DEFENSE: NON SPECIFIC
8/3/87, RVSD 8/17/94, 14 Aug 00, 12 Aug 02, 13 Aug 03, 16 Aug 04, 5 May 06, 15 Aug 07, 18 Aug 08, 16 Aug 09, 17 Aug 11, 18 Apr 13
Fr: TFC, 2nd Ed, 437-. Alcamo, pp547-581, TFC’s 7*: 454-472, 476-495, 8*: 458-481, Black’s 6*: 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 especially in respiratory tract, fallopian tubes
- tears lysozyme (cleaves glycan in cell wall), IgA antibodies

CELLULAR DEFENSES
LEUKOCYTES
GRANULO CYTES: 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

AGRANULO CYTES: 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**

8/3/87, 8/17/94, 14 Aug 00, 12 Aug 02, 15 Aug 05, 18 Aug 07, 16 Aug 09, 17 Aug 11


**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**

Illustrate IgG: neutralization, opsinozation, agglutination , (468) [& precipitation]

**ANTIBODIES:** table: p 469

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

**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: Te: 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 HISTOCOMPTABILITY 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.