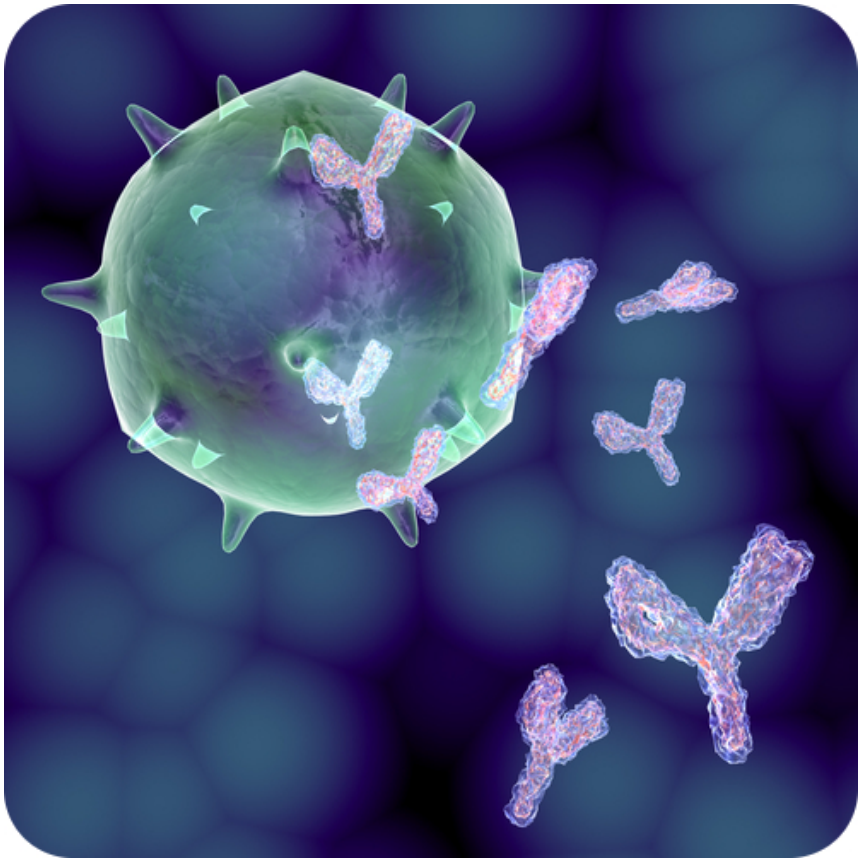
# CONCEPT 1 Humoral Immune Response

- List the steps that occur in a humoral immune response.



**What are those Y-shaped things floating around the cell?**

They are antibodies , which are large proteins. And they connect to specific antigens for destruction. It does help that the antigens are usually attached to pathogens.

## Humoral Immune Response

There are actually two types of immune responses: humoral and cell-mediated. The **humoral immune response** involves mainly **B cells** and takes place in blood and lymph. You can watch an animation of the humoral immune response at the link below. http://www.cancerresearch.org/resources.aspx?id=586

### B Cell Activation

B cells must be activated by an antigen before they can fight pathogens. This happens in the sequence of events shown in **Figure** below.

1. First, a B cell encounters its matching antigen and engulfs it.

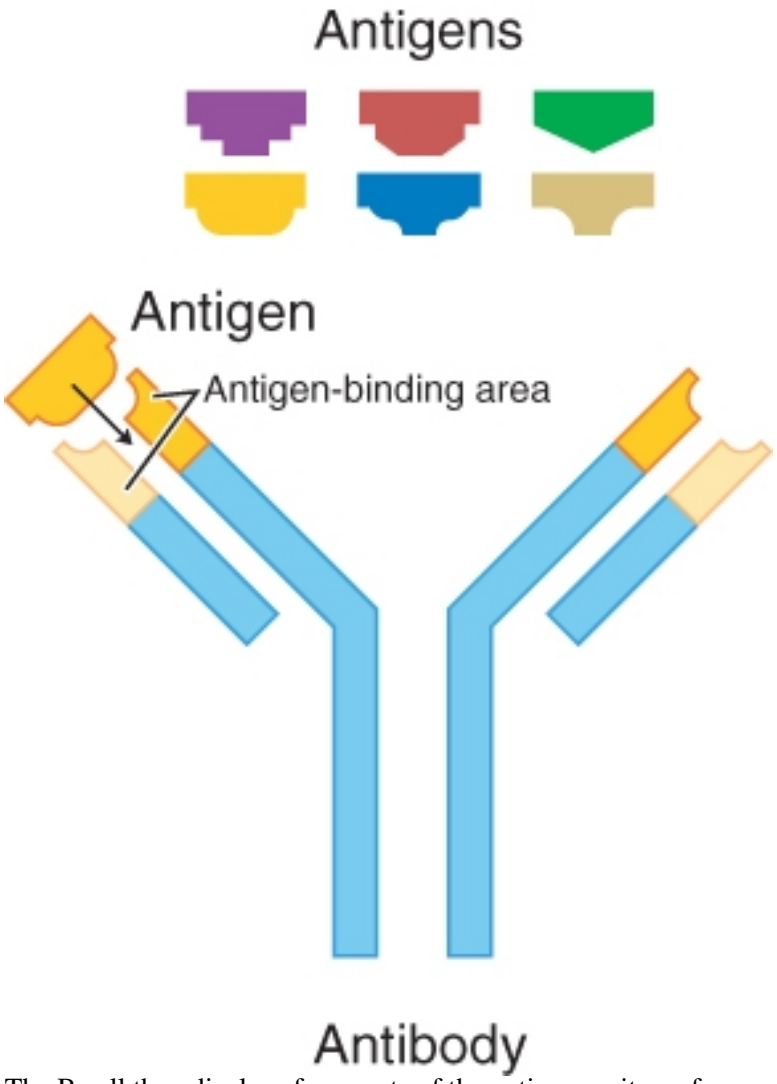
2. 


FIGURE 1.1

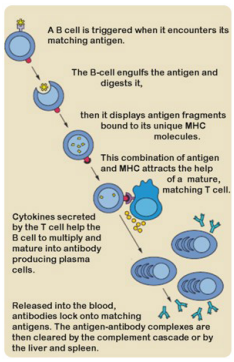
3. The B cell then displays fragments of the antigen on its surface.
4. This attracts a **helper T cell**.
5. The helper T cell binds to the B cell at the antigen site and releases **chemicals (Cytokines)** that "tell" the B cell to develop into a **plasma cell**.

(a) Plasma cells are activated B cells that make/secrete antibodies.

i. *Plasma cells are like antibody factories, producing many copies of a single type of antibody.*

(b) **Antibodies** are large, Y-shaped proteins that recognize and bind to antigens.

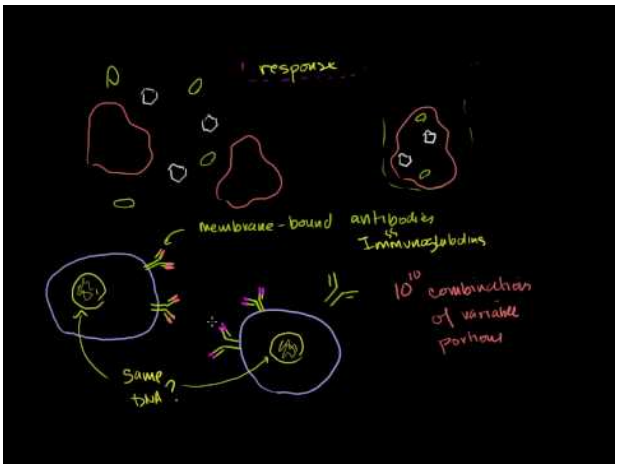
i. The antibodies travel throughout the body in blood and lymph.
ii. Each antibody binds to just one kind of antigen.
iii. It works like a handcuff, connecting to antigen on invading cells and clumping them up!
iv. When it does, it forms an **antigen-antibody complex** (see **Figure**below). The complex flags the antigen-bearing cell for destruction by **phagocytosis**.

v. 


6. **PLASMA CELLS:**Most plasma cells live for just a few days, but some of them live much longer.
   (a) They may even survive for the lifetime of the individual.
   (b) Long-living plasma cells are called **memory cells.**
   (c) They retain a "memory" of a specific pathogen long after an infection is over.
   (d)

## TABLE 1.1:

B lymphocytes are further discussed at http://www.youtube.com/watch?v=Z36dUduOk1Y (14:13).




---

The video at the link below shows how this happens. http://www.youtube.com/watch?v=lrYlZJiuf18&feature=fvw

MEDIA

Click image to the left for more content.

## Summary

- Activated B cells produce antibodies to a particular antigen.
- Memory B cells remain in the body after the immune response is over and provide immunity to pathogens bearing the antigen.

## Practice

Use this resource to answer the questions that follow.

- http://www.hippocampus.org/Biology → Biology for AP* → Search: **The Humoral Response**

1. What is the humoral response?
2. What cells are involved in the humoral response?
3. Describe the antibody-B cell-Helpter T cell complex. Include an illustration.
4. How do B-cells function?
5. Describe the role of Helper T cells.
6. Distinguish between Effector B and Memory B cells.
7. Define immunoglobulin and epitope.
8. Describe antibody function.

## Review

1. How do plasma cells form, and how do they help fight pathogens?
2. If a disease destroyed a person's helper T cells, how might this affect the ability to launch an immune response?