

Immunology of the skin

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Immune reactions

- * Specific vs. Non- specific
- * Cellular immunity (against viruses, mycotic elem., IC bacteria, cancer, GvH reaction, Cell-mediated reaction)
- * vs. Humoral (EC bacteria, some viruses, toxins)

Cellular immunity

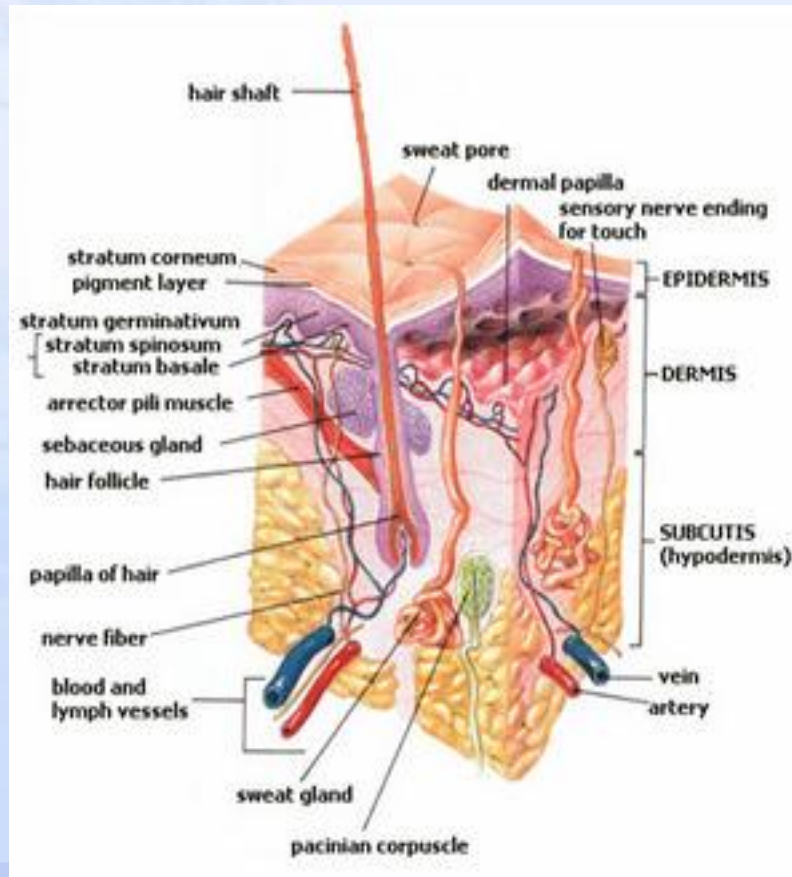
- * Non-specific:
 - * fagocytosing cells, NK cells, keratinocytes, mast cells, fibroblasts...
- * Specific:
 - * T- lymphocytes, APC

Humoral immunity

- Non- specific:
 - complement system, proteins of acute reaction
- Specific:
 - antibodies produced by B- lymphocytes

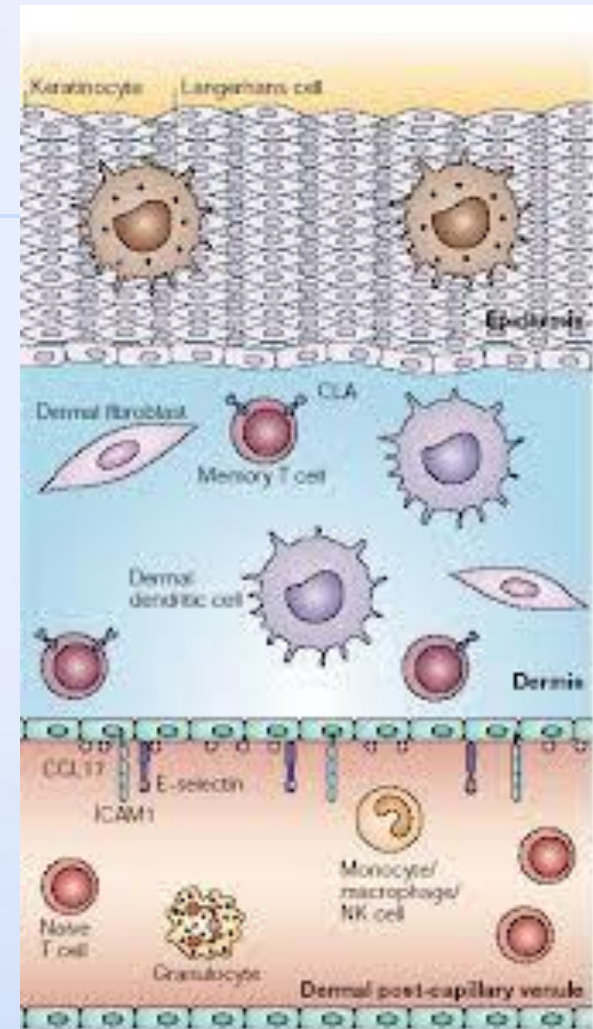
SIS (skin immune system)

- ✿ Functional unit - epidermis, dermis, blood vessels, lymphatics, lymph nodes



SIS

- * **Cells** - Keratinocytes
- Langerhans cells
- dermal dendritic cells
- fibroblasts
- Lymphocytes
- Macrophages
- Granulocytes
- Mast cells



- * All units of SIS cooperate x redundant
- * Communication : selectins, integrins, cytokines

Cytokines

- ✿ Polypeptides
- ✿ Changes in cellular proliferation, differentiation, migration
- ✿ Stimulate immunoglobulins and cellular immunity
- ✿ Specific receptors
- ✿ Pleiotropic effect

Cytokines- 5 groups

- * 1. interleukins:
 - * Leukocytes (lymfokiny, monokiny)
- * 2. interferons (α, β, γ):
 - * Antivirotic
 - * Synthesis of Ig by B-lymphocytes, activate macrophages, NK cells, lymphocytes-T
 - * Antiproliferative \rightarrow cytostatic/cid against tumours

Cytokines - 5 groups

* 3. chemokins:

- * Induce inflammation (eg. IL 8)
- * Chemotaxes
- * Physiological migration of leukocytes

* 4. Colony stimulating factors (CSF):

- * Prolifer. of specific pluripotent cells of bone marrow in adults
- * Granulocytic vs. Macrophages

Cytokines - 5 groups:

- * 5. tumor necrosis factor (TNF):
 - * TNF α (kachektin)
 - * Growth f., interleukins
 - * TNF β (lymfoxin)
 - * Cytotoxic
- * effects: support cellular, humoral imm., proinflammatory, regulation of hematopoiesis, cell proliferation, differentiation, healing wounds

Other mediators:

- * Neuropeptides (substance P)
- * Eikosanoidy – allergic reactions, inflammation

Physiological reactions:

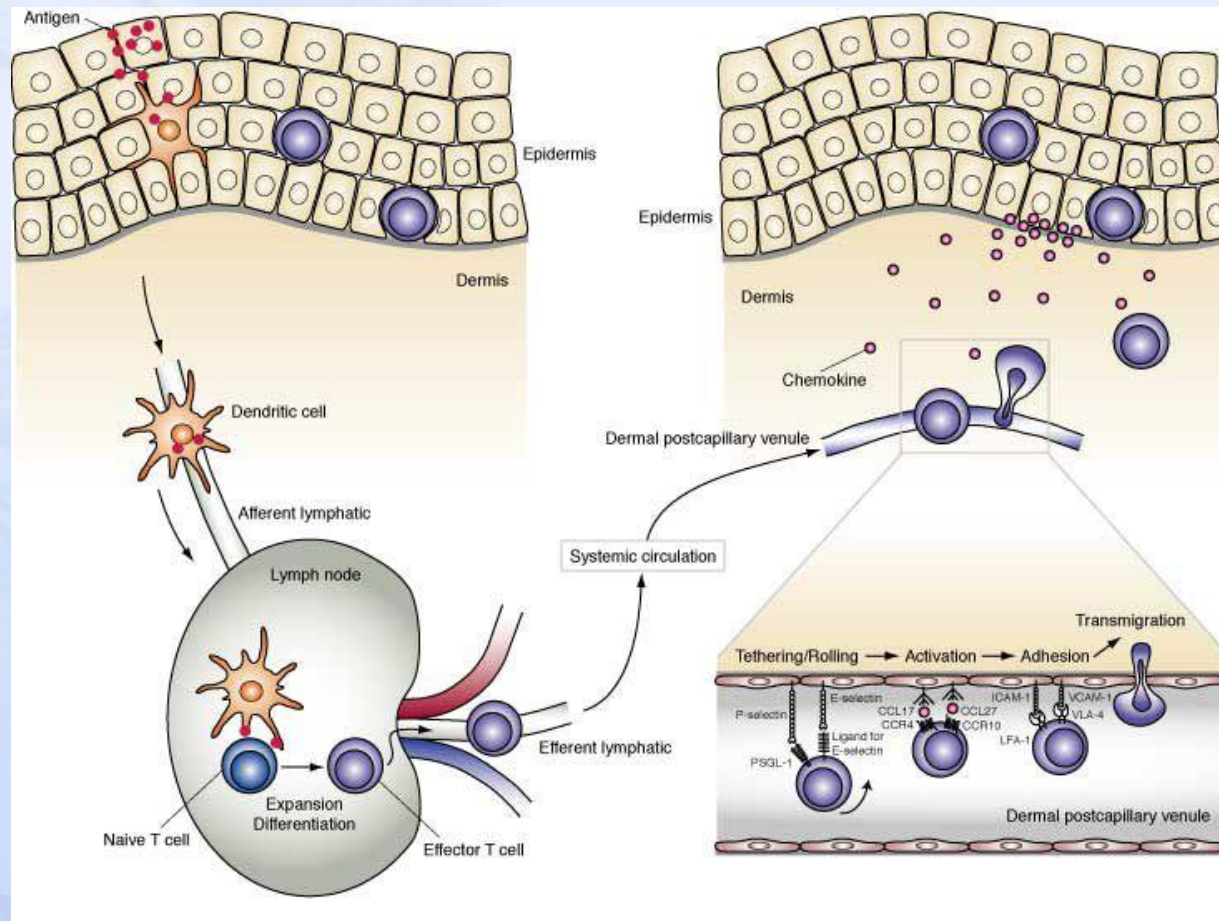
- * Elimination of extracorporal and bodie's „damaged“ structures
- * Phases: aferent, amplification, effector
- * Damage of skin → non- spec. immune reaction = acute inflammation
 - * keratinocytes, complement sys., fagocyt. cells (polymorfonuclears, macrophages), NK , mast cells, cytokins, activation of lysosomal enzymes,.....
 - fagocytosis / cytolysis of most of patogens
- * Rest activate SPECIFIC immune system

* Specific :

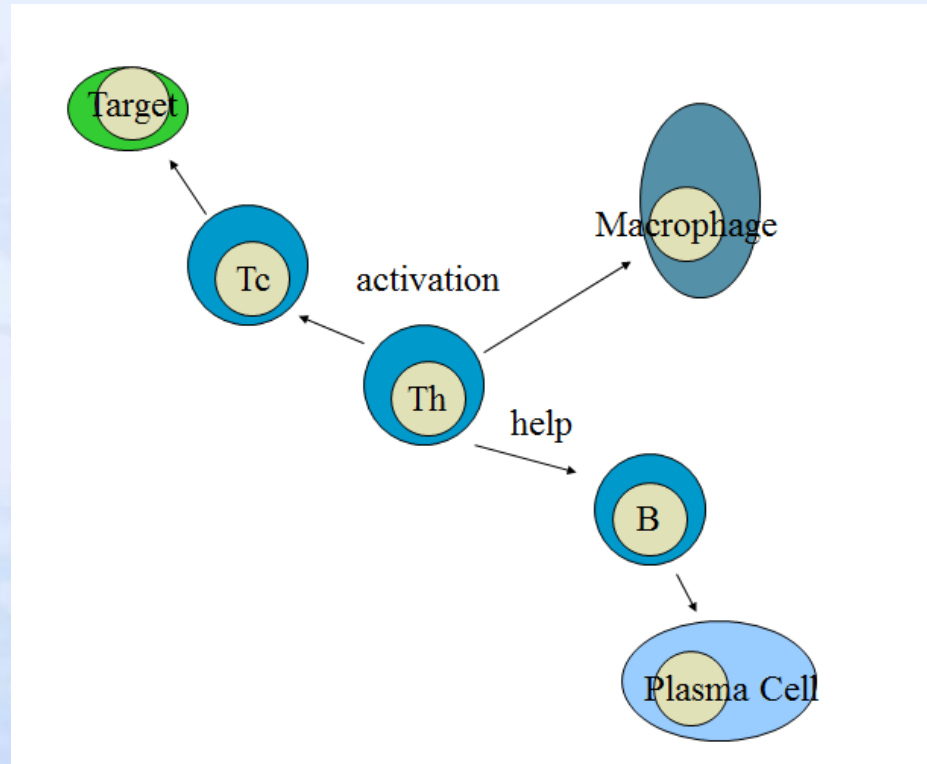
- * T+B – lymphocytes
- * APC (Langerhans cells,dermal denritic cells, macrophages, keratinocytes), fagocytes, cytokines, complement
- * HLA compatibility between APC and lymphocytes

Immunological reaction

- ✿ In the skin- swallow of antigen by APC → to the sentinel lymph node → remodelation of „naive“ T-lymphocyte to „memory“ T-cell →



- differentiation to cytotoxic (CD 8+) and helper (CD4+) → subpop. Th1 (supress Ig) and Th2 (support Ig)



- Activation of B-lymfocyte → differentiate to plasmocytes → produce Ig (IgM)

Immunological memory

- ✿ Memory T and B lymphocytes
- ✿ Secondary immune reaction
- ✿ Effector cells and Ig (mainly IgG)- more, quicker reaction, longer

Homing

- Sensitized T cells return to the skin

Pathological immune reactions

- * Immunodeficiency - insufficiency
- * Autoimmune diseases – bad tolerance
- * Allergies
 - * Intensified defensive reaction
 - * Allergens, haptens
 - * Harmful
 - * 80% of allergies- on skin and mucosae

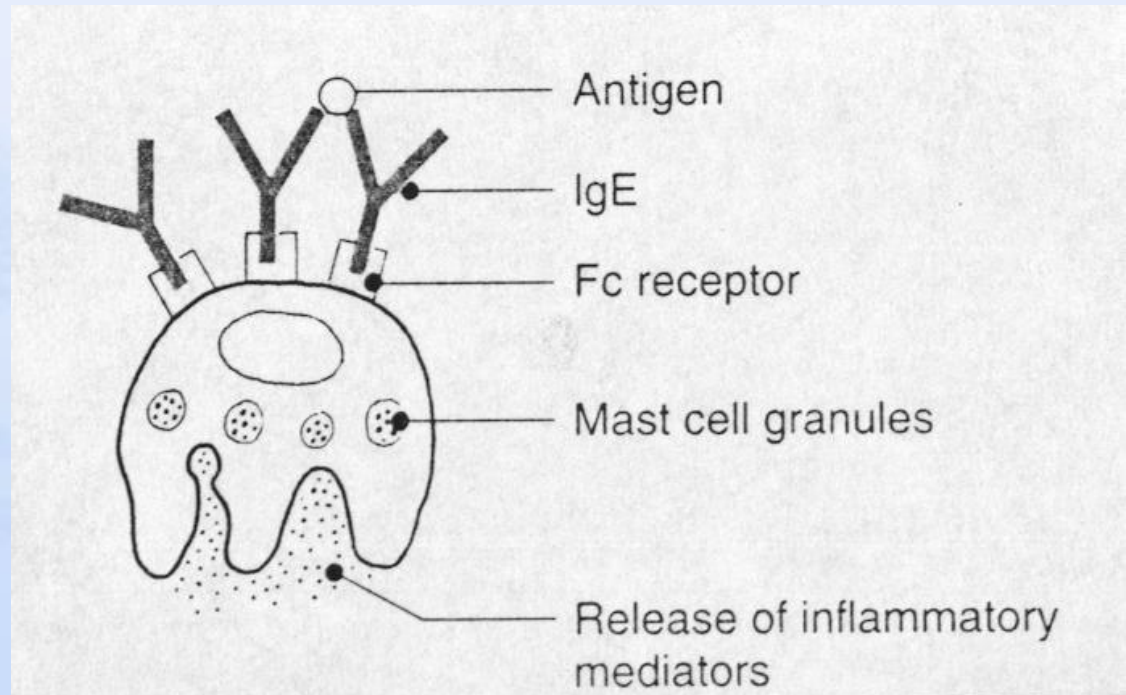
Allergies :

division Coombse-Gell- IV types:

- * Type I: immediate hypersensitivity reaction (mediated by IgE and mast cells)
- * Type II: Humoral cytotoxic reaction (mediated by IgG, IgM, C)
- * Type III: Immune complex reaction (mediated by IgG, IgM, IgA and C)
- * Type IV: Cell-mediated reaction (lymphocytes, lymphokines)

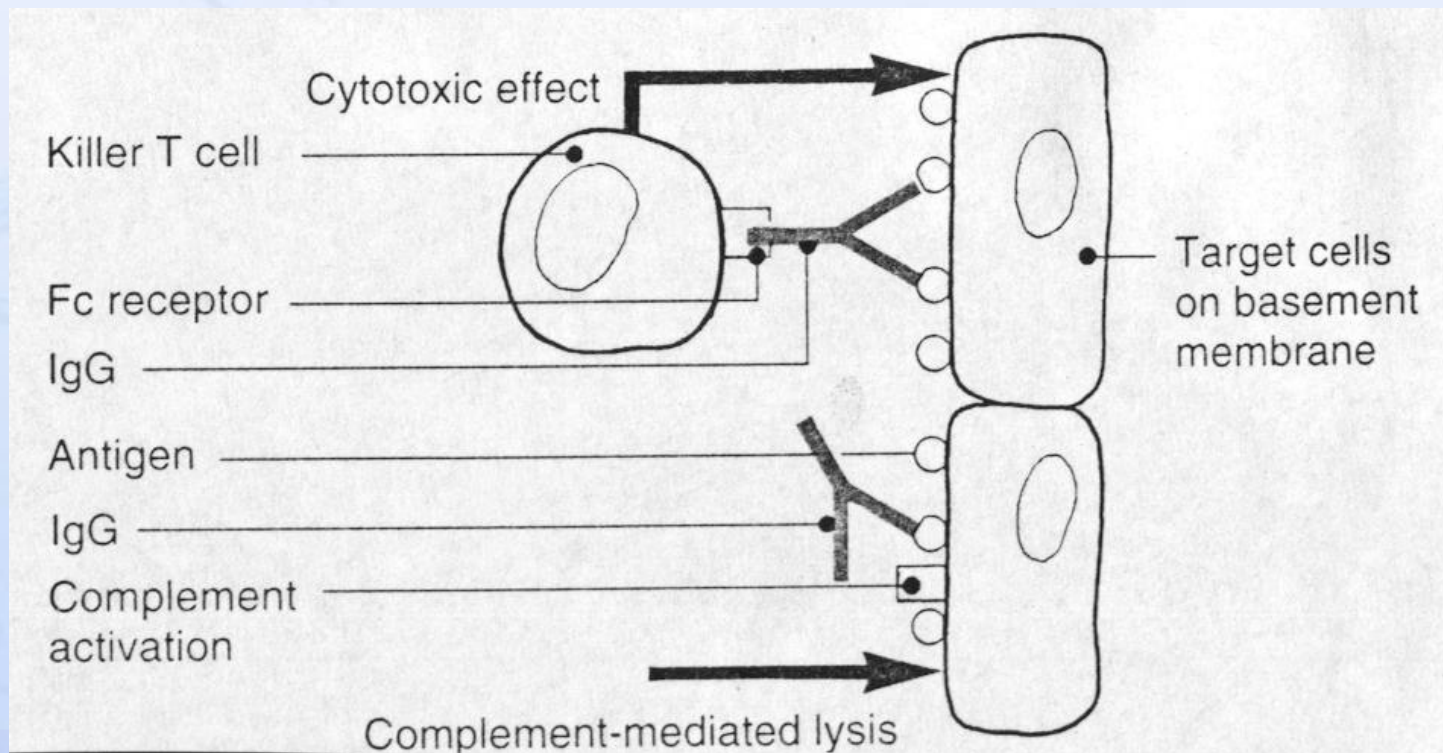
Type I: immediate hypersensitivity r. (mediated by IgE and mast cells)

- * Seconds to minutes (x latent -hours- mites)
- * Anaphylaxis , Angioedema
- * Urticaria
- * Atopy
- * Sting
- * allergy to food



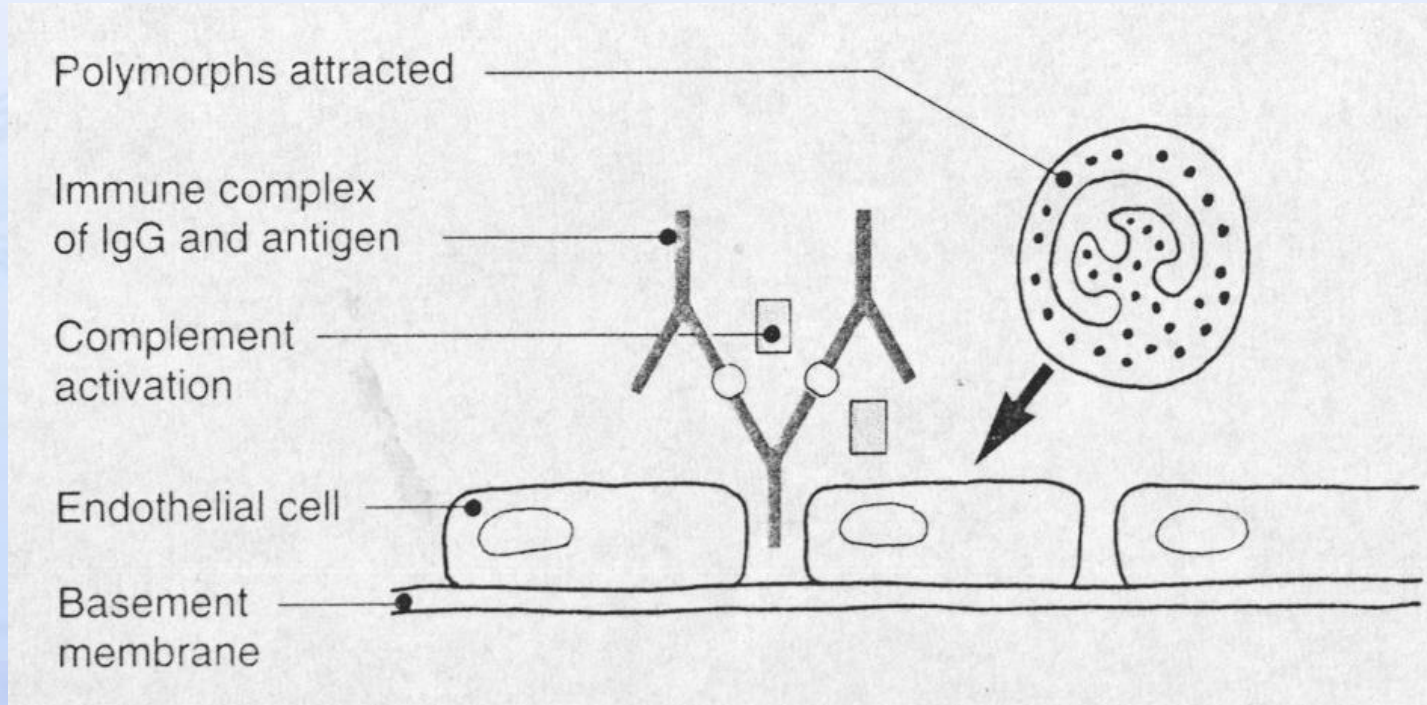
Type II: Humoral cytotoxic reaction (mediated by IgG, IgM, C)

- ✱ Complement/ antibody mediated cytolysis
- ✱ 6 hours
- ✱ Hemolysis in newborns, hemolytical anemia, purpura, pemphigus vulgaris, pemfigoid bullosus, DHD,



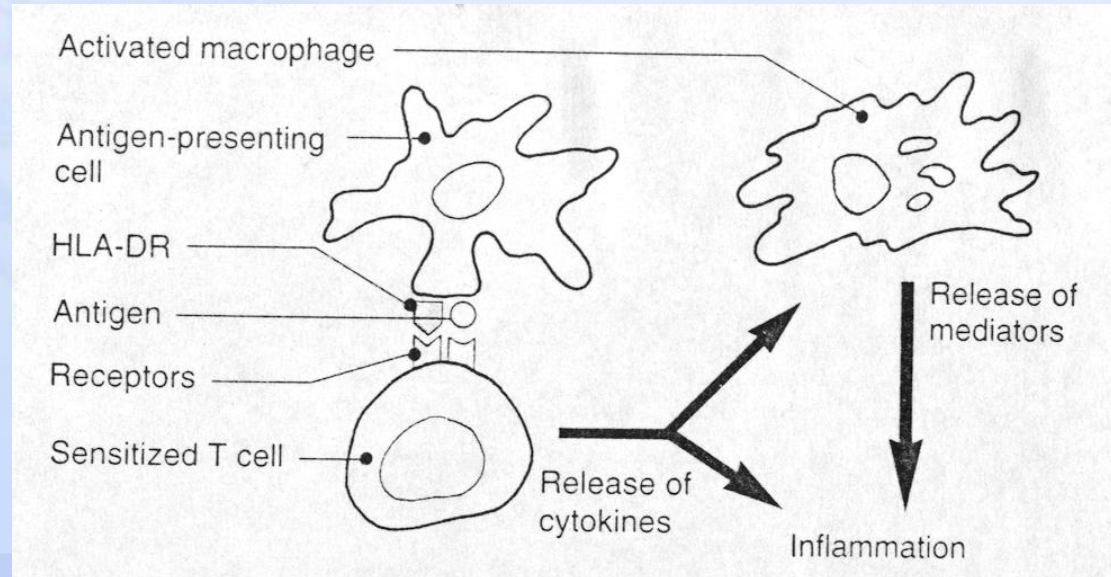
Type III: Immune complex reaction (mediated by IgG, IgM, IgA and C)

- * 6-12 hours
- * Vasculitis – subpapilar, periadnexal vessels
- * SLE, erythema nodosum, EEM, DHD- cytotox type
- * Arthus reaction – localised variant (eg. Insulin)



T. IV: Cell-mediated r.(lymphocytes, lymphokines)

- * sensitised T cells → antigen specific receptors
- * Effector- macrophages
- * delayed hypersensitivity – 7 days –refractory phase – after 1st contact, 24-72 hours after 2nd...n contact
- * intracellular microorganisms – eg. TBC- tuberkulin r., viruses, mykotic, parazites, cancer
- * allergic contact dermatitis





Langerhans cell