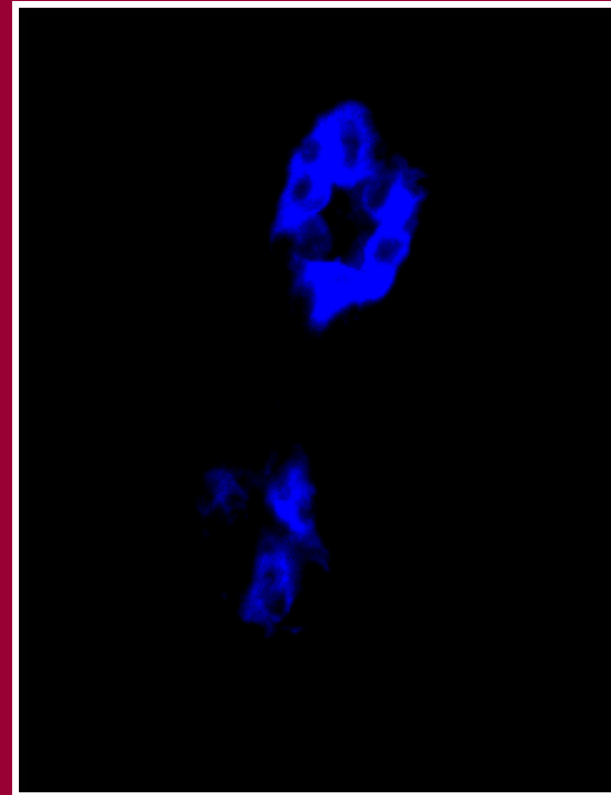
Injected cells (**CFSE**)



PNAd (**TRITC**)



MAdCAM-1 (**Cy5**)

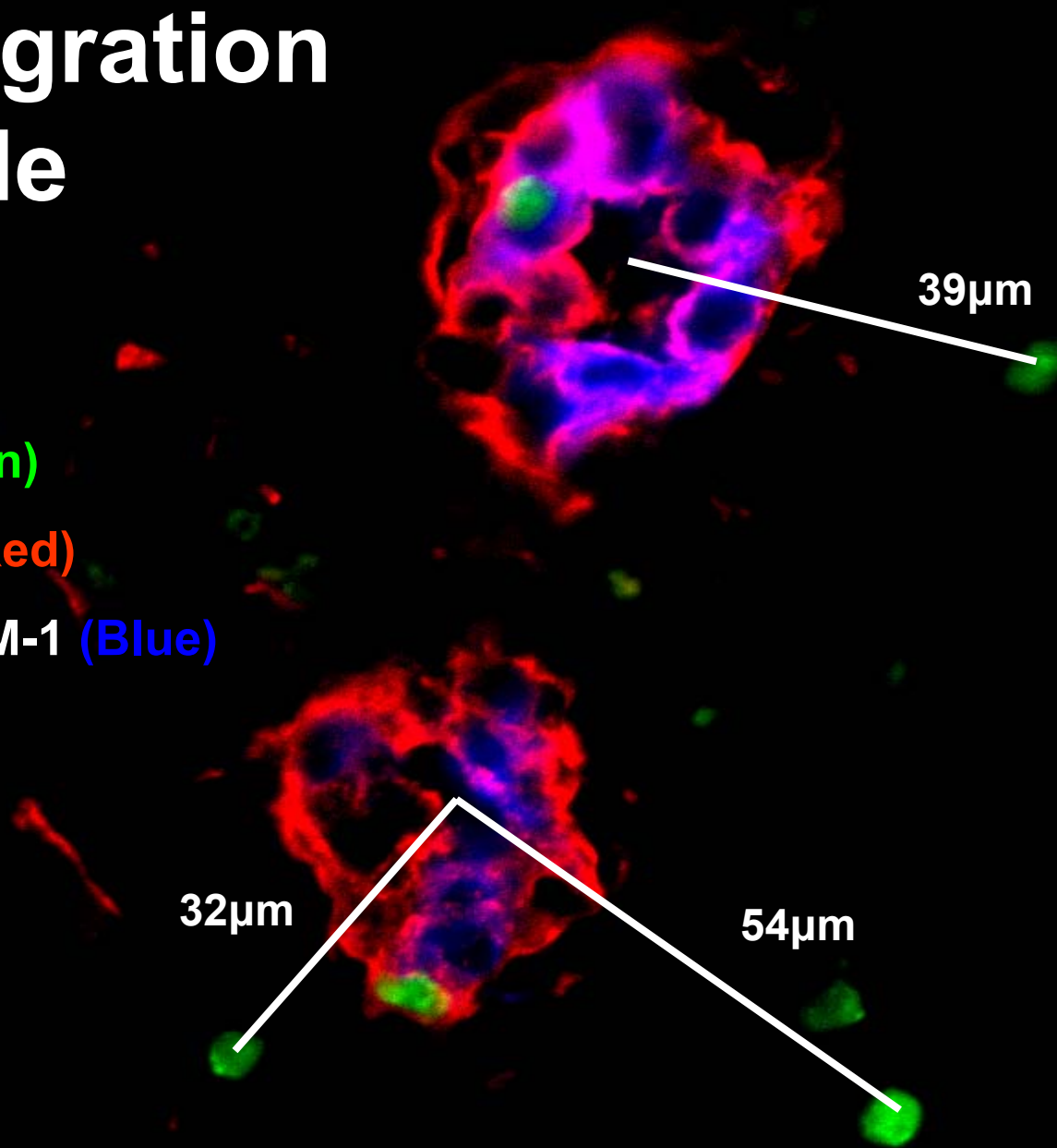


15 minute migration to lymph node

- CFSE labeled cells (Green)
- HEV expressing PNAAd (Red)
- HEV expressing MAdCAM-1 (Blue)

Analysis

of cells associated (2)
migrated across (4)
distance migrated



How to Bring It Into the High School?



- West Allis Central High School
- 1600 students (Minority-18%)
- Urban
- 38% on Free/Reduced Lunch
- 95% graduation rate
- 65% go onto post secondary education

What needed to be addressed

Challenges:

- **Limited time** →
- **Varied backgrounds of students** →
- **Rules/regulations of school** →

How to Overcome:

- **Keep it focused**
- **Motivational, diversified**
- **Use all non biological material**



“Which Way Did You Go George?”

1. Use inquiry to determine how disease can be passed
2. Understand the importance of immunity
3. Communicate how human immunity works
4. Apply new knowledge to a specific disease (extension project)



Glow Germ



Introduction Of Lesson

K

What I *Know*

W

What I *Want To*
Learn

L

What I Have
Learned



Answers to “What I Know”

K

What I Know

W

What I Want To
Learn

L

What I Have
Learned

- Antibodies help fight bad bacteria
- Can't get the same virus twice
- Deals with lymph nodes
- Can be enhanced with medicine or immunizations
- T & Y cells
- Consists of white blood cells, red cells and platelets
- Enzymes fight off intruding virus cells
- Mine sucks
- Vitamin C

Answers to “What I Want to Learn”

K

What I *Know*

W

What I *Want To*
Learn

L

What I Have
Learned

- How do we exactly get sick?
- Are there organs involved?
- How do you strengthen your immune system?
- How would you deal if you did not have one?



Internet Day

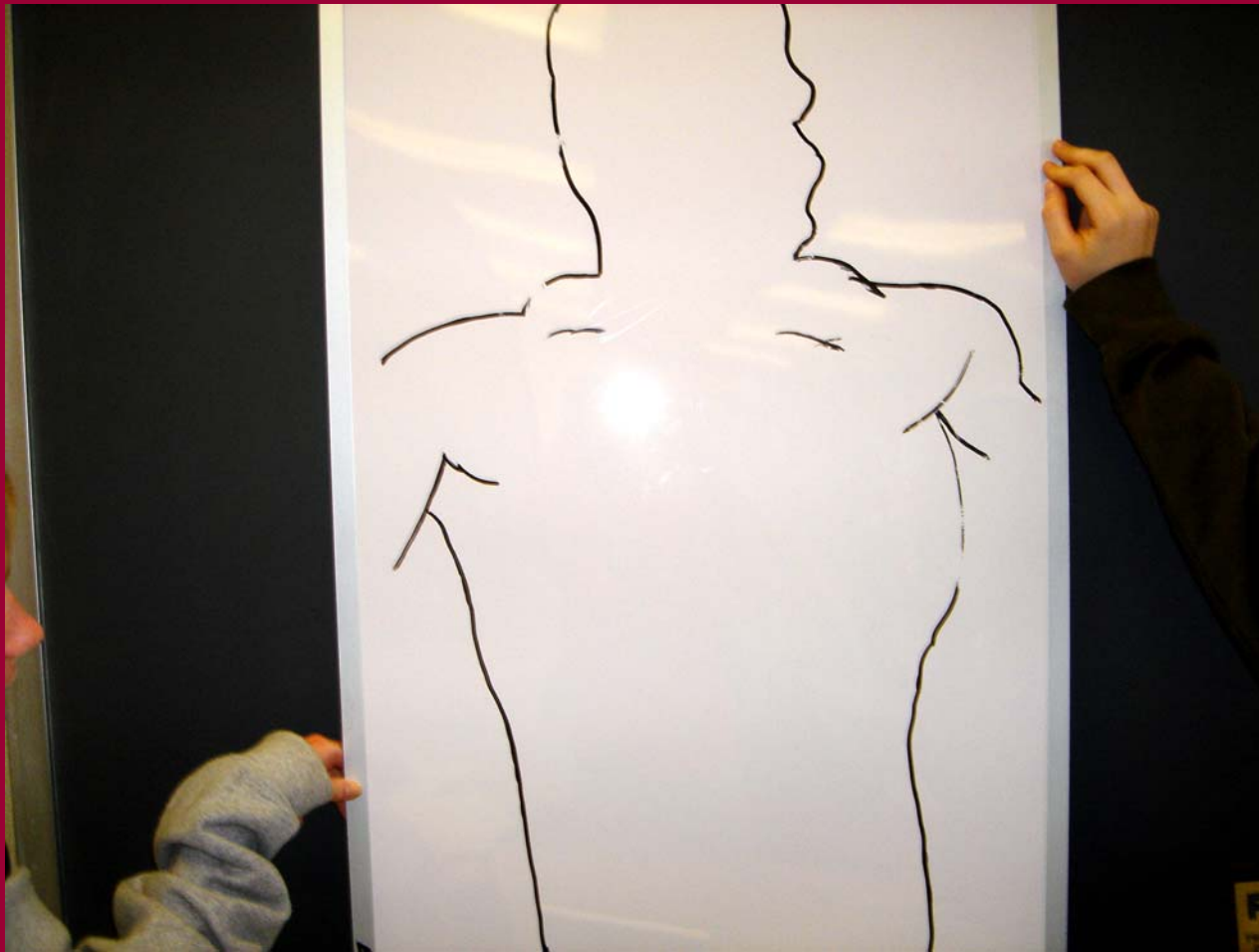
1. http://kidshealth.org/parent/general/body_basics/immune.html
2. <http://www.wisegeek.com/what-is-immunology.htm>
3. <http://www.biology.arizona.edu/immunology/immunology.html>

Catch up Day

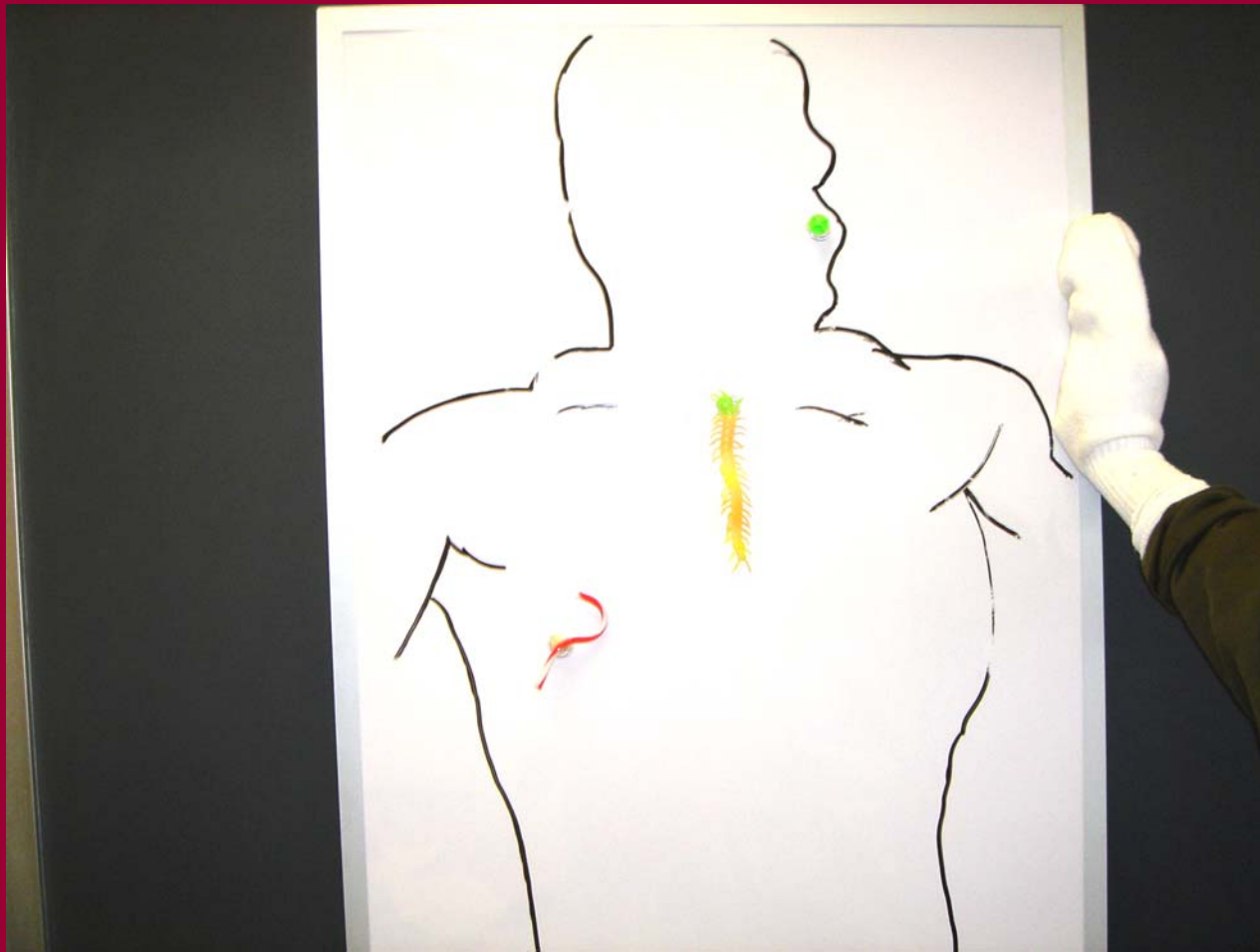
- Address misconceptions of “What they Know”
- Students take notes
- Use visual to help explain (from Peggy Deichstetter NABT convention 2005)



Visualization of Immune System



Here Come the Pathogens



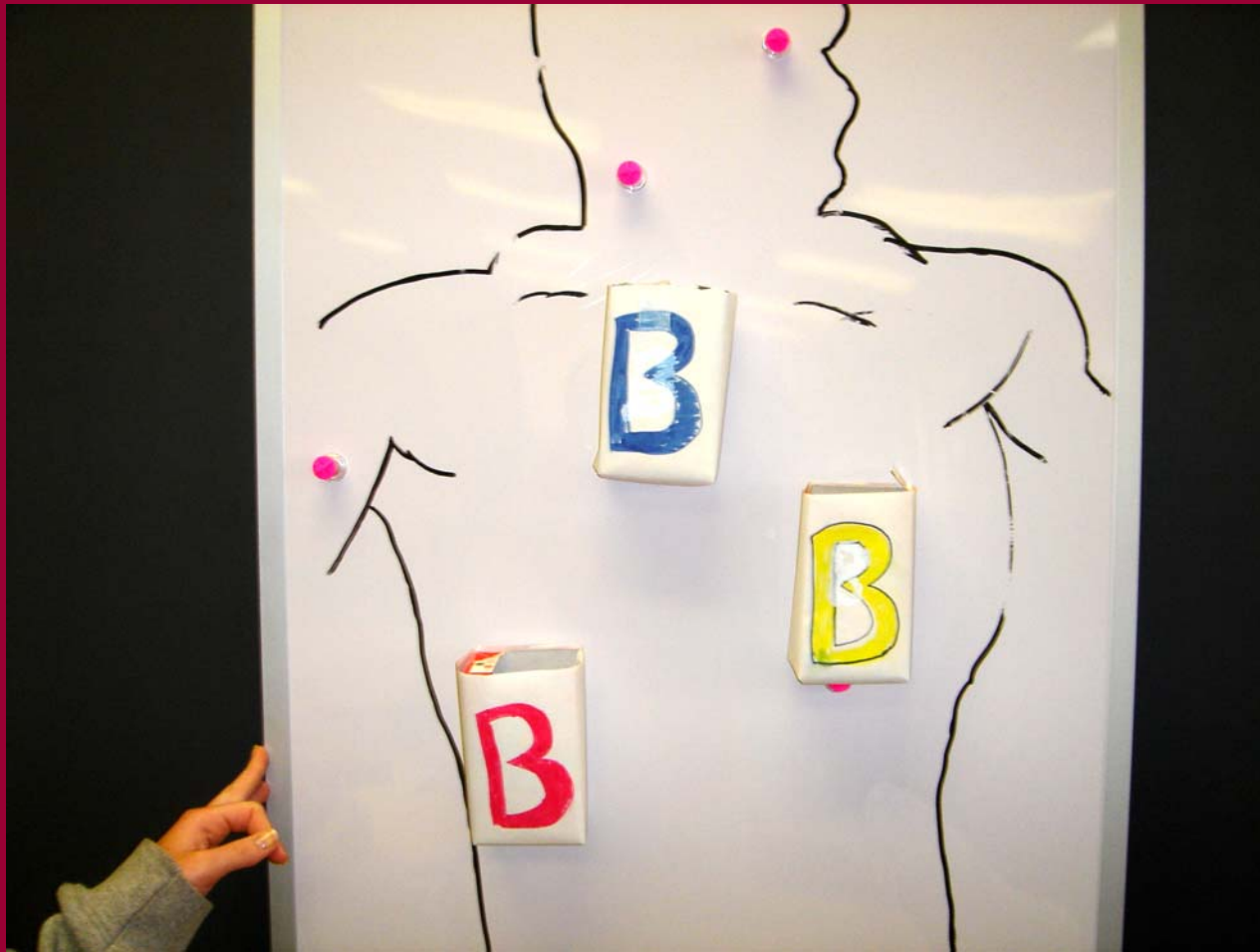
The Macrophage is here



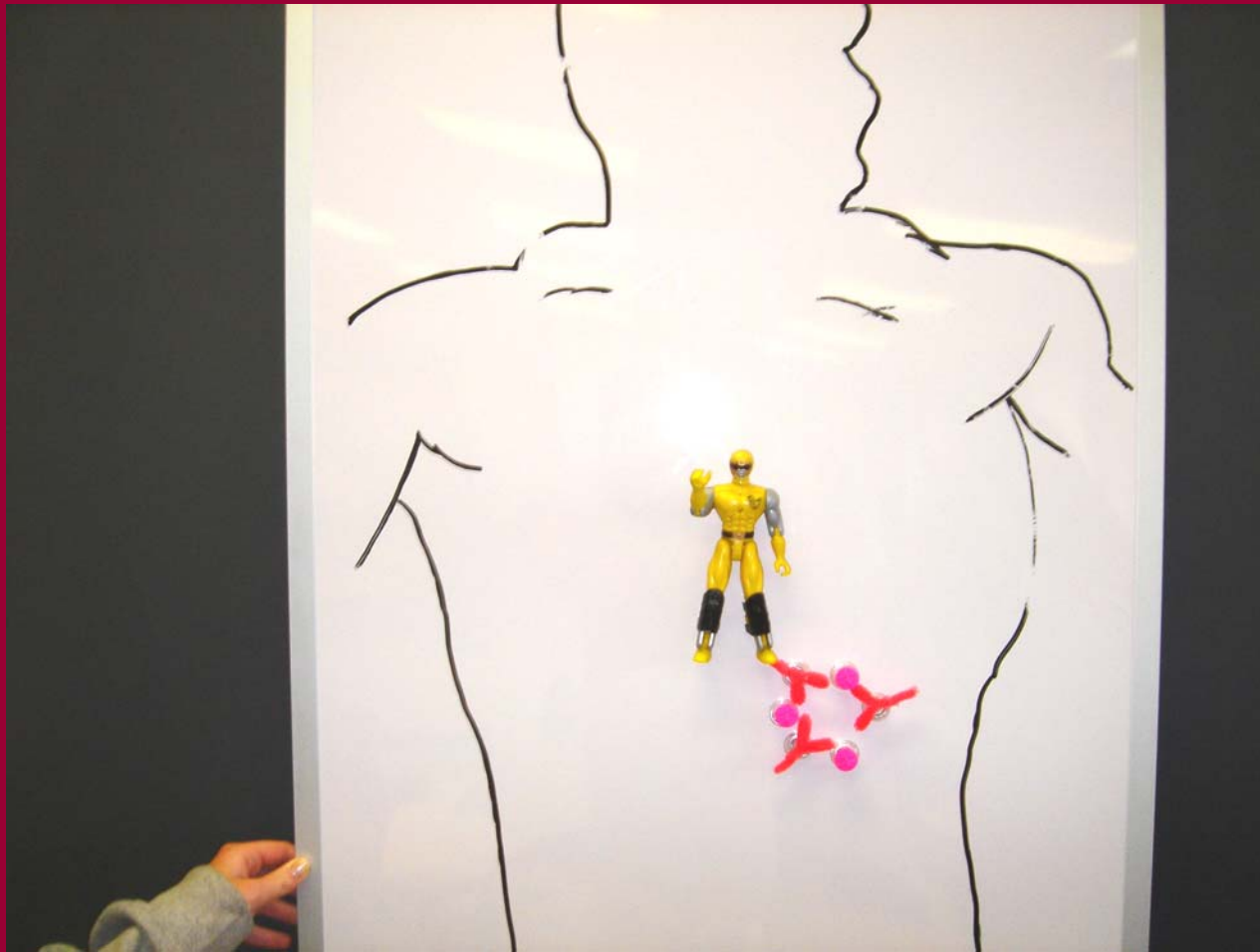
THE SIGN



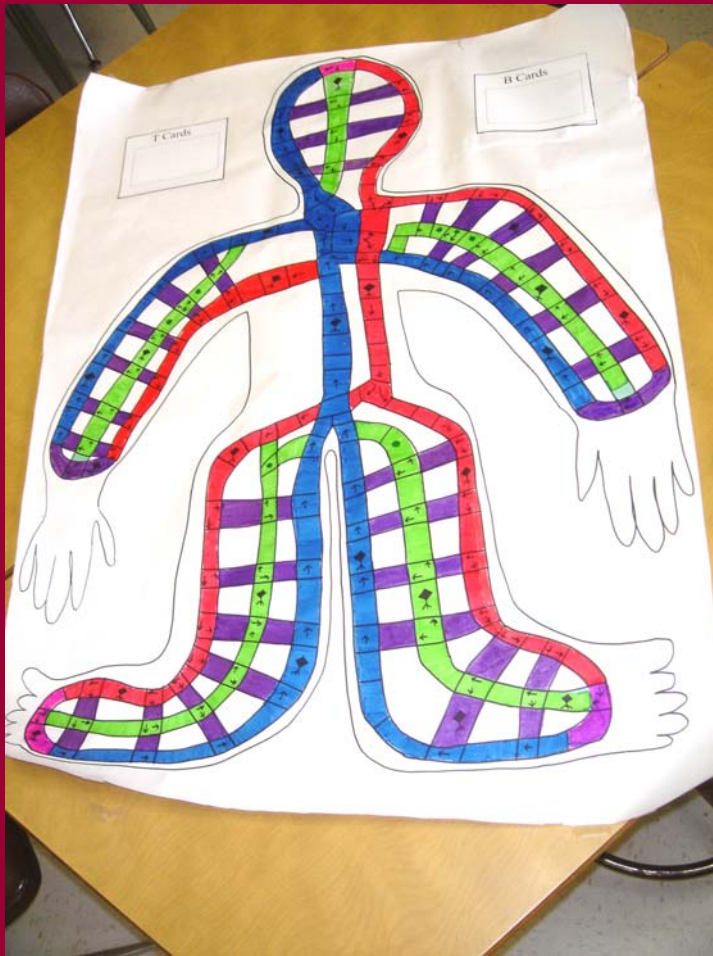
Trying to Find the Right B Cell



The Antibodies Are Here!



Game Day

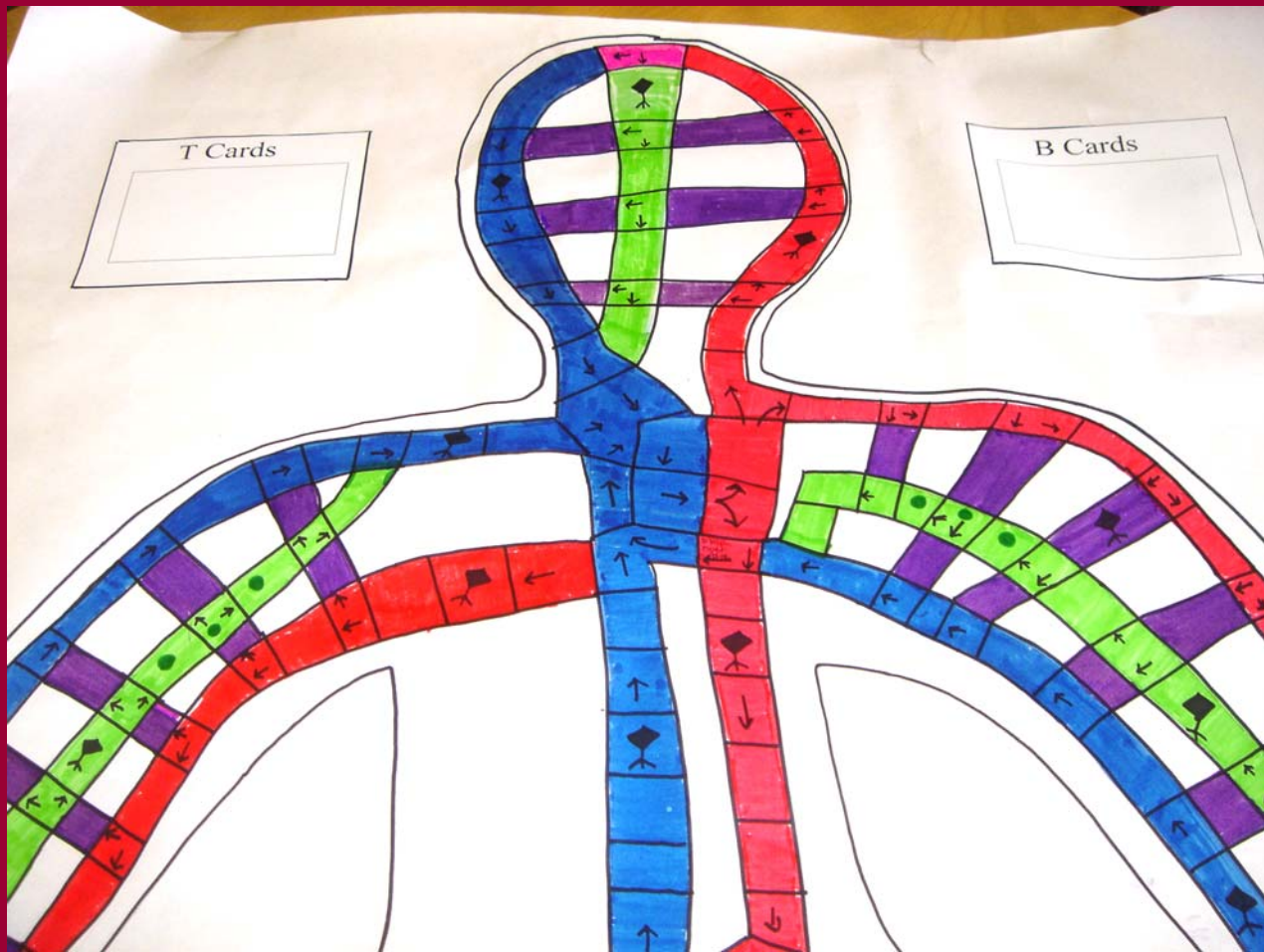


Red path-Arteries

Purple path-Capillaries

Green Path-lymphatic vessel

Blue Path-Vein



- Arrows—tell direction
- Virus-pick a card
- Green Circle-Lymph node (where you start)

Game Pieces

Antibodies



B Cells



T Cells

Sample B Cell Cards

You are needed in the capillary of the brain. A possible infection is there. You match!! Take an antibody.

You need to hang out in a lymph node. Lose a turn.

You have successfully survived for one year. Happy Birthday!! Take another turn.

Your body signed up to a health club and has been going for 3 weeks. All right!! Go again.

Sample T Cell Cards

Go and tell a B cell there is an infection in the left knee. Go there and get an antibody because you are a match!

If the last B cell earned an antibody you also earn an antibody. If not you lose two turns.

You have done a great job for years. You however are weak. Time to go. You die.

Wait for the next B cell's turn. If you get an antibody so do you! Good luck.

What students learned from the lesson

K
What I *Know*

W
What I *Want To*
Learn

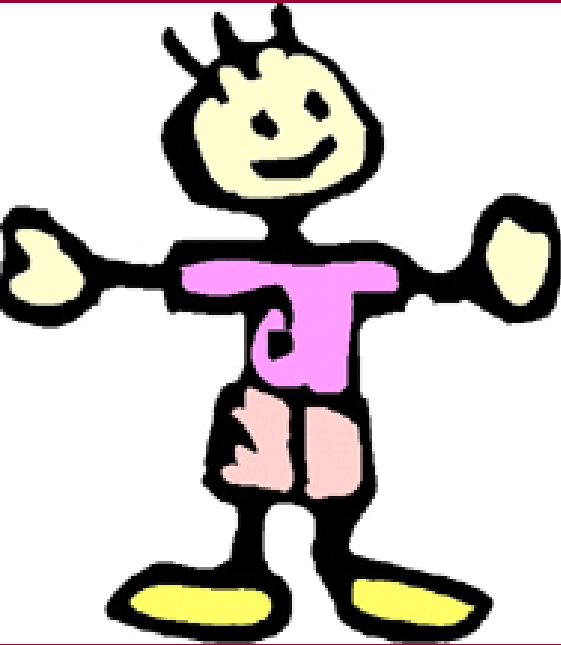
L
What I Have
Learned

- There are more B Cells than T Cells
- There is another liquid called lymph
- White blood cells travel all over
- There are other things that make you sick

My experiences with project

- Pushed my limits
- Allowed my mind to participate in the world of research
- Made me understand 'hurry up and wait'
- Gave me a better understanding of immunology

Acknowledgements



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- » Peggy Deichstetter

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