Hypersensitivity

Hypersensitivity refers to excessive, undesirable (damaging, discomfort-producing and sometimes fatal) reactions produced by the normal immune system. Hypersensitivity reactions require a pre-sensitized (immune) state of the host. Hypersensitivity reactions can be divided into four types: type I, type II, type III and type IV, based on the mechanisms involved and time taken for the reaction. Frequently, a particular clinical condition (disease) may involve more than one type of reaction.

Type I hypersensitivity

IgE-mediated diseases in humans

• Systemic (anaphylactic shock)

• Asthma – Classification by immunopathological phenotype can be used to determine management strategies

• Hay fever (allergic rhinitis)

• Allergic conjunctivitis

• Skin reactions

• Food allergies .

Systemic anaphylaxis - potentially fatal - due to food ingestion (eggs, shellfish, peanuts, drug reactions) and insect stings - characterized by airway obstruction and a sudden fall in blood pressure.

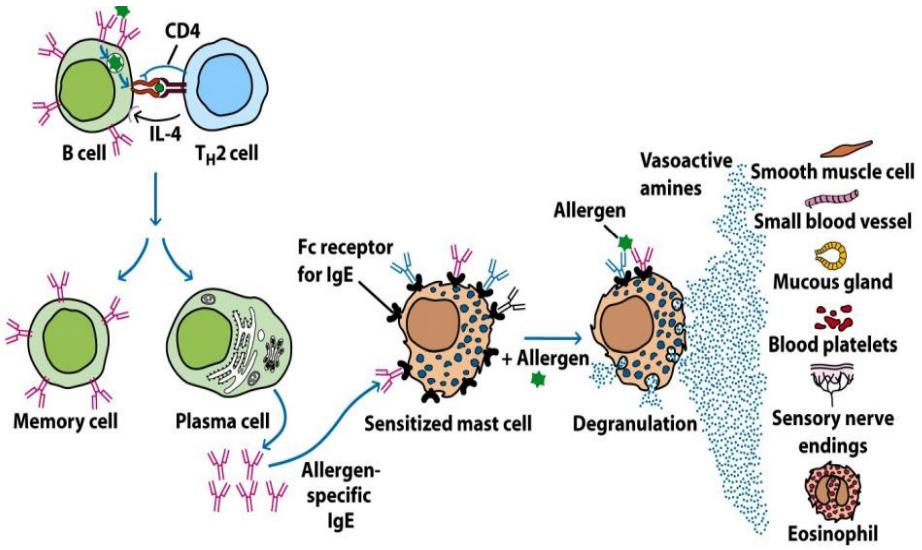

Figure 15-2
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Type II hypersensitivity

Mediated by abs directed towards antigens present on cell surfaces or the extracellular matrix (type IIA) or abs with agonistic/antagonistic properties (type IIB). • Mechanisms of damage: – Opsonization and complement- and Fc receptor mediated phagocytosis – Complement- and Fc receptor-mediated inflammation – Antibody-mediated cellular dysfunction example Transfusion reactions (ABO incompatibility • Hemolytic disease of the newborn (erythroblastosis fetalis)

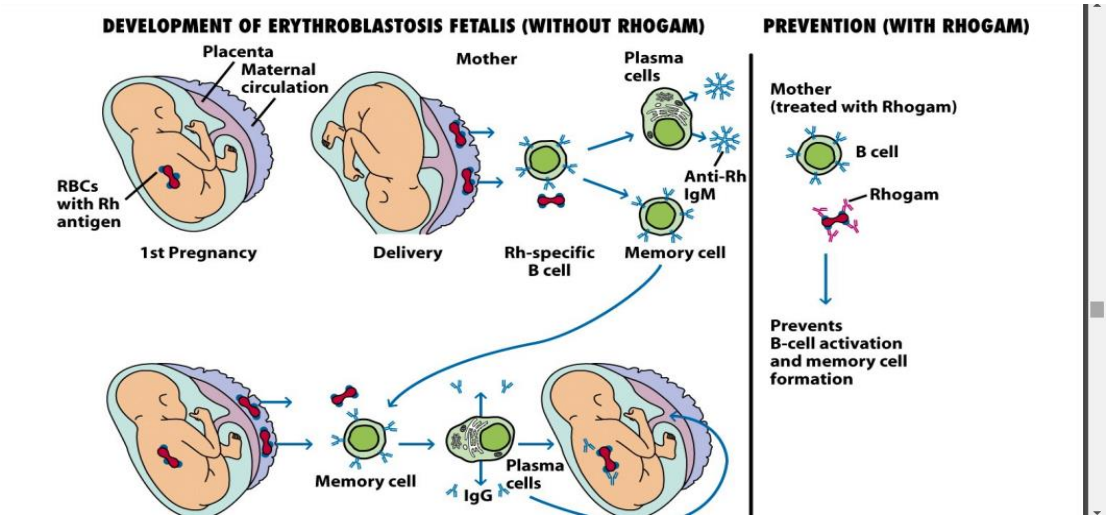

Figure 2 type II

Type III hypersensitivity

Formation of circulating immune complexes contributes to the pathogenesis of:

• Autoimmune diseases – SLE (lupus nephritis), rheumatoid arthritis • Drug reactions – Allergies to penicillin and sulfonamides • Infectious diseases – Poststreptococcal glomerulonephritis, meningitis, hepatitis, mononucleosis, malaria, trypanosomiasis

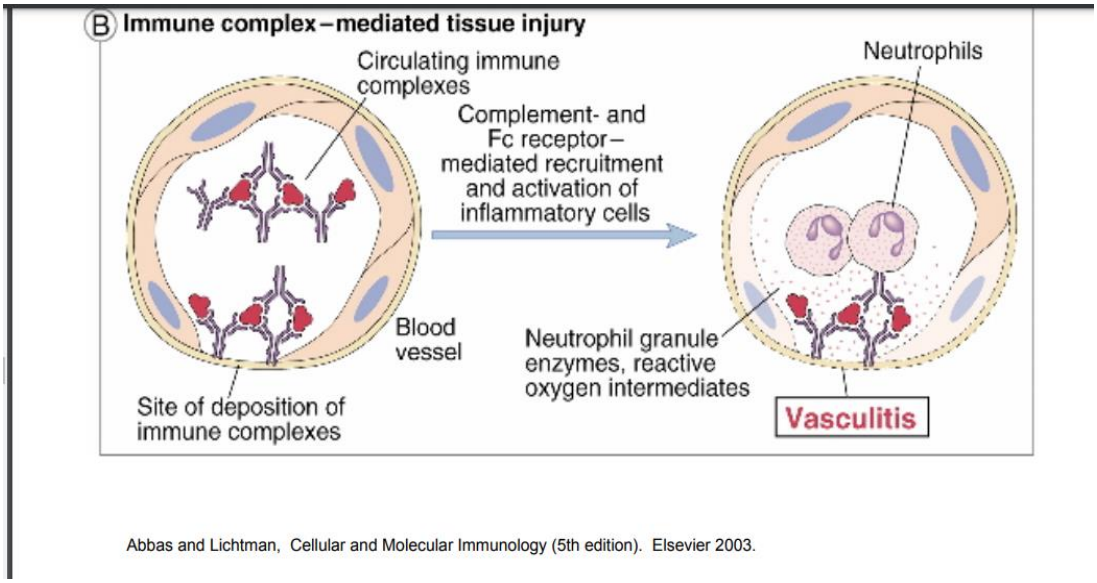

Figure 3 type III hypersensitivity

Type IV Hypersensitivity

mechanism: Cell-mediated, antibody independent. Release of mediators by sensitized CD4+ T cells provoke tissue destruction by mononuclear cells. CD8+ T cells known as cytotoxic T lymphocytes (CTL) may kill chemically modified host cells and cells that display disparate MHC molecules.

Type IV hypersensitivity reactions result from the interaction of T cell-initiated inflammation and do not involve antibody. Inflammatory responses result from the manner in which T cells encounter and respond to antigen. CD4+ T cells may be sensitized and respond to topically applied antigen (contact dermatitis, CD, also called contact sensitivity), by antigen injected antigen [delayed (-type) hypersensitivity, DTH]. Alternatively, CD8+ T cells may encounter cell-surface antigen and directly cause the lysis of that cell (CTL). Type IV Hypersensitivity - Contact dermatitis Chemically reactive substances may be absorbed through the epidermis, where they bind to proteins. Potential contact

sensitizers include synthetic chemicals, plant products, and certain metals (e.g., nickel). Generally, contact sensitizers are, by themselves, too small

Table 5 - Comparison of Different Types of hypersensitivity

Characteristics	Type-I (anaphylactic)	Type-II (cytotoxic)	Type-III (immune complex)	Type-IV (delayed type)
Antibody	IgE	IgG, IgM	IgG, IgM	None
Antigen	Exogenous	Cell surface	Soluble	Tissues and organs
Response time	15-30 minutes	Minutes-hours	3-8 hours	48-72 hours
Appearance	Weal and flare	Lysis and necrosis	Erythema and edema, necrosis	Erythema and induration
Histology	Basophils and eosinophil	Antibody and complement	Complement and neutrophils	Monocytes and lymphocytes
Transferred with	Antibody	Antibody	Antibody	T-cells
Examples	Allergic asthma, hay fever	Erythroblastosis fetalis Goodpasture's nephritis	SLE, farmer's lung disease	Tuberculin test, poison ivy, granuloma

T cells.