

DEFENSE: NON SPECIFIC

8/3/87, RVSD 8/17/94, 14 Aug 00, 7 March 02, 12 Aug 02, 13 Aug 03, 16 Aug04, 5 May06, 15 Aug 07, 18Aug08, 16Aug09, 17Aug11, 18Apr13
Fr: TFC, 2nd Ed, 437., Alcamo, pp547-581, TFC's 7th: 454-472, 476-495, 8th: 458-481, Black's 6th: 446-467, Bauman 2nd: 438-459

NONSPECIFIC DEFENSES SYSTEMS:

(see summary table on p 441, 442)

MECHANICAL BARRIERS

skin	keratin (resists water, digestion), sebum (organic acid)
mucous membrane	mucus barrier contains IgA antibodies, lysozyme, often be acidic
cilia & mucus fallopian tubes	especially in respiratory tract,
tears	lysozyme (cleaves glycan in cell wall), IgA antibodies

CELLULAR DEFENSES

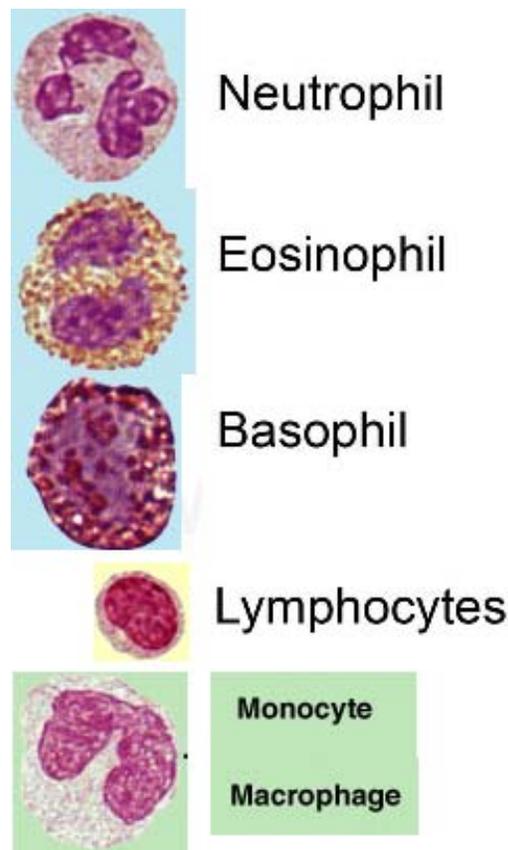
LEUKOCYTES

GRANULOCYTES: cytoplasm stains to produce granules. (illustration on p 445)

NEUTROPHILS	57-67%	phagocytic , increase with infection (polymorphonuclear leukocytes= PMNs)
EOSINOPHILS	1 - 3 %	phagocytes of Ag-Ab complex increase in allergy, parasitic infection, leukemia.
BASOPHILS	0.5 - 1%	alarm cells , like mast cells: release histamine (induces inflammation) & heparin, accumulate in damaged tissue

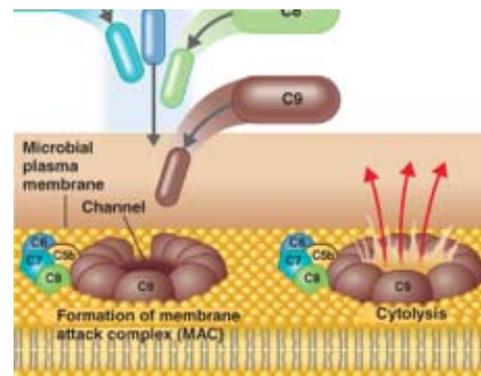
AGRANULOCYTES: cytoplasm does not stain to produce granules:

LYMPHOCYTES	25 - 33%	immune cells: most numerous agranulocytes produce Antibodies. during mononucleosis , they increase to 50% of total lymphocytes, many atypical lymphocytes (irreg. nuclei).
MONOCYTES	3 - 7%	immature macrophage , stock the reticuloendothelial system (RES) increase in TB, protozoan infection, leukemia. Most aggressive phagocytes.



NON-SPECIFIC DEFENSE FEATURES:

Chemical	acid in stomach, bile, lysozyme, sebum, interferon
Phagocytosis	PMNs, reticuloendothelial system , chemotaxis
Compliment	serum proteins which, when activated by antibodies attached to foreign cell, combine form doughnut, lyses tagged cell. Important killing mechanism.
Interferon	(a cytokine), released from certain leukocytes when dsRNA is detected (sign of RNA viral infection). Interferon leads to inhibited translation in the infected cell, thus inhibiting viral reproduction (and can kill the infected cell). Can cause fever and myalgia.
Inflammation	mediated by histamine from mast cells (erythema, pyrogenic effect, edema)
Fever	pyrogens and/or interleukin-1 triggers hypothalamus to rest thermostat. chills shivering can accompany. When reset: sweat = crisis



DEFENSE: IMMUNITY

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 Fr: TFC, 2nd Ed, 437., Alcamo, pp547-581, TFC's 7th: 454-472, 476-495, 8th: 458-481, Black's 6th: 470-577, Bauman 2nd: 462-483



IMMUNE SYSTEM Adaptive Immunity either natural or by immunization
 Passive Immunity natural through placenta and milk, or by gamma globulin injections

ANTIGENS: Anything causing antibodies to be made. Determinant sites = haptens (grasp)

LYMPHATIC SYSTEM System to bathe organs with lymph, filter lymph, house immune cells
 lymph node structure

TWO COMPONENTS OF IMMUNE SYSTEM: Humoral [bodily fluid] and Cell-mediated

HUMORAL SYSTEM B cells (first seen in bursa of Fabricius) found in all lymphoid tissues, 10% of circulating lymphocytes. B cells secrete soluble antibodies, found in bodily fluids (humors)

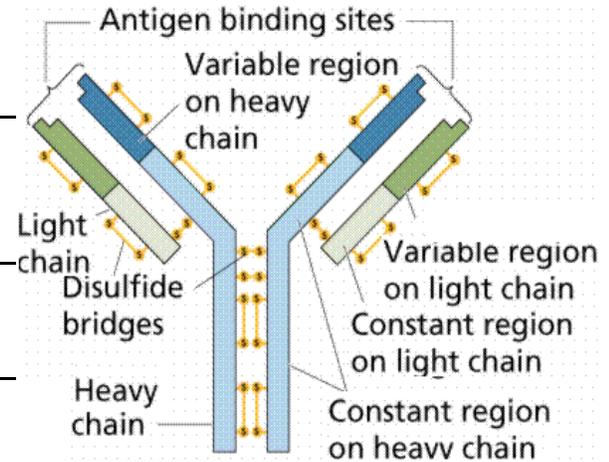
 Serum [whey] carries antibodies in gamma globulin fraction
 electrophoresis separates serum into protein fractions:

 POSITIVE (+): **gamma**, beta, alpha, album. most NEGATIVE (-)

ANTIBODY STRUCTURE (p) Illustrate IgG: neutralization, opsonization, agglutination ,(468) [& precipitation]

ANTIBODIES: table: p 469

IgG:	80-85%	monomer	can cross placenta Ag binding, light, heavy chains, constant, variable regions, compliment activating region
IgM	5-10%	pentamer	first to appear, highly effective agglutinators, microorganisms ABO blood group antibodies
IgA	15 %	dimer	carries secretory component, allows secretion into saliva, tears, mucus, breast milk
IgD	0.2%	monomer	cannot cross placenta, surface of B, cells, do not fix complement
IgE	0.002%	monomer	bound to mast cells, triggers release of histamine, anaphylactic rxns, etc



CELL-MEDIATED IMMUNITY: cells (thymus derived), 75% of circulating lymphocytes

Immunity which is not transferred with blood

Effective against tumors, cells with foreign Ag on surface

T Cells: Tc: cytotoxic (killer cells)

Td: delayed hypersensitivity, release lymphokines:macrophage chemotactic factor

Th: helper cells

Ts: suppressor cells

Recognition of self: (p 473) **Apoptosis** (detach, fall): Clonal selection hypothesis: Burnet in 1950s:

Immune cells generated by random genetic recombination: portions of DNA deleted, spliced together

Each cell makes only a single antibody, unique to that cell, coats itself with it

Fetal encounter with an antigen which reacts with the cell coating leads to destruction of cell,

creating sense of self (**tolerance**)

Titer = highest dilution which still shows agglutination (etc)

MAJOR HISTOCOMPATIBILITY COMPLEX: (p 474) glycoproteins identify self.

MECHANISM OF IMMUNE RESPONSE:

Clonal selection, memory and plasma cells

anamnestic (upward memory response) increases strength of immune response with each exposure

ACQUIRED IMMUNITY: natural through exposure, artificial, vaccines

HYPERSENSITIVITY: Four types, I, II, III, IV.

I Anaphylaxis: within minutes, either systemic or localized, IgE Ab are cytotoxic

IV delayed hypersensitivity 12-24 hours later, tuberculin, PI, hapten binds to cells, T cells and macrophages move in, trigger inflammation.