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Immune Attack

Teaching Immunology Concepts
Using the Features of
Computer Video Games



Cyber Therapy
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Adam Burrowbridge
aburrowbridge@fas.org

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Project Overview

- Funded by a National Science Foundation, Information Technology Research Grant
- Award date: Sept 2004; Game Distribution/Initial Evaluation: Mar-May 2006; 2nd Evaluation Fall 2006
- Project team: immunologists, computer scientists, software engineers and educators
- Goal: Motivate students with a series of progressively more difficult challenges in a compelling gaming environment in which success depends on an increasingly sophisticated grasp of concepts in immunology
- Evaluation at 5 high schools; 15 biology classes, ~225 biology students
- PC-based, CD-ROM distribution (also web downloadable)

Project Team

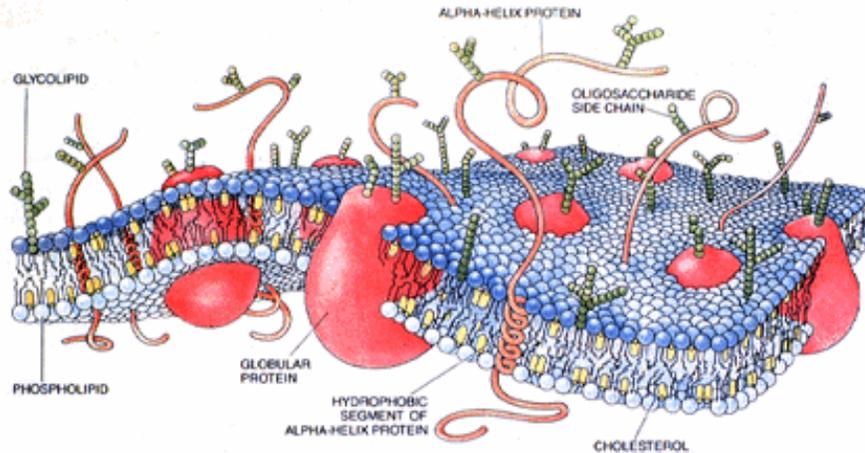
- **Federation of American Scientists:** Henry Kelly (co-PI) learning content, including oversight of Ed Adv Panel; project mgmt for game design and development; implementation and evaluation of the game
- **Brown University:** Andries van Dam (co-PI) graphics R&D, such as how to handle deformable objects; visualize cell signaling
- **University of Southern California:** Michael Zyda, Chris Swain, Jeremy Bernstein, Jenova Chen, game development
- **Advisory Panel:** Christine Byron, Brown University; David Scott, University of Maryland; Jeremy Ahouse; Jon Getbehead, Troy High School; Meghan Kuhn, Troy High School; Angelique Bosse, Montgomery Blair High School; Rod Wong, McKinley Technology High School; Joe Issac, Bellarmine College Preparatory High School

Immune Attack An Educational Video Game

- Demonstrate that simulations and the challenges of games can make learning more engaging
- **Goals:**
 - engage students in basic immunology concepts
 - create a more positive attitude towards biology
 - help teach young adults to choose better life-style behaviors to protect themselves from infection
 - expose young adults to the exciting fields of healthcare and biosciences

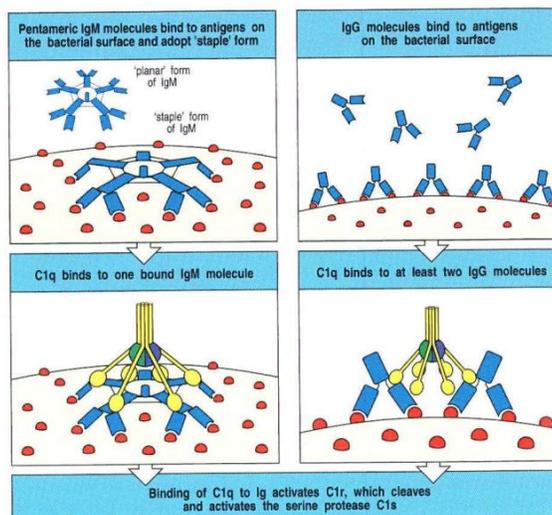
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How do you turn this:



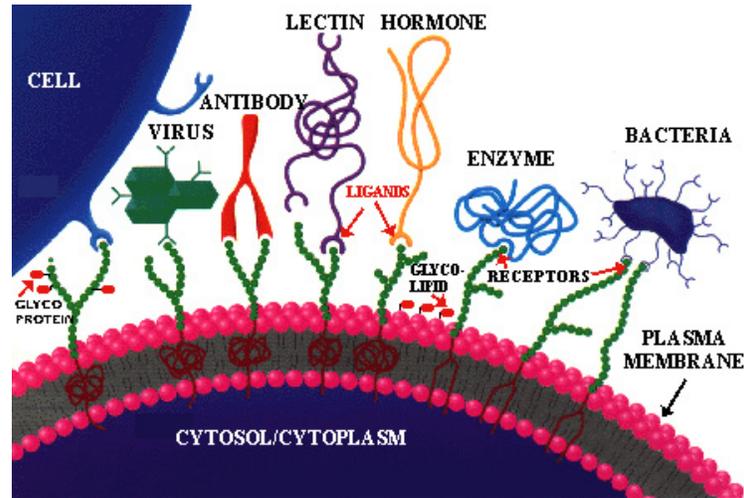
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And this:



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And this...



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Into a Game?



Learning Content

Learning Objectives

- That the Immune System is constantly operating and protecting us from harmful pathogens
- The different agents in the immune system work together to defeat bacterial and viral infections
- How immune cells recognize 'self' versus 'non-self'

Corresponding Game Play

- Infectious agents are pathogens that cause common diseases such as swimmer's ear and food poisoning
- Most infections cannot be defeated using one type of cell, and different units must signal each other to successfully complete each level
- Before attacking pathogens they must be ID'ed using appropriate receptor/ligand pairings

Game Features

- Immersive, biologically accurate 3D environments, including the circulatory system and connective tissue
- Interoperable cells & environments, allowing students to piece together individual cells, cell groups, cell surface constituents & organ systems

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More Game Features

- Cellular detail and simulations, including 3D textures and accurate polygonal models of different cell types, both friend (e.g., lymphocytes) and foe (e.g., bacteria, viruses)
- Real-time help and knowledge enrichment via *My Learning Assistant*, an innovative Question & Answer Tool

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Evaluation Methods

- Immune Attack was evaluated at 5 high schools across America in April and May. Goal: To determine the effect Immune Attack has on student's attitudes
- Similar surveys were distributed before and after the students received the game in class
- Each class played the game for half a period, followed by a assessment discussion in which students provided feedback about the game.



(Early) Evaluation Results

- Students were very positive about the visualization of the body: "It's fun to see what this looks like"
- Generally, students felt the game could get them excited about biology
- Teachers were strong proponents of the game: "We are always looking for innovative new ways to reach out to students"
- Surprise: Game works VERY well cooperatively. Students playing together got further, and asked better questions.

Next Steps

- Add more levels and content, including adaptive Immune System and viruses
- Expand on the My Learning Assistant Database by incorporating more information and further integrating it into gameplay
- Create multiplayer options for cooperative use by multiple students

Contact Information

Adam Burrowbridge
Immune Attack Development
Federation of American Scientists
aburrowbridge@fas.org
www.fas.org/learningfederation