7.014 Section Problem: Immunology

Match the following statements with the appropriate cell type(s).
Choose from:
• All body cells  •  B cells  •  Helper T cells
•  Neurons  •  Macrophages  •  Cytotoxic T cells

1) destroy infected body cells
2) specifically bind soluble antigen
3) present peptides on class II MHC
4) present peptides on class I MHC
5) stimulate B cells
6) undergo somatic recombination

The varicella zoster virus (VZV) is the infectious agent that results in chickenpox, a common childhood illness that causes itchy red spots on the skin. Contracting VZV as a child is relatively benign, but can present serious health issues when contracted as an adult.

i) How does a VZV infected cell signal the immune system. How are the infected cells specifically eliminated from the body.

ii) Over the course of a lifetime, the average person is exposed to VZV many times, yet usually only displays symptoms once. What is the immune system mechanism that results in lifetime resistance?

As of September 1999 any child entering kindergarten must have had chickenpox or received a new vaccine against VZV.

iii) Present an argument in support of this vaccination campaign.

iv) Present an argument opposed to this vaccination campaign.
7.014 Section Solutions: Immunology

1) destroy infected body cells  
   T cells

2) specifically bind soluble antigen  
   B cells

3) present peptides on class II MHC  
   B cells and Macrophages

4) present peptides on class I MHC  
   All body cells

5) stimulate B cells  
   Helper T cells

6) undergo somatic recombination  
   B cells, Helper T cells, and Cytotoxic T cells

a  
   i) Once a body cell is infected, peptides specific to VZV are presented on class I MHC molecules on the surface of the infected cell. Some cytotoxic T cells will recognize the MHC I/ VZV peptide complex as non-self, become activated and destroy the VZV-infected cells.

   ii) Once infected with VZV, the individual mounts a full immune response and eventually clears the virus. Part of the immune response is the generation of memory B and T cells. Upon re-exposure to VZV, the immune system is primed with cells proven effective against VZV. The secondary immune response is faster and more effective and eliminates the virus before symptoms of VZV occur.

iii) An argument for vaccination is to reduce pain and discomfort in young children, and ensure that no one enters adulthood susceptible to the disease.

iv) An argument against vaccination is driven by the concern that the vaccine may not provide lifetime immunity against VZV. It is not clear that whether the lifetime immunity of individuals is due to contracting the disease, or whether subsequent exposure to the VZV virus (from siblings, classmates, etc.) acts as an immune system booster. If all children receive the vaccine, then after several years there will be no secondary exposures and thus no boost to the immune system. The fear is then that these children reach adulthood they may be exposed to VZV (not every country will vaccinate all their children) and no longer have immunity. The consequences of contracting VZV as an adult are unpleasant at best and life-threatening in some cases.