

ME 411 / ME 511

Biological Frameworks for Engineers

Class Organization

- Lab 1 due today
- Hw 3 due on Friday
- Lab 2 – Lab-on-a-Chip
 - Fri, More 320
 - Sign up for 1:30, 2:30, 3:30 slots
 - Read the pre-lab instructions
 - Report due Mon, 10/28 (2-3 pages)

ME 411 / ME 511

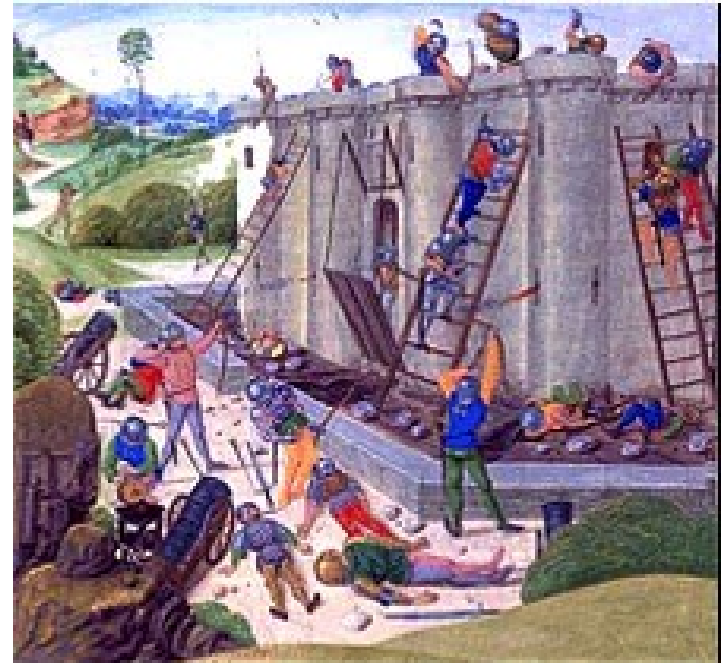
Immunology

Protect the Castle!

Invaders



Defenses



Protect the Body!

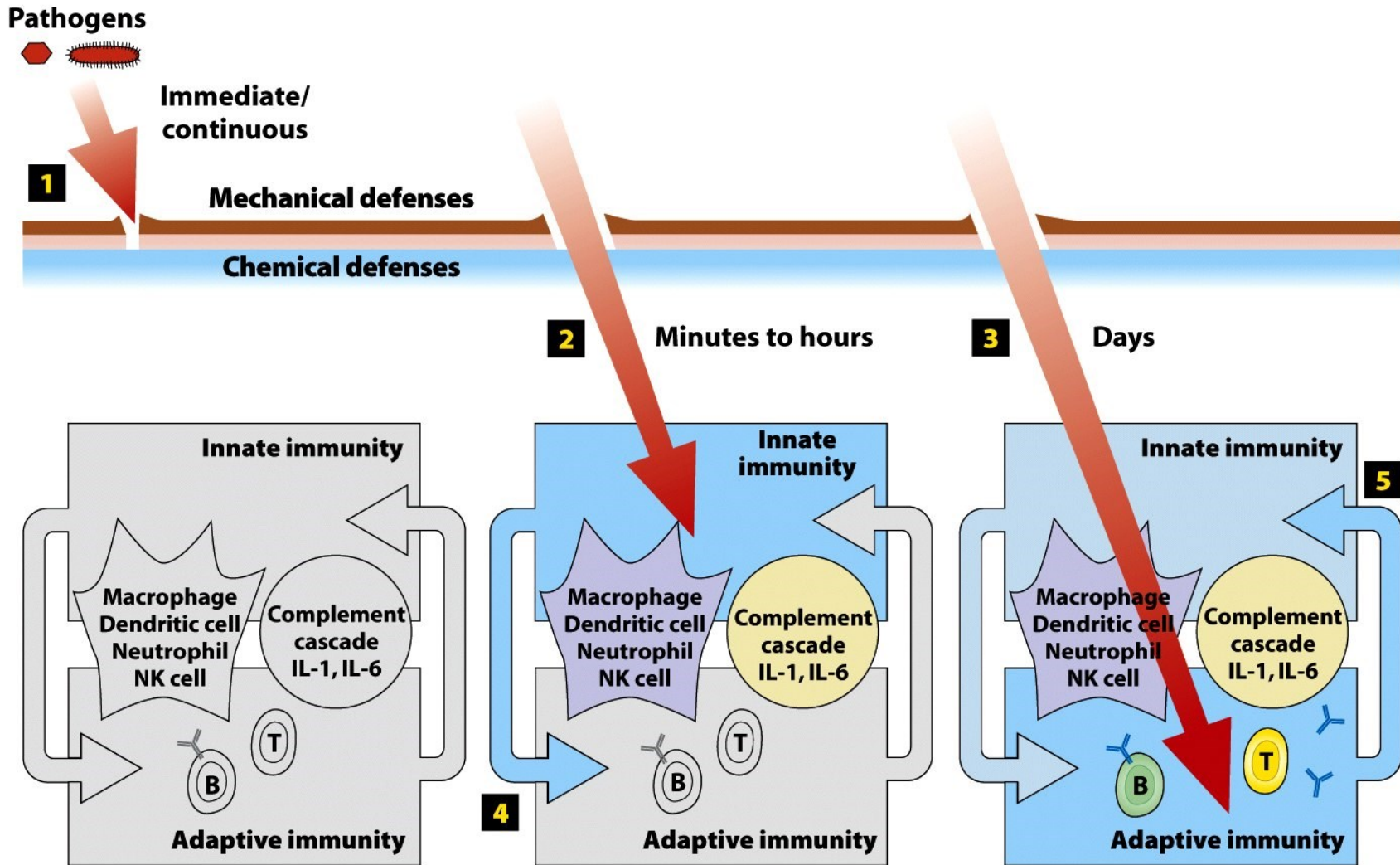


Figure 24-1
 Molecular Cell Biology, Sixth Edition
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Lymphatic System

- Circulatory vessels
- Lymph fluid
 - 3 liters of clear fluid
 - Recycled blood plasma
- Function
 - Tissue drainage
 - Fatty acid transport
 - WBC passage

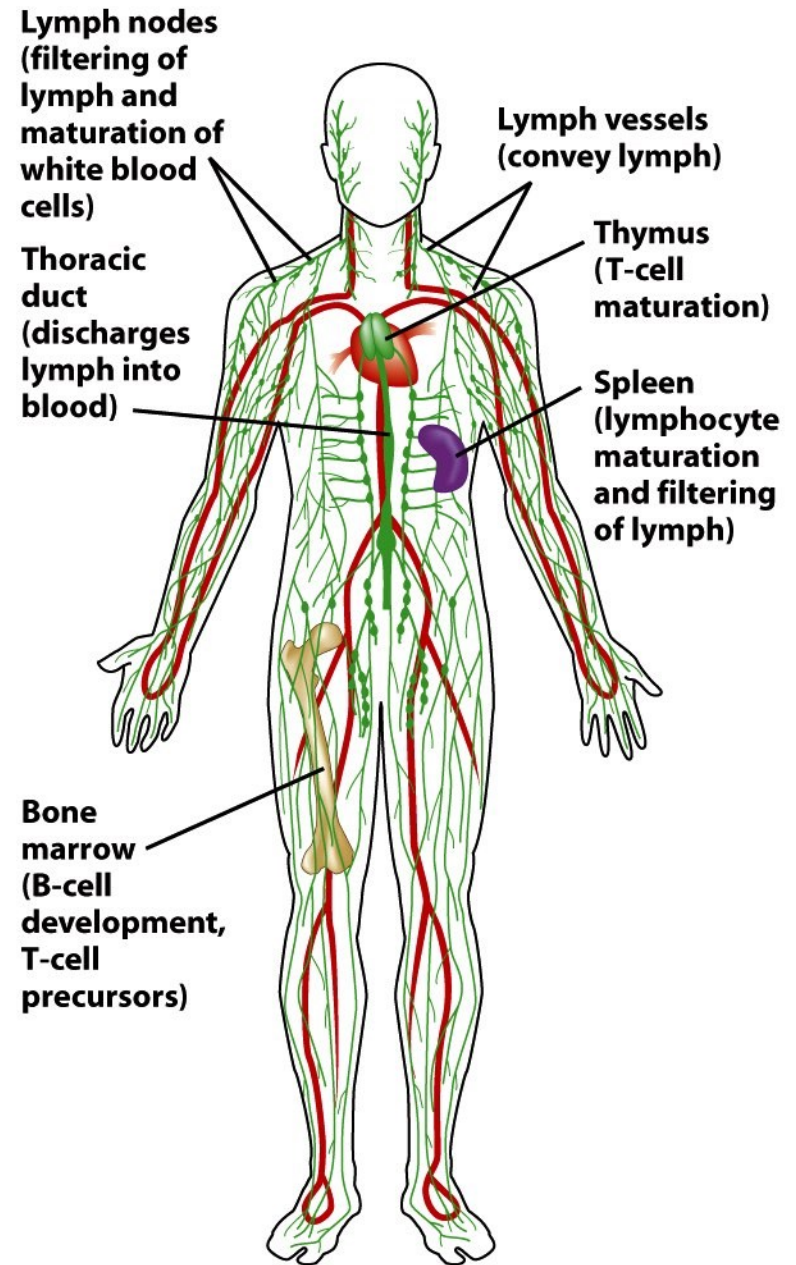
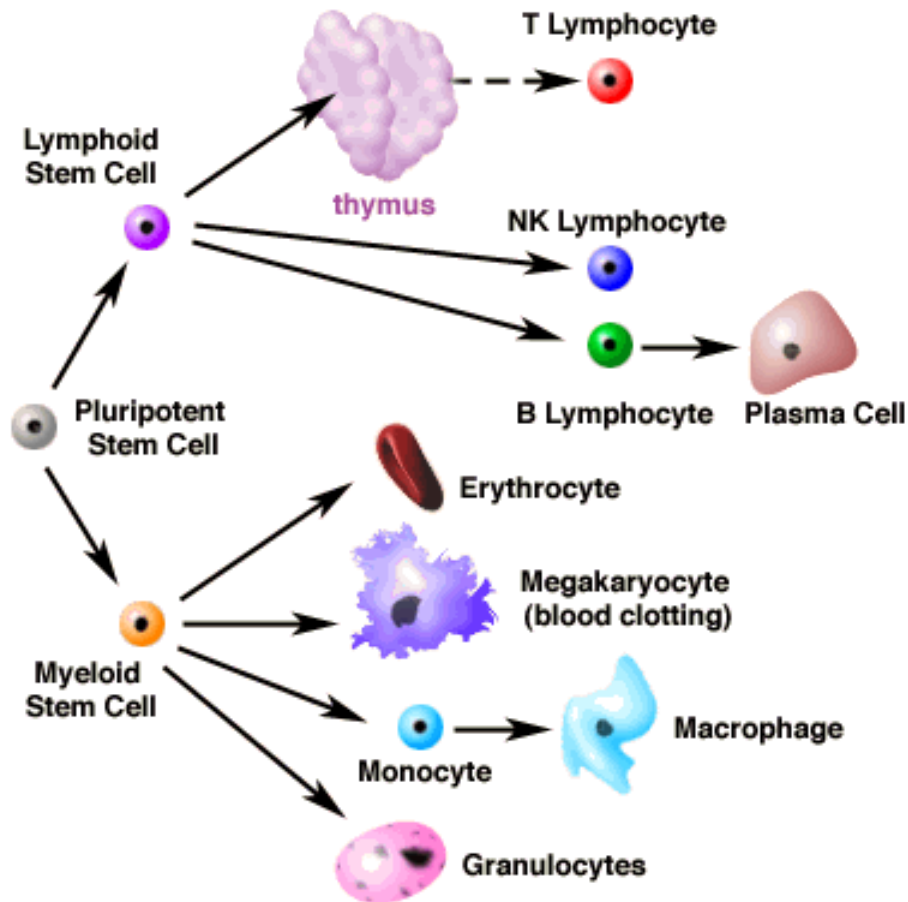


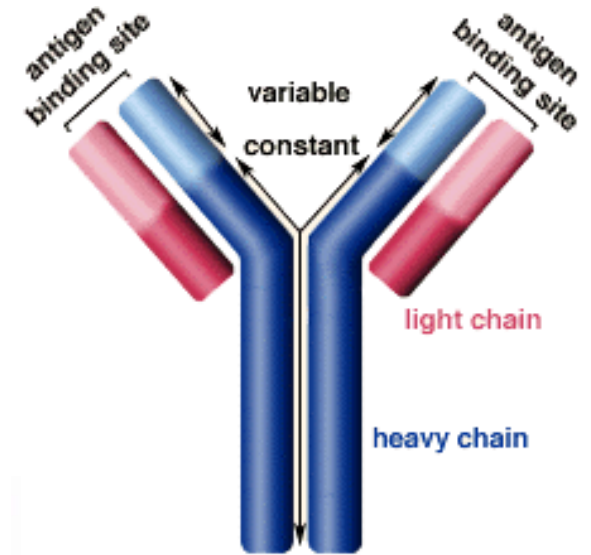
Figure 24-2
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Cells of the Immune System



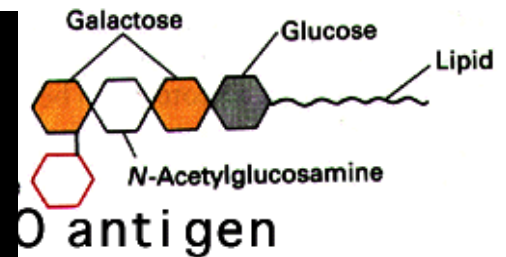
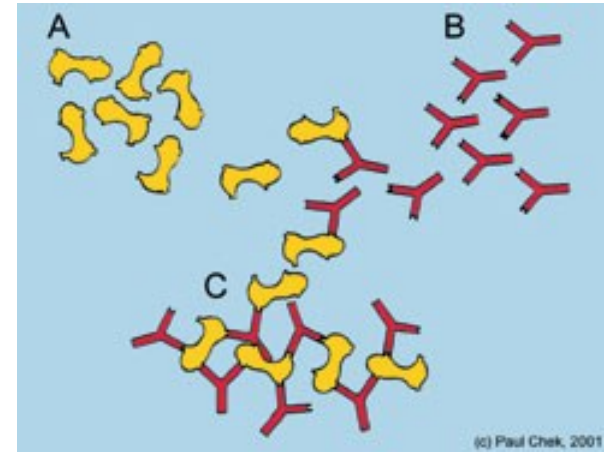
Antibodies

- B-cells make them
- Not antibiotics
- Immunoglobulins (Ig)
- Structure
 - Heavy chain, light chain
 - 2:1 binding
 - Fab – antibody fragment
 - Fc – crystallizable fragment

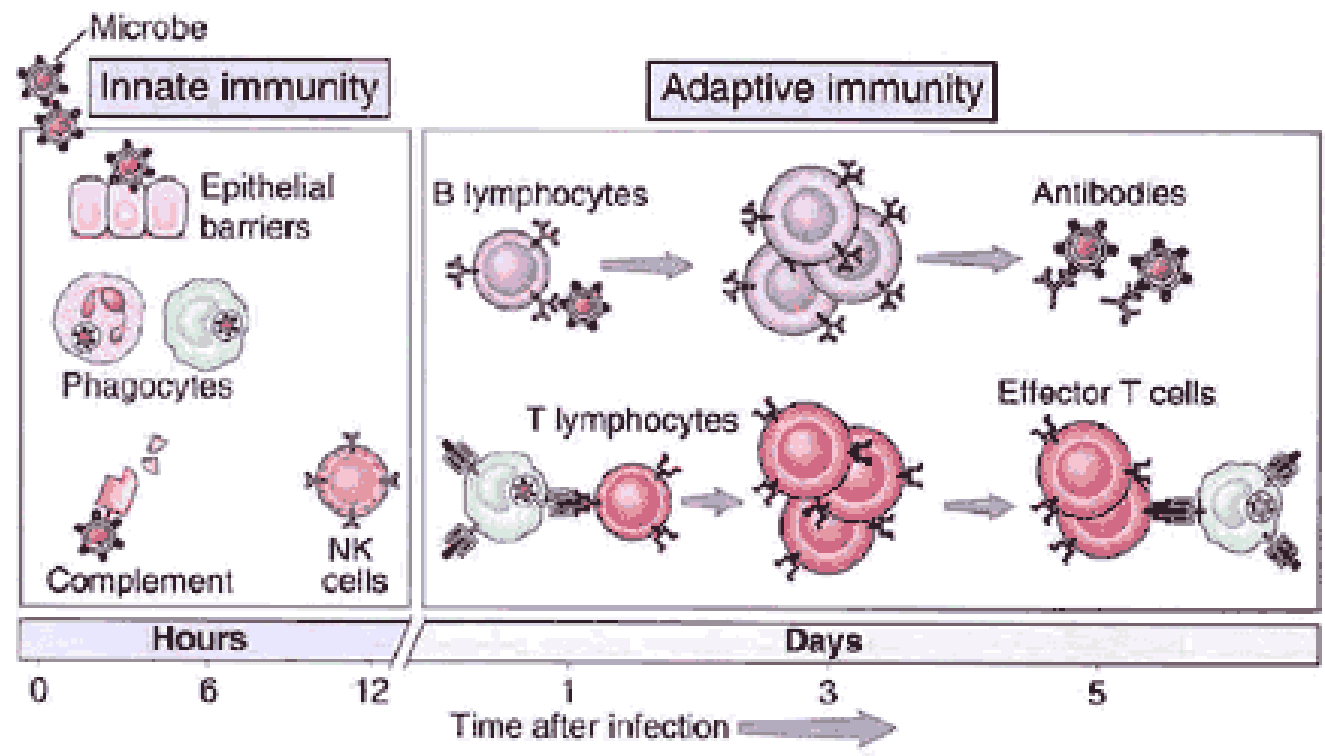


Antigens

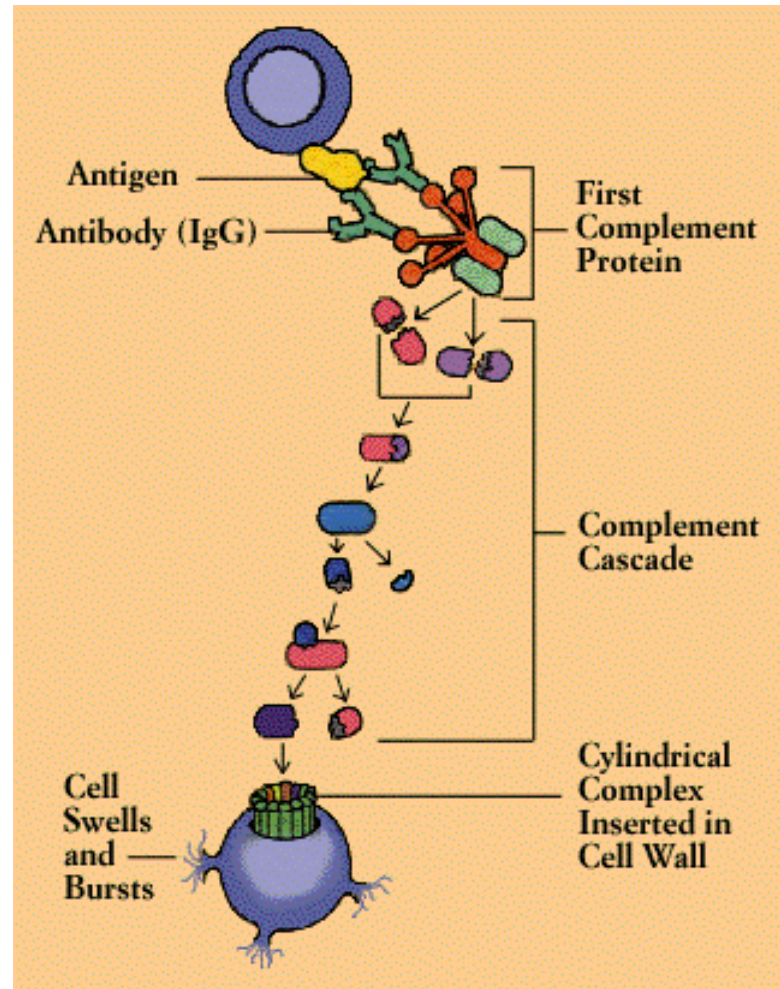
- Protein, lipid, glycan
- Epitopes
- Surface markers on foreign cells or bacteria



Immune Response

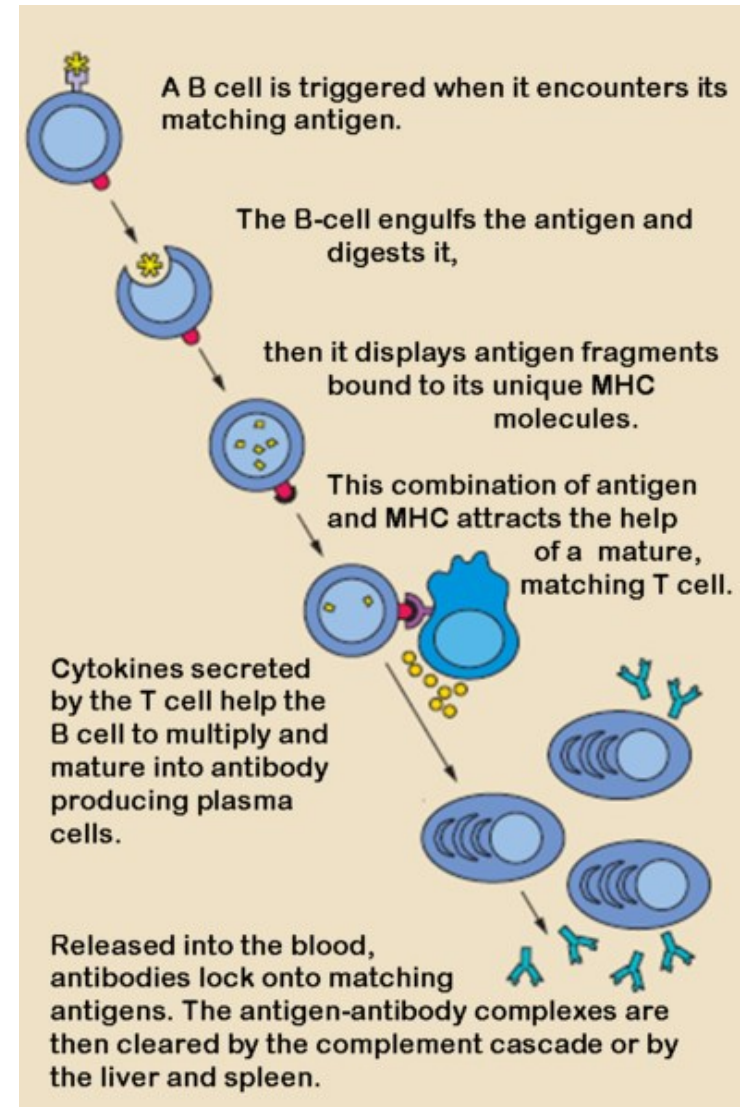


Complement System



Adaptive Immune Response

- Cell Hunters
 - B cell lays a trap...
 - Find it, kill it...
 - Shows off the trophy...
 - Learns to kill at a distance...
- MHC: major histocompatibility complex
 - “Self” receptor



If it doesn't kill you at first...

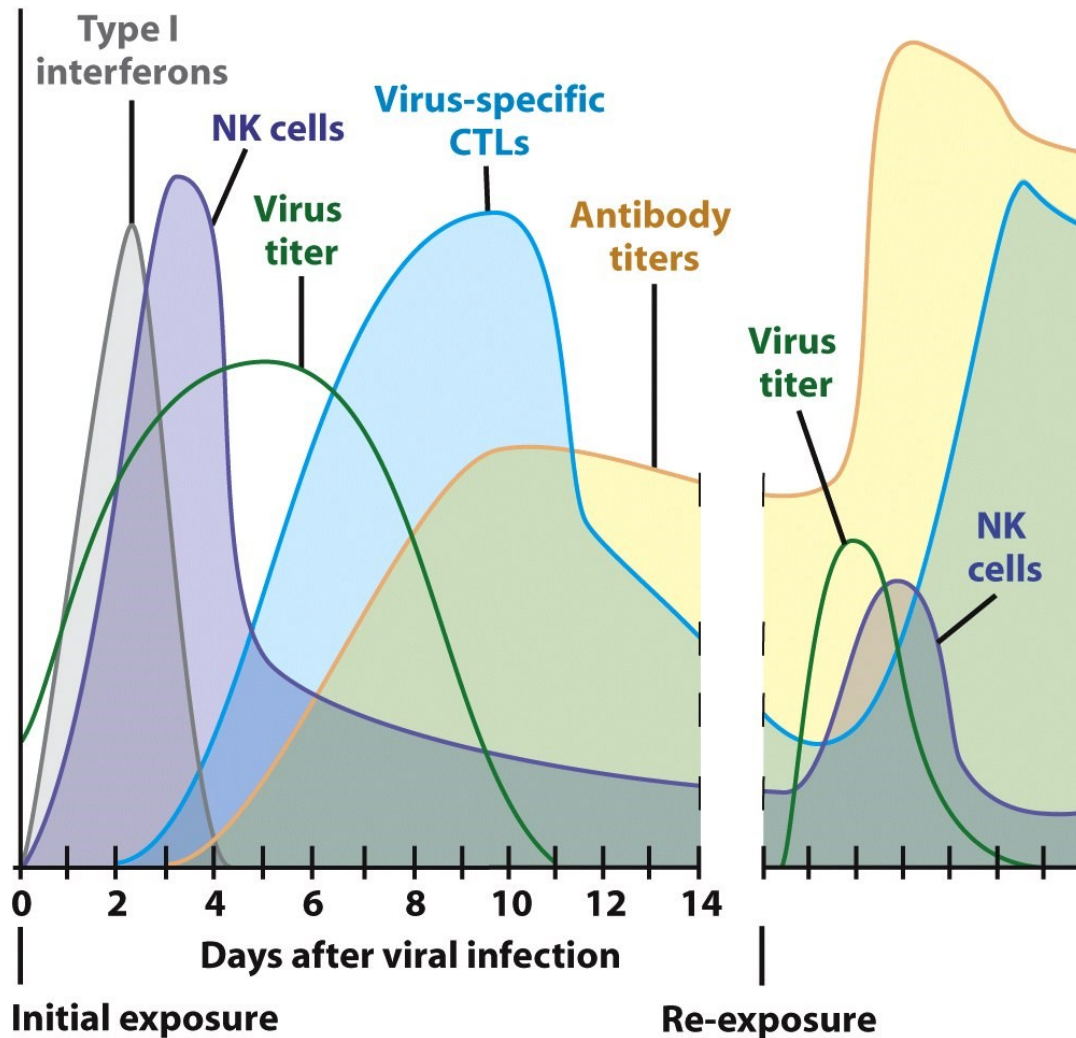
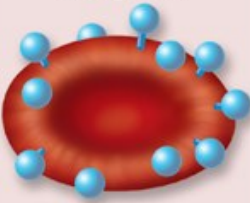
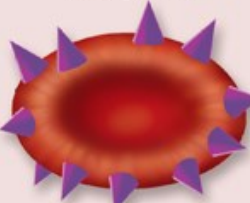
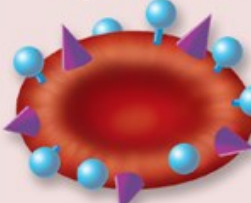






Figure 24-37
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Blood Types

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ABO Blood Types				
Erythrocytes	Antigen A 	Antigen B 	Antigens A and B 	Neither antigen A nor B 
Plasma	Anti-B antibodies 	Anti-A antibodies 	Neither anti-A nor anti-B antibodies	Both anti-A and anti-B antibodies 
Blood type	Type A Erythrocytes with type A surface antigens and plasma with anti-B antibodies	Type B Erythrocytes with type B surface antigens and plasma with anti-A antibodies	Type AB Erythrocytes with both type A and type B surface antigens, and plasma with neither anti-A nor anti-B antibodies	Type O Erythrocytes with neither type A nor type B surface antigens, but plasma with both anti-A and anti-B antibodies

(a)

Method

**Reliable diagnosis
in 2 minutes**

Test procedure

Place one drop of isotonic saline solution on each reaction field and auto-control field.



Add one drop of the recipient's blood to each field in the upper panel of the card and one drop of donor blood to each field in the lower panel of the card.



Stir each field with an applicator stick for approx. 30 seconds. The reagents must dissolve completely.



Gently rock the card back and forth for approx. 30 to 60 seconds, then check each field for agglutination.

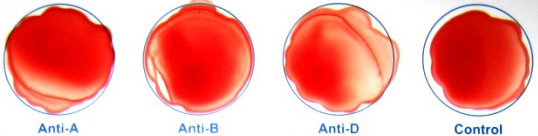


Dry the reaction mixtures and cover with self-adhesive film before filing the card.



Donor/Recipients

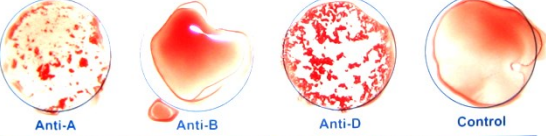
Amal



Amal's blood typing results are shown in four circular wells: Anti-A, Anti-B, Anti-D, and Control. The Anti-A well shows a solid red color. The Anti-B well shows a solid red color. The Anti-D well shows a solid red color. The Control well shows a solid red color.

Name - Nombre - Navn	Address - Dirección - Adresse
AMAL GRAAESTRA	

Jenny



Jenny's blood typing results are shown in four circular wells: Anti-A, Anti-B, Anti-D, and Control. The Anti-A well shows agglutination (clumping). The Anti-B well shows a solid red color. The Anti-D well shows agglutination (clumping). The Control well shows a solid red color.

Name - Nombre - Navn	Address - Dirección - Adresse
Jenny	

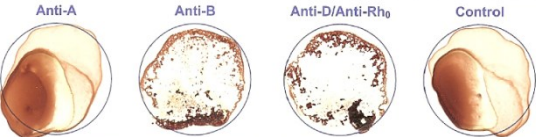
Timmy



Timmy's blood typing results are shown in four circular wells: Anti-A, Anti-B, Anti-D, and Control. The Anti-A well shows a solid red color. The Anti-B well shows a solid red color. The Anti-D well shows agglutination (clumping). The Control well shows a solid red color.

Name - Nombre - Navn	Address - Dirección - Adresse
Monkey, Timmy	ThinkGeek HQ

Ryan

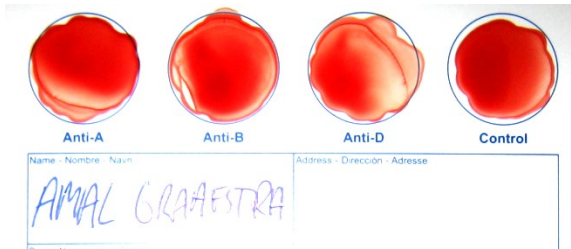


Ryan's blood typing results are shown in four circular wells: Anti-A, Anti-B, Anti-D/Anti-Rh₀, and Control. The Anti-A well shows a solid red color. The Anti-B well shows agglutination (clumping). The Anti-D/Anti-Rh₀ well shows agglutination (clumping). The Control well shows a solid red color.

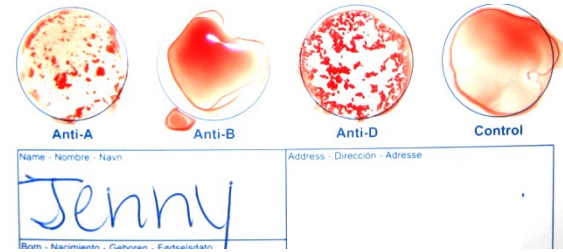
Name - Nome	Address - Dirección
RYAN P. REYES	

Donor/Recipients

Amal (O-)



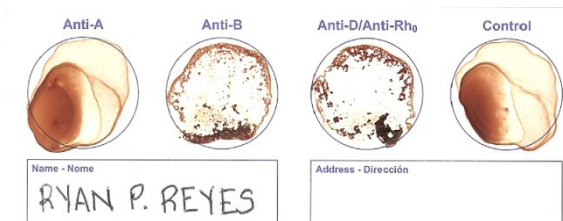
Jenny (A+)



Timmy (O+)



Ryan (B+)



Donor/Recipients

Amal (O-)

Anti-A Anti-B Anti-D Control

Name - Nombre - Navn: AMAL GRAAFSTRA
Address - Dirección - Adresse:

Jenny (A+)

Anti-A Anti-B Anti-D Control

Name - Nombre - Navn: Jenny
Address - Dirección - Adresse:

Timmy (O+)

Anti-A Anti-B Anti-D Control

Name - Nombre - Navn: Monkey, Timmy
Address - Dirección - Adresse: ThinkGeek HQ

Ryan (B+)

Anti-A Anti-B Anti-D/Anti-Rh0 Control

Name - Nome: RYAN P. REYES
Address - Dirección:

Donor/Recipients

Amal (O-)

Anti-A Anti-B Anti-D Control

Name - Nombre - Navn: AMAL GRAAESTRA
Address - Dirección - Adresse:

Jenny (A+)

Anti-A Anti-B Anti-D Control

Name - Nombre - Navn: Jenny
Address - Dirección - Adresse:

Timmy (O+)

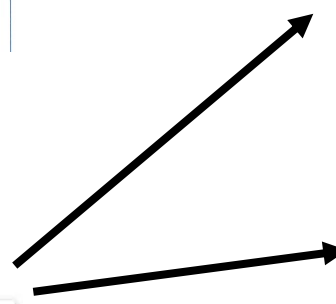
Anti-A Anti-B Anti-D Control

Name - Nombre - Navn: Monkey, Timmy
Address - Dirección - Adresse: ThinkGeek HQ

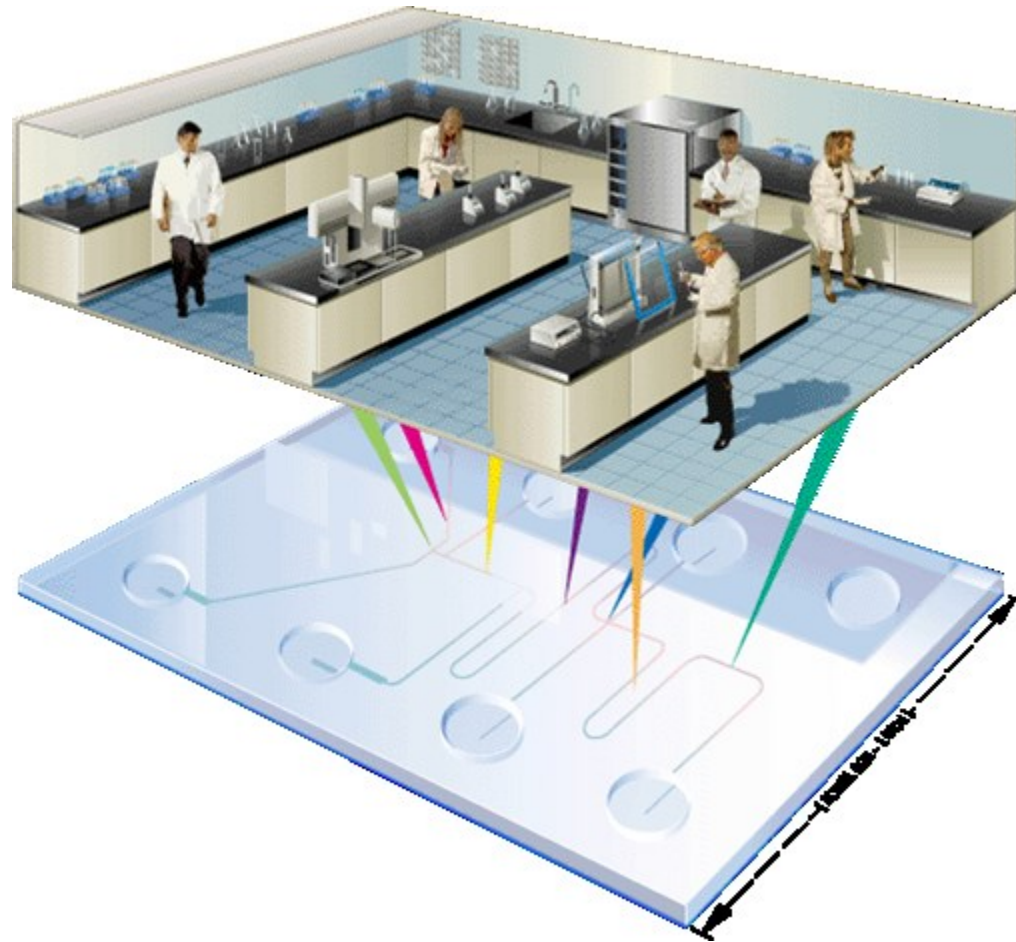
Ryan (B+)

Anti-A Anti-B Anti-D/Anti-Rho Control

Name - Nome: RYAN P. REYES
Address - Dirección:

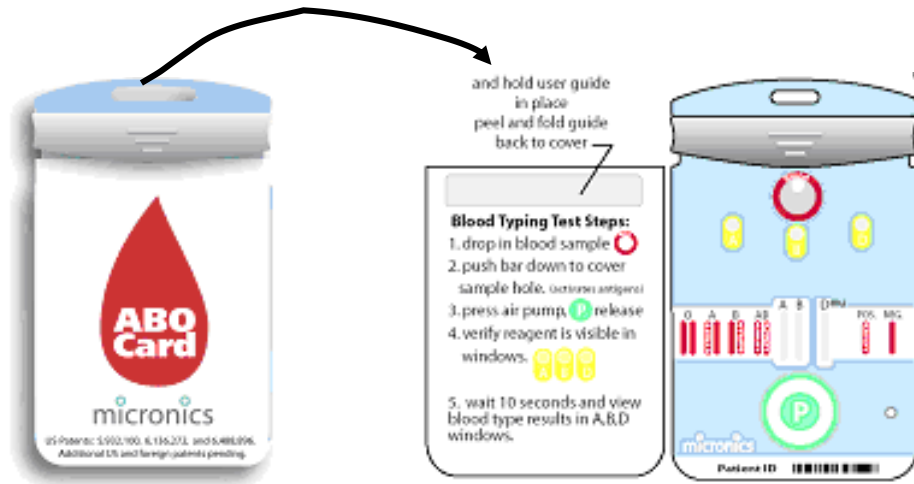


Lab on Chip



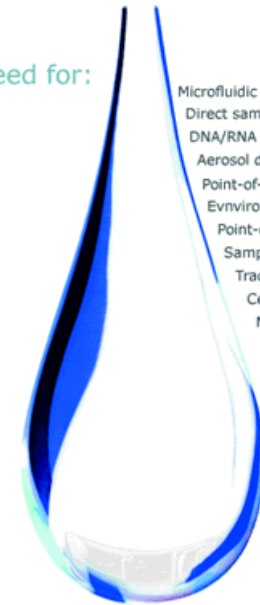
ABO Card

- Simple, portable, rapid diagnostics



all you need for:

- Microfluidic lab cards (application specific)
- Direct sample testing on card
- DNA/RNA analysis
- Aerosol detection
- Point-of-use viral detection
- Environmental sampling and analysis
- Point-of-use bacteriological detection
- Sample, reagent and waste containment
- Trace mineral testing
- Cell count analysis
- Micro to macro interface



Transmission Risk of BBP

- Risk of infection depends on several factors:



- Pathogen involved
- Type/route of exposure
- Amount of virus in infected blood during exposure
- Amount of infected blood involved in the exposure
- If post-exposure treatment was taken
- Specific immune response of infected individual

Questions ?