



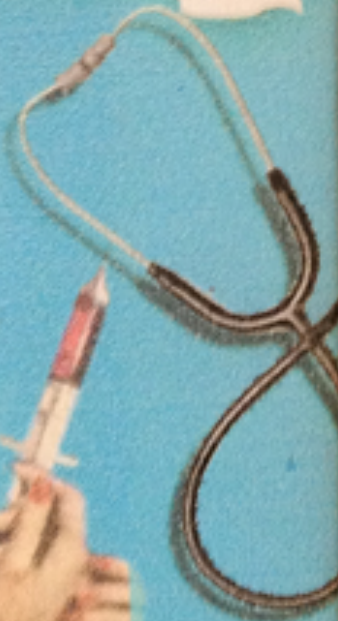
Allergy and Immunology



Kraig W. Jacobson, M.D. Feb. 4, 2014

100% NATURAL

HANDMADE
IN
HAWAII



Filthy

NURSE

SOAP



The Godfather





"Numbers"
Evans

Jammy
"The Enforcer"

"Shorty"
Buck

"Blondie"
Redner

Doc
Smythe

"Vitamins"
(Mrs. E.)

"GUNNER"
GILCHRIST

"Bugsy"
Jinnah

Big
Daddy J

Stout

"The Fixer"

Patty
"Cakes"
Nadel

Kirk "Boon-Boon"
Jacobson

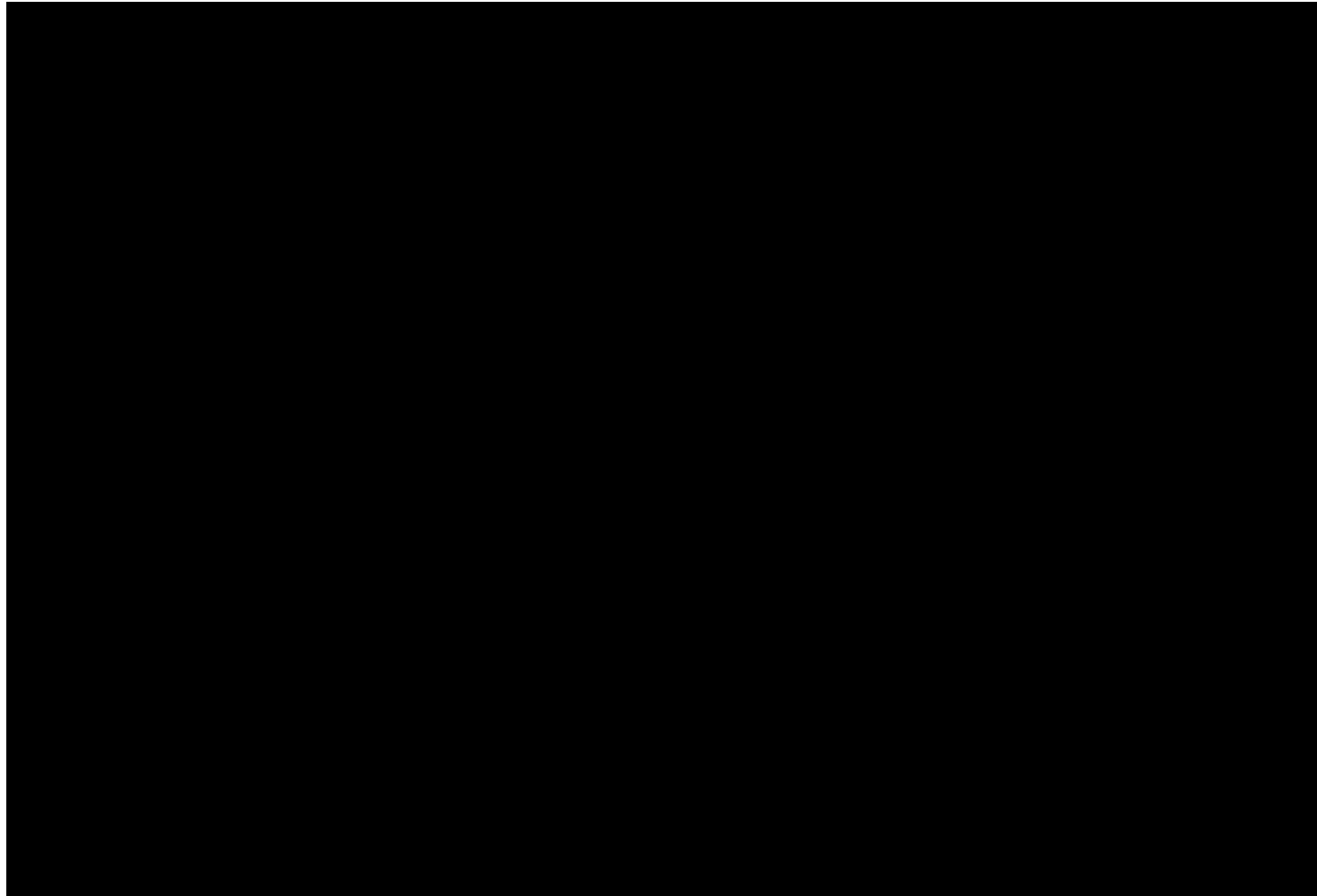
"Baby Face"
Kehl

Ricky B

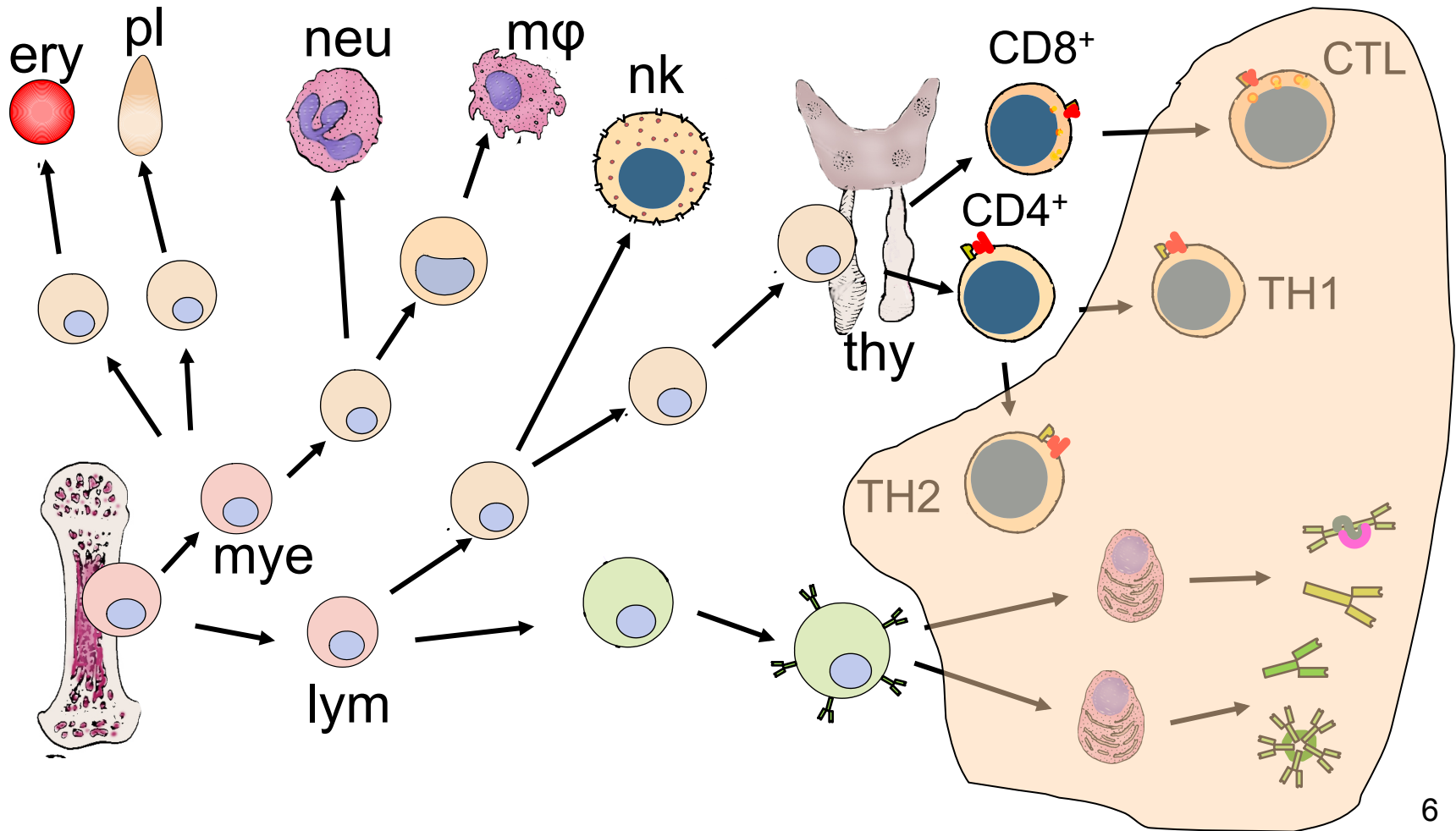
J. "Flash" Friesen

Oak Street Medical, PC... "Where You Always Get What's Coming To Ya!"

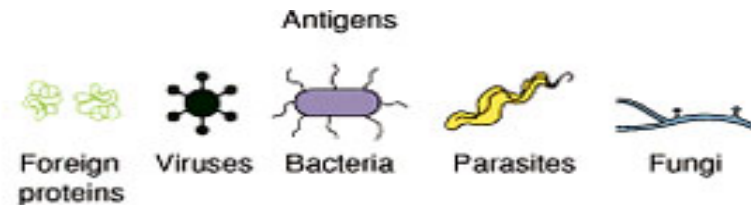
Why do you need immunity?



Development of the Immune System



ACTIVE IMMUNE DEFENSES



Innate Immunity

- invariant (generalized)
- early, limited specificity
- the first line of defense



Adaptive Immunity

- variable (custom)
- later, highly specific
- “remembers” infection

1. *Barriers - skin, tears*
2. *Phagocytes - neutrophils, macrophages*
3. *NK cells and mast cells*
4. *Toll-like receptors TLRs*
5. *Complement and other proteins*

1. *APC's present antigen to T cells*
2. *Activated T cells help B cells and kill abnormal and infected cells*
3. *B cells - produce antibody specific for antigen*

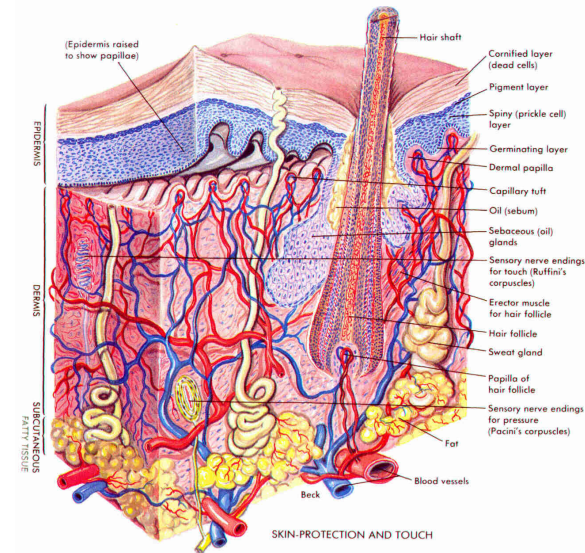
INNATE IMMUNITY

Physical Barriers

–skin

–hair

–mucous

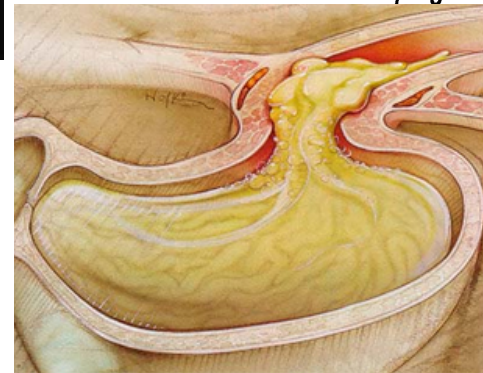




INNATE IMMUNITY

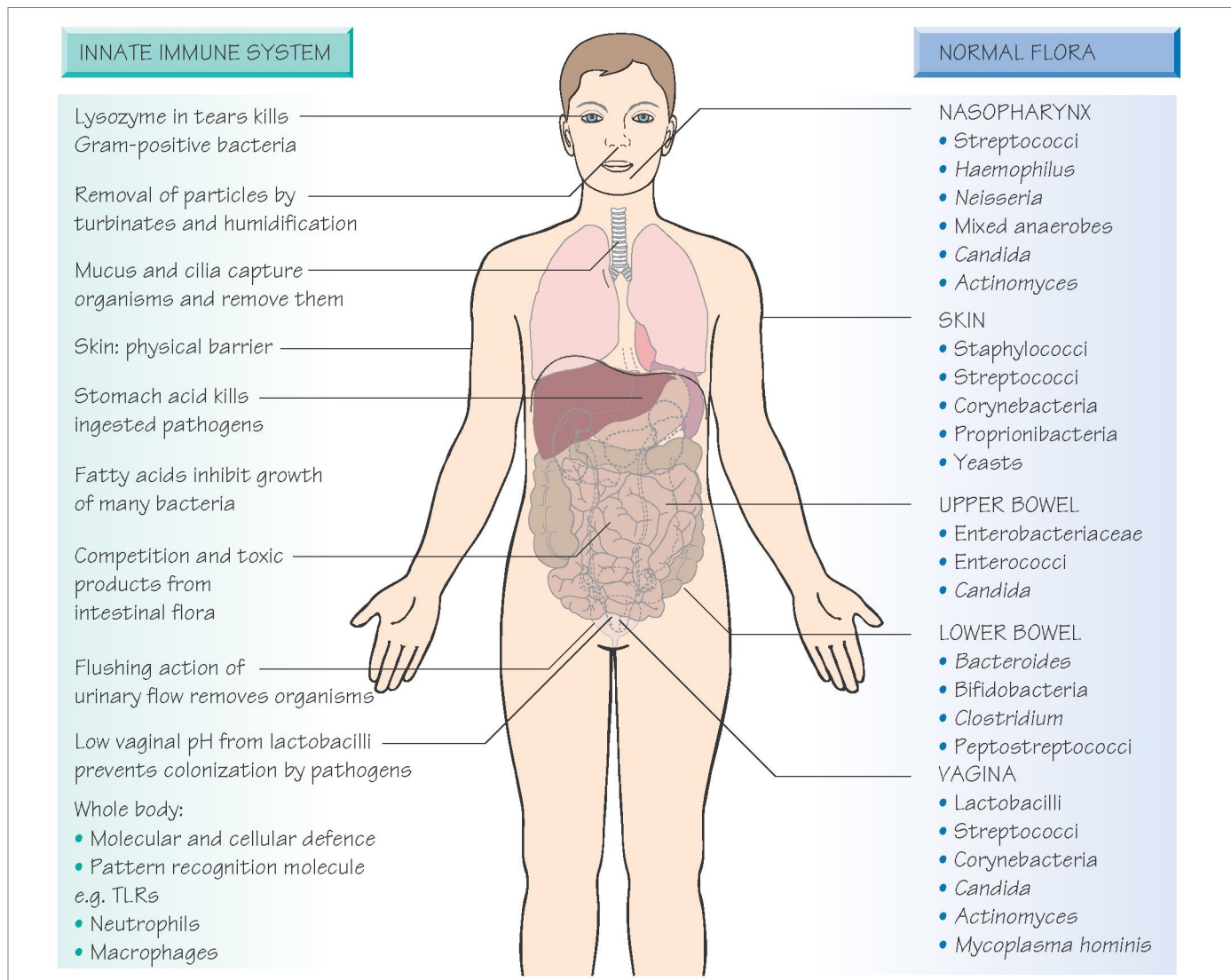
Chemical Barriers

- sweat
- tears
- saliva
- stomach acid
- urine



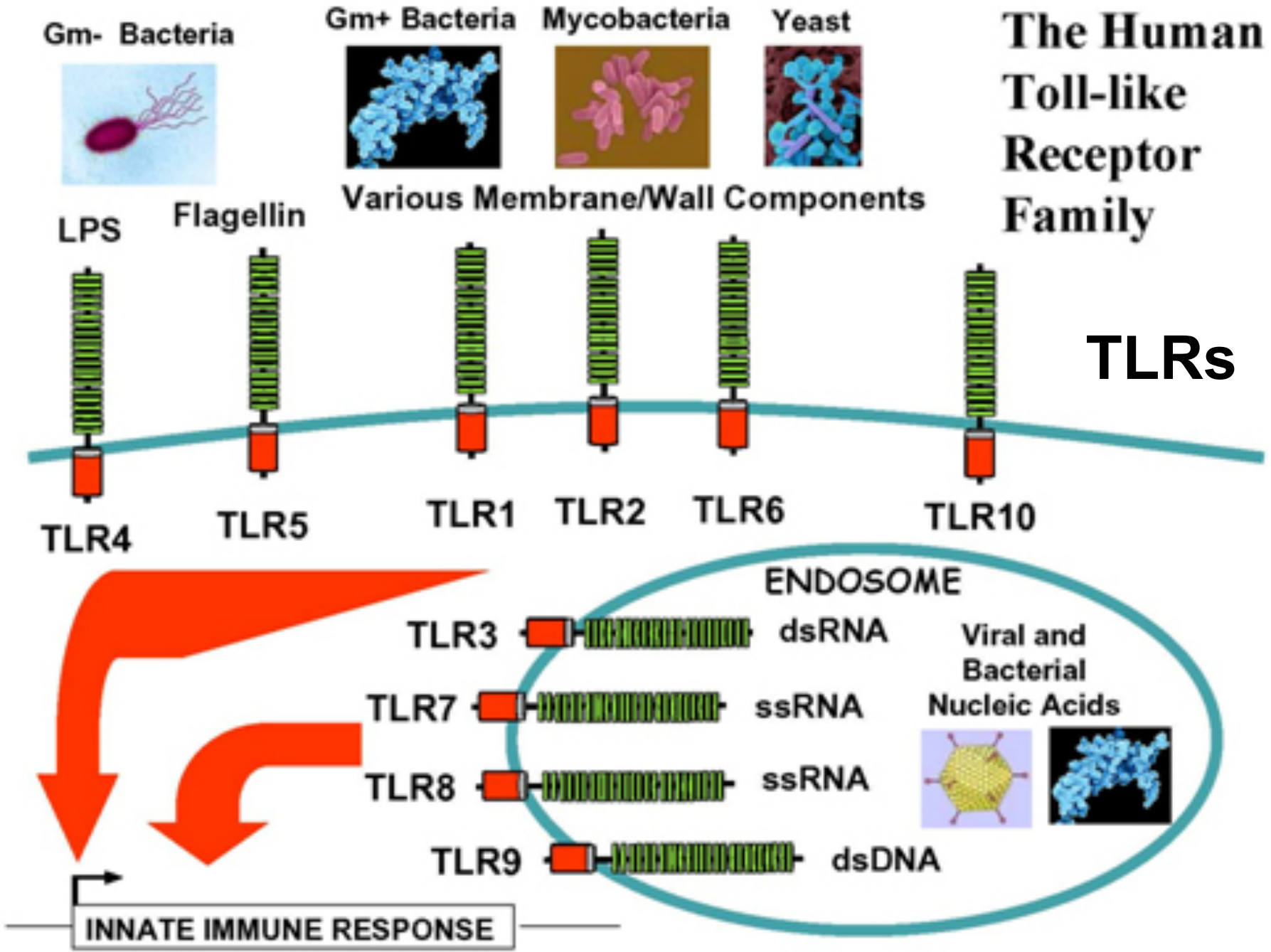


Innate Immune System



The Human Toll-like Receptor Family

TLRs



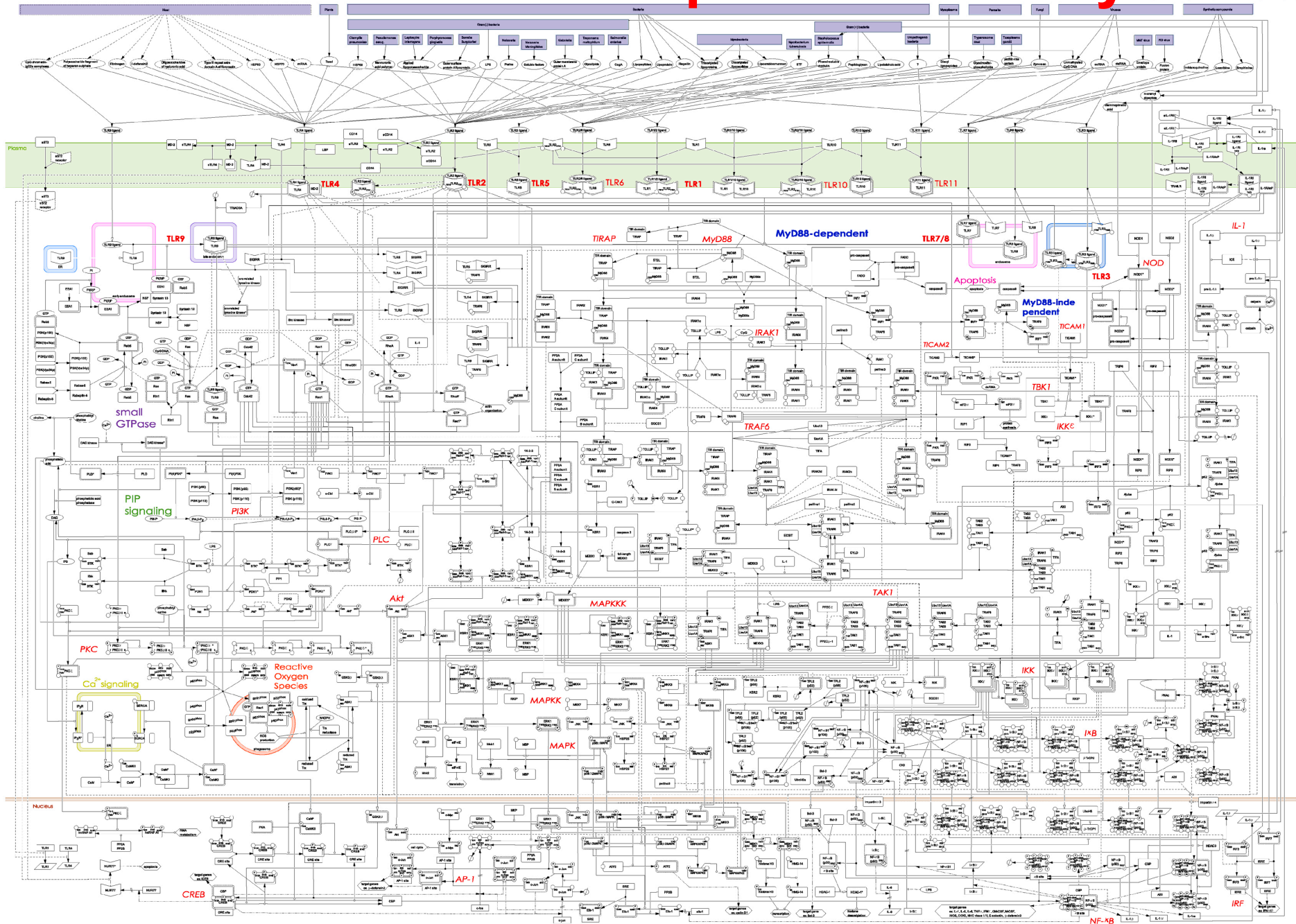
TLRs in Treatment

Imiquimod (Aldara) activates immune cells through the [toll-like receptor 7](#) (TLR7), commonly involved in pathogen recognition. Cells activated by imiquimod via TLR-7 secrete [cytokines](#) (primarily [interferon- \$\alpha\$](#) (INF- α), [interleukin-6](#) (IL-6), and [tumor necrosis factor- \$\alpha\$](#) (TNF- α)). There is evidence that imiquimod, when applied to skin, can lead to the activation of [Langerhans cells](#), which subsequently migrate to local lymph nodes to activate the adaptive immune system.^[9] Other cell types activated by imiquimod include [natural killer cells](#), [macrophages](#) and [B-lymphocytes](#)



Toll-like receptors chemistry

The Systems Biology Institute, Tokyo, Japan
<http://www.systems-biology.org>



LEGENDS



produced by
CellDesigner 2.2
CellDesigner is available from
<http://cellDesigner.org>

The Immune System

```
graph TD; A[The Immune System] --> B[Innate]; A --> C[Acquired]; B --> B1[physical barriers]; B --> B2[natural killer cells]; B --> B3[macrophages]; B --> B4[Toll-like receptors]; C --> D[Cell-mediated]; C --> E[Humoral]; D --> D1[T & B cells]; E --> E1[antibody-mediated];
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Innate

physical barriers
natural killer cells
macrophages

Toll-like receptors

Acquired

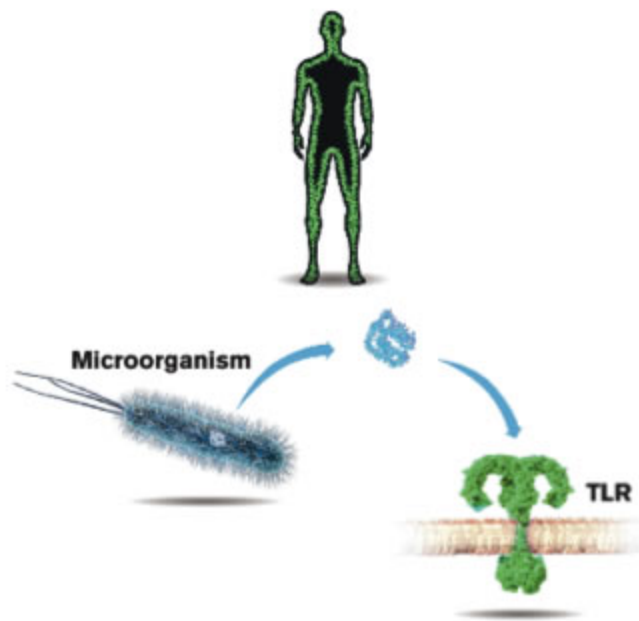
Cell-mediated

T & B cells

Humoral

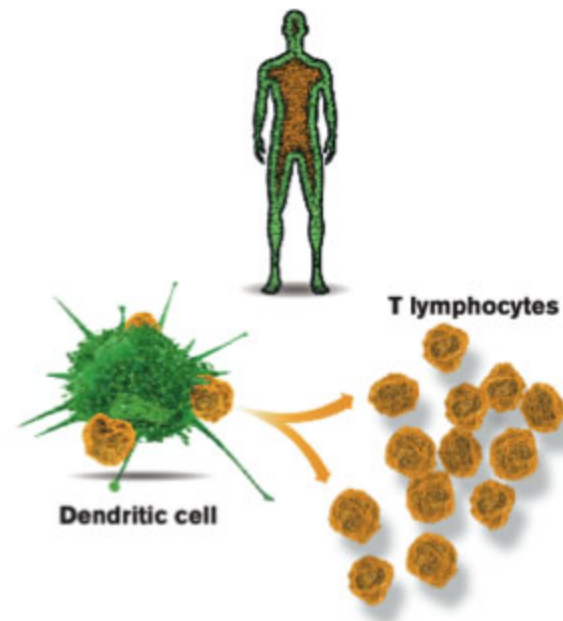
antibody-mediated

Figure 1. Classifications of Immunity.



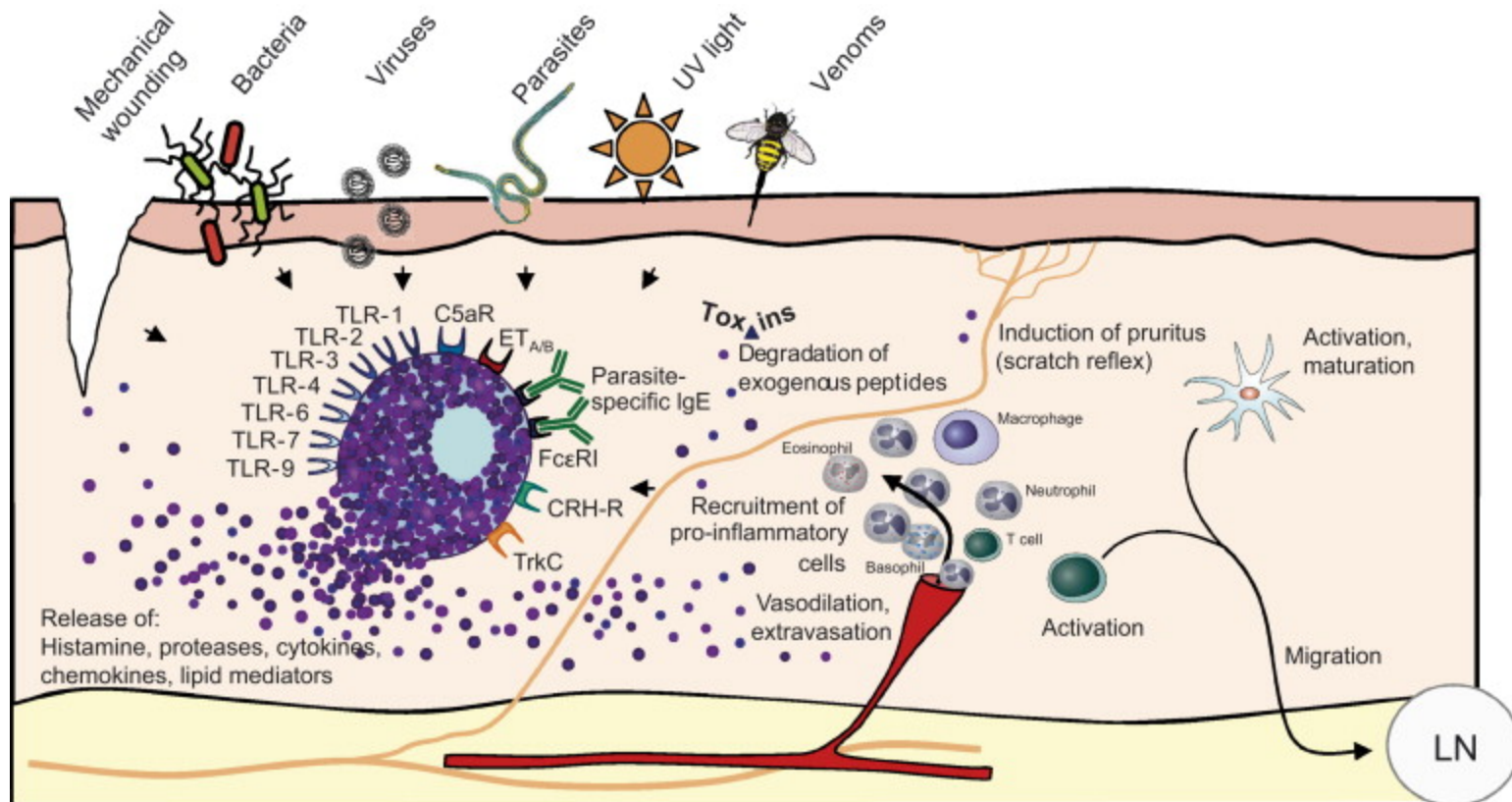
1 Innate immunity

Components of microorganisms bind to Toll-like receptors located on many cells in the body. This activates innate immunity, which leads to inflammation and to the destruction of invading microorganisms.

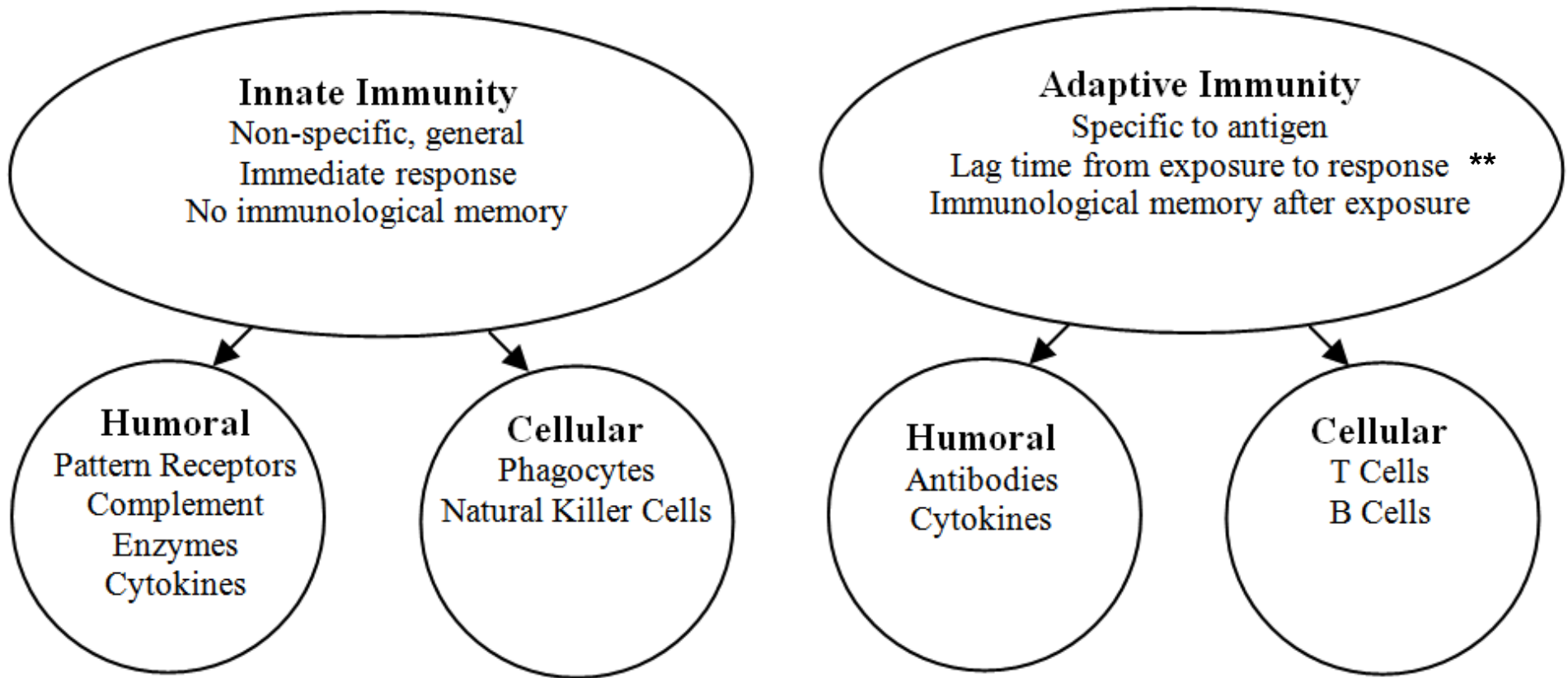


2 Adaptive immunity

Dendritic cells activate T lymphocytes, which initiates adaptive immunity. A cascade of immune reactions follows, with formation of antibodies and killer cells.



	Innate	Adaptive
Characteristics		
Specificity	For structures shared by groups of related microbes	For antigens of microbes and for nonmicrobial antigens
Diversity	Limited; germline-encoded	Very large; receptors are produced by somatic recombination of gene segments
Memory	None	Yes
Nonreactivity to self	Yes	Yes
Components		
Physical and chemical barriers	Skin, mucosal epithelia; antimicrobial chemicals	Lymphocytes in epithelia; antibodies secreted at epithelial surfaces
Blood proteins	Complement	Antibodies
Cells	Phagocytes (macrophages, neutrophils), natural killer cells	Lymphocytes

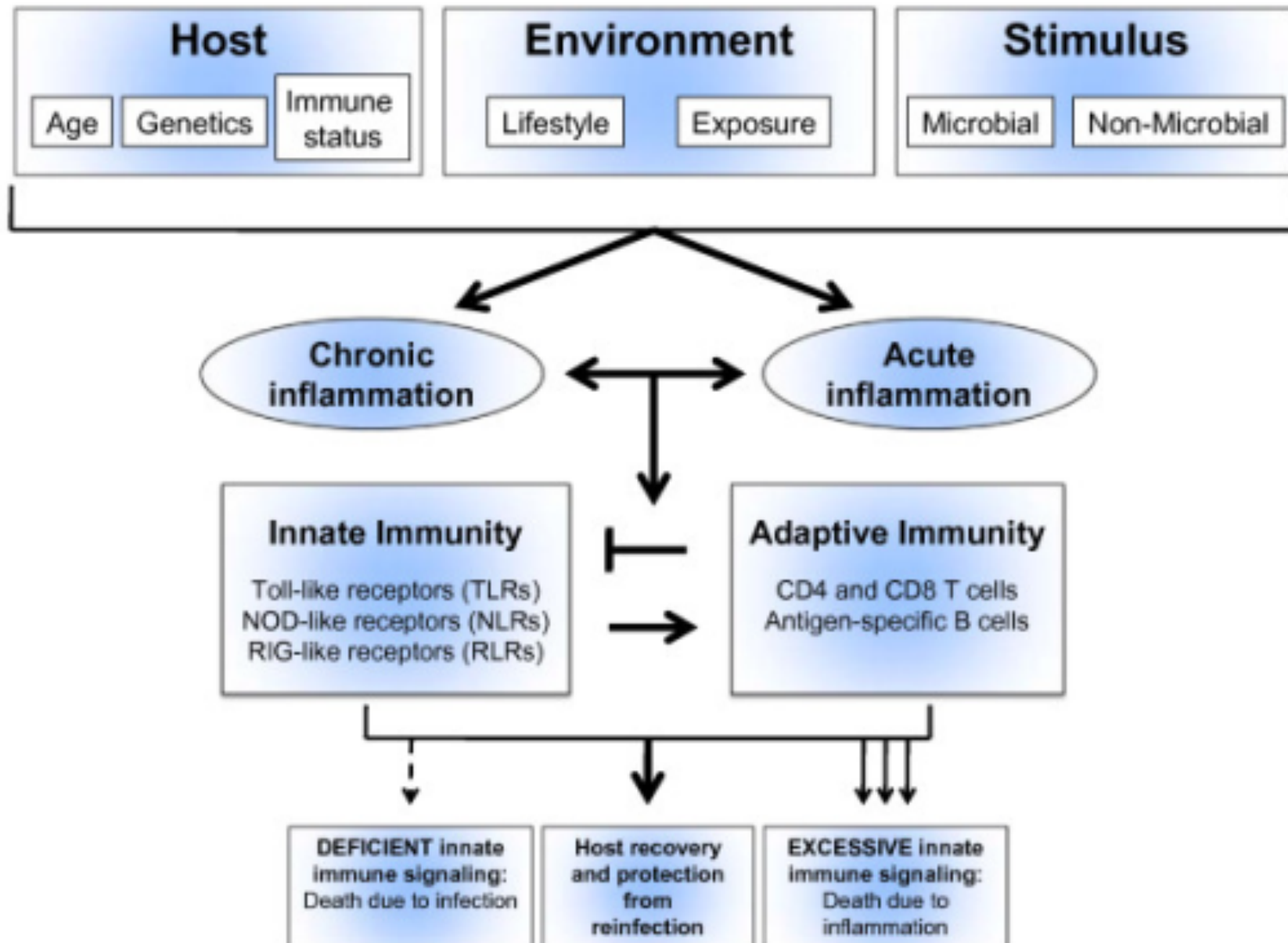


****Except for IgE allergic reactions**

Model of Immune Responses: Speed and Specificity







Innate Immunity

- Antigen independent
- No time lag
- Not antigen specific
- No Immunologic memory

Adaptive Immunity

- Antigen dependent
- A lag period (**except IgE**)
- Antigen specific
- Development of memory

Primary Function of the Adaptive Immune System

- Protect self from non-self;



and ...

- Remember it!

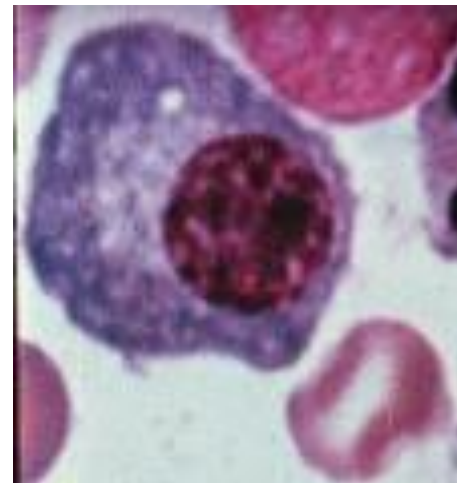
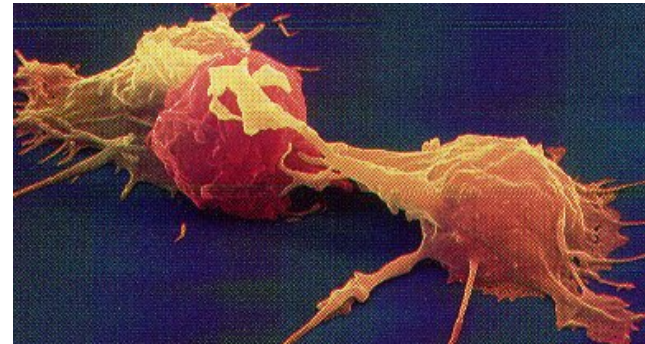




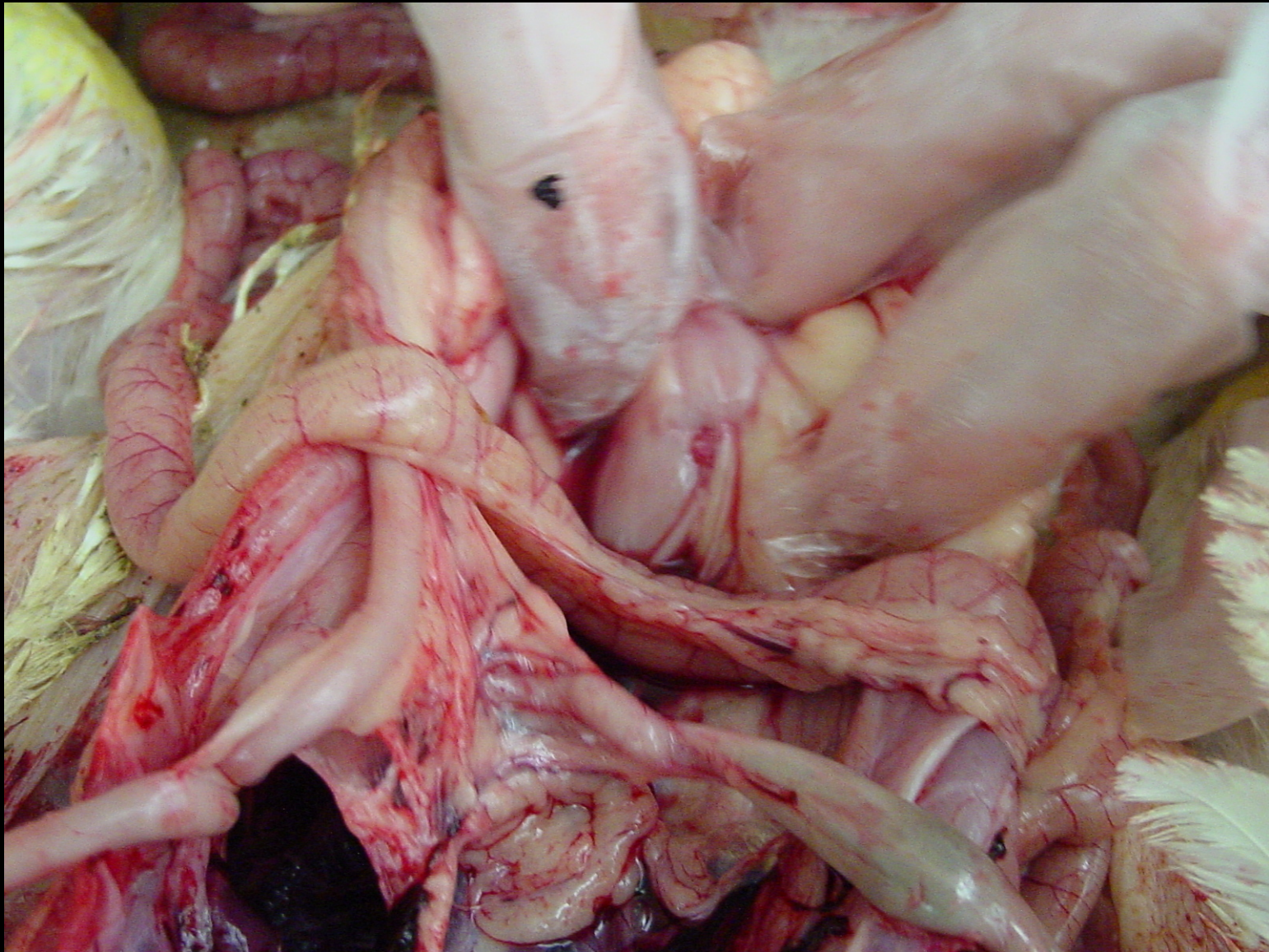


T and B Lymphocytes

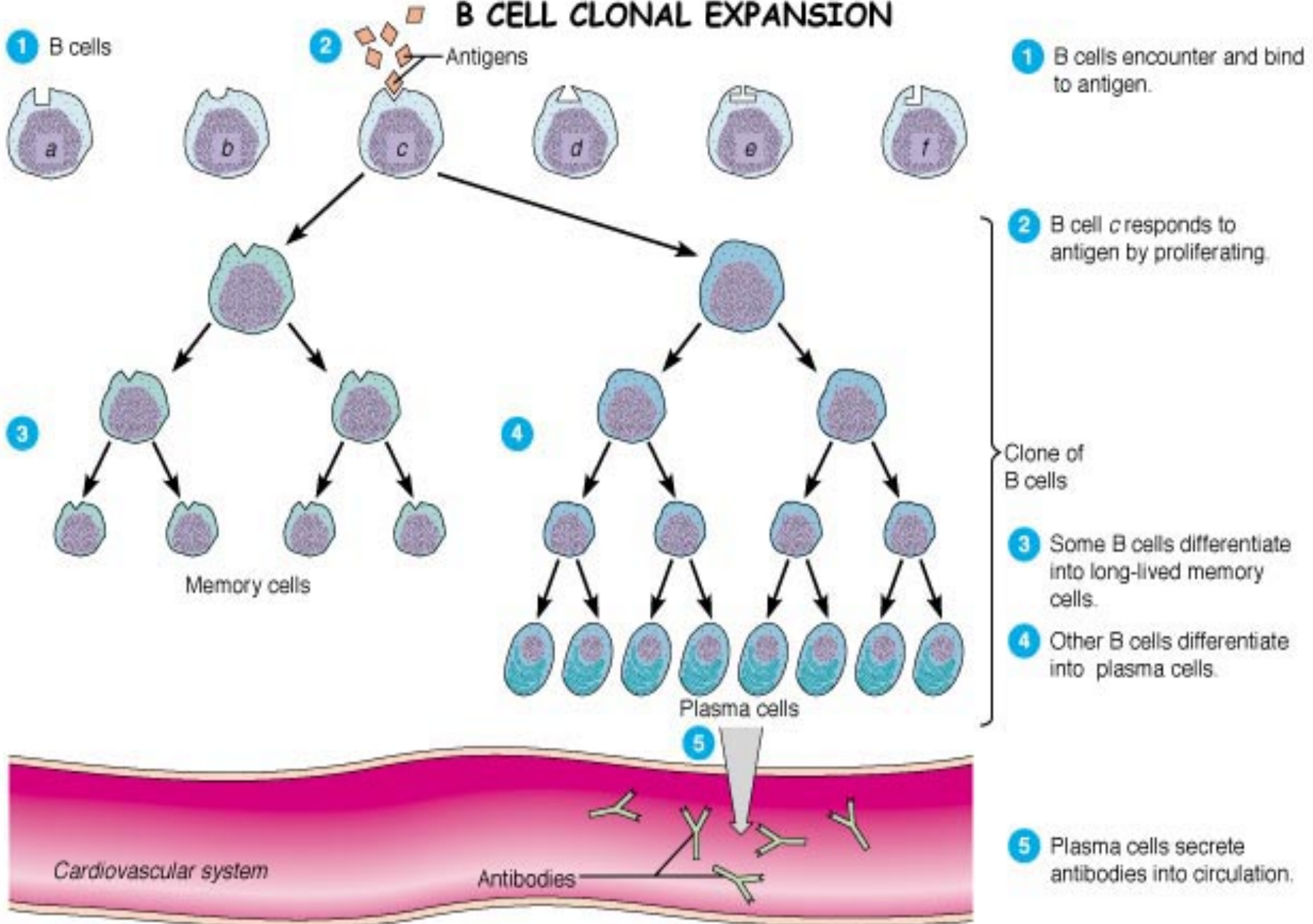
- T cells originate from the **Thymus** and may be Helper (CD4), Suppressor (CD8) or Cytotoxic.
- B cells originate from the "**Bursa**". Their major function is to produce antibodies in response to foreign proteins including bacteria, viruses, and tumor cells.



Bursa of Fabricius



B CELL CLONAL EXPANSION



Function of the Immune System (Self / Non-self Discrimination)

- To protect from pathogens
 - Intracellular (*e.g.* viruses and some bacteria and parasites)
 - Extracellular (*e.g.* most bacteria, fungi and parasites)
- To eliminate modified or altered self

Hypersensitivity

There are four different responses of the immune system:

Type I: Immediate hypersensitivity

- onset within minutes of antigen challenge
- examples are allergies to molds, insect bites

Type II: Cytotoxic hypersensitivity

- onset within minutes or a few hours of antigen challenge
- examples are adult hemolytic anemia and drug allergies

Type III: Immune complex-mediated hypersensitivity

- onset usually within 2 - 6 hours
- examples include serum sickness and systemic lupus erythematosus

Type IV: Delayed hypersensitivity

- inflammation by 2- 6 hours; peaks by 24 - 48 hours
- examples include poison ivy and chronic asthma