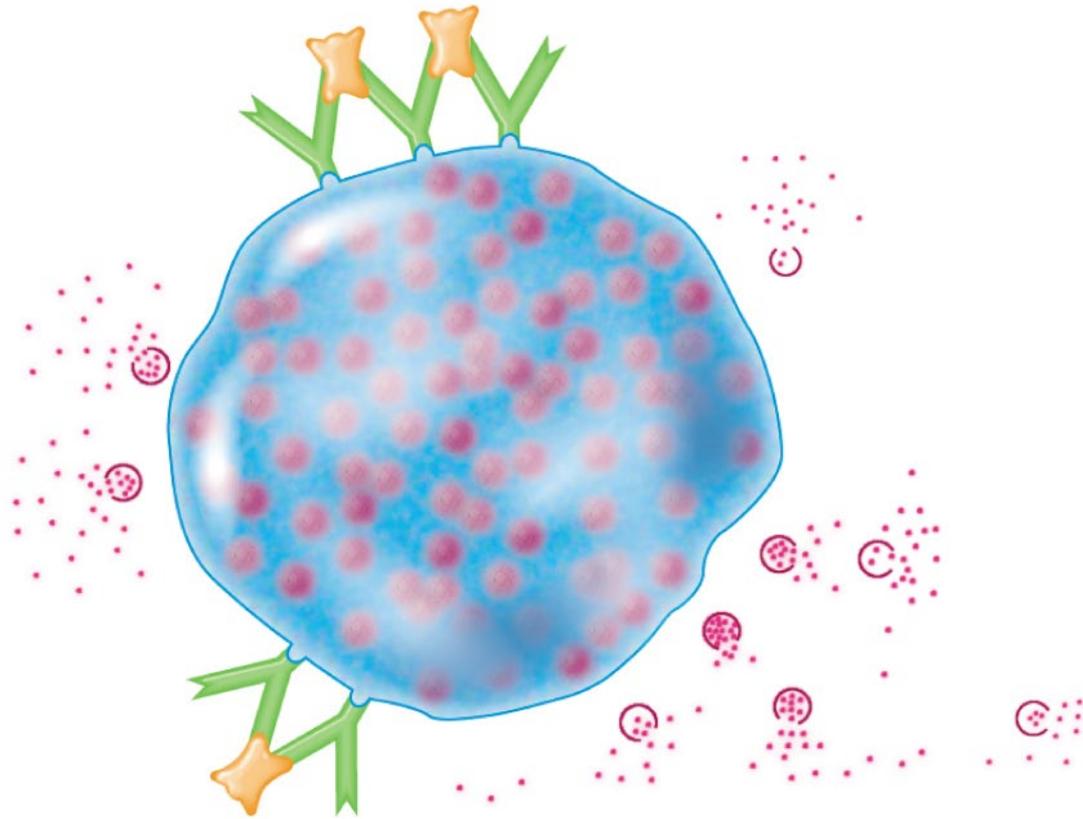


C21.8

Hypersensitivity



Four Different Types of Hypersensitivity

Hypersensitivity reactions are inappropriate extreme immunologic responses that occur in response to an antigen or allergen.

Type I, II and III hypersensitivity reactions are known as **immediate hypersensitivity reactions** because they occur within 24 hours of exposure to the antigen or allergen. /// These are caused by antibodies.

*Type IV hypersensitivity is caused by T cells and is **delayed hypersensitivity***

Four Different Types of Hypersensitivity

Four hypersensitivity types based on the immunity (antibodies or T cells) and response time to antigen

Type I acute hypersensitivity

- very rapid response // within seconds resolves in 30 min.
- antigen binds to E class antibody receptors on mast cells
- mast cells **release histamine** (and heparin)
- maybe local vs systemic
- local = Food allergies and asthma
- If systemic = Anaphylactic shock / potentially deadly!

Type II - antibody dependent cytotoxic

- Sub-acute
- slower onset // 1 – 3 hours after exposure
- last longer – 10 to 15 hrs
- G and M class antibodies bind to antigen on cell
- Antibodies **activate complement**

Four Different Types of Hypersensitivity

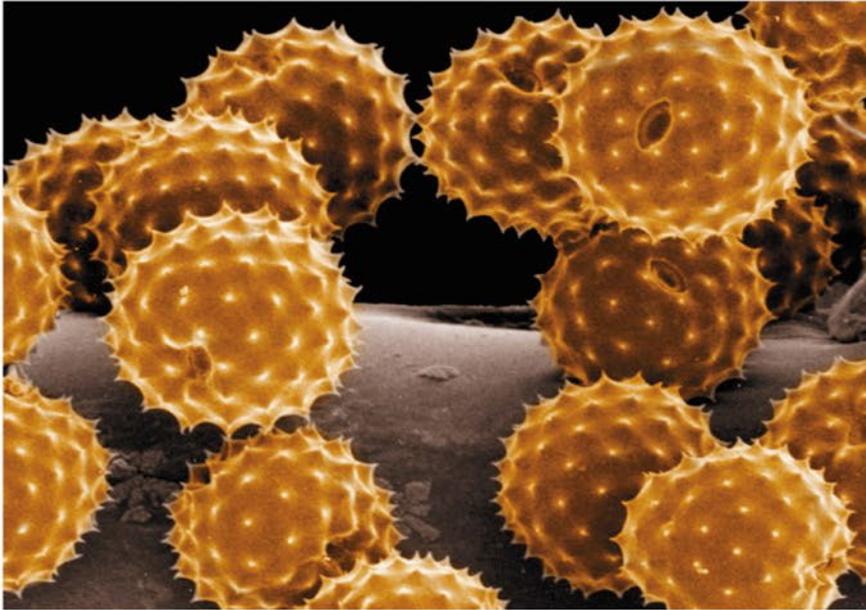
Type III - immune complex hypersensitivity

- sub-acute /// slower onset // 1 – 3 hours after exposure
- last longer – 10 to 15 hrs
- **antibody-antigen complex under endothelium and other tissues**
- Stimulate intense inflammation
- Autoimmune diseases like systemic lupus and glomerulonephritis

Type IV - delayed hypersensitivity

- **T-Cell mediated** response
- Response time 12-72 hours
- Examples = Graft rejections and poison ivy

Type I - Localized Anaphylaxis



SEM

40 μm

(a) A micrograph of pollen grains

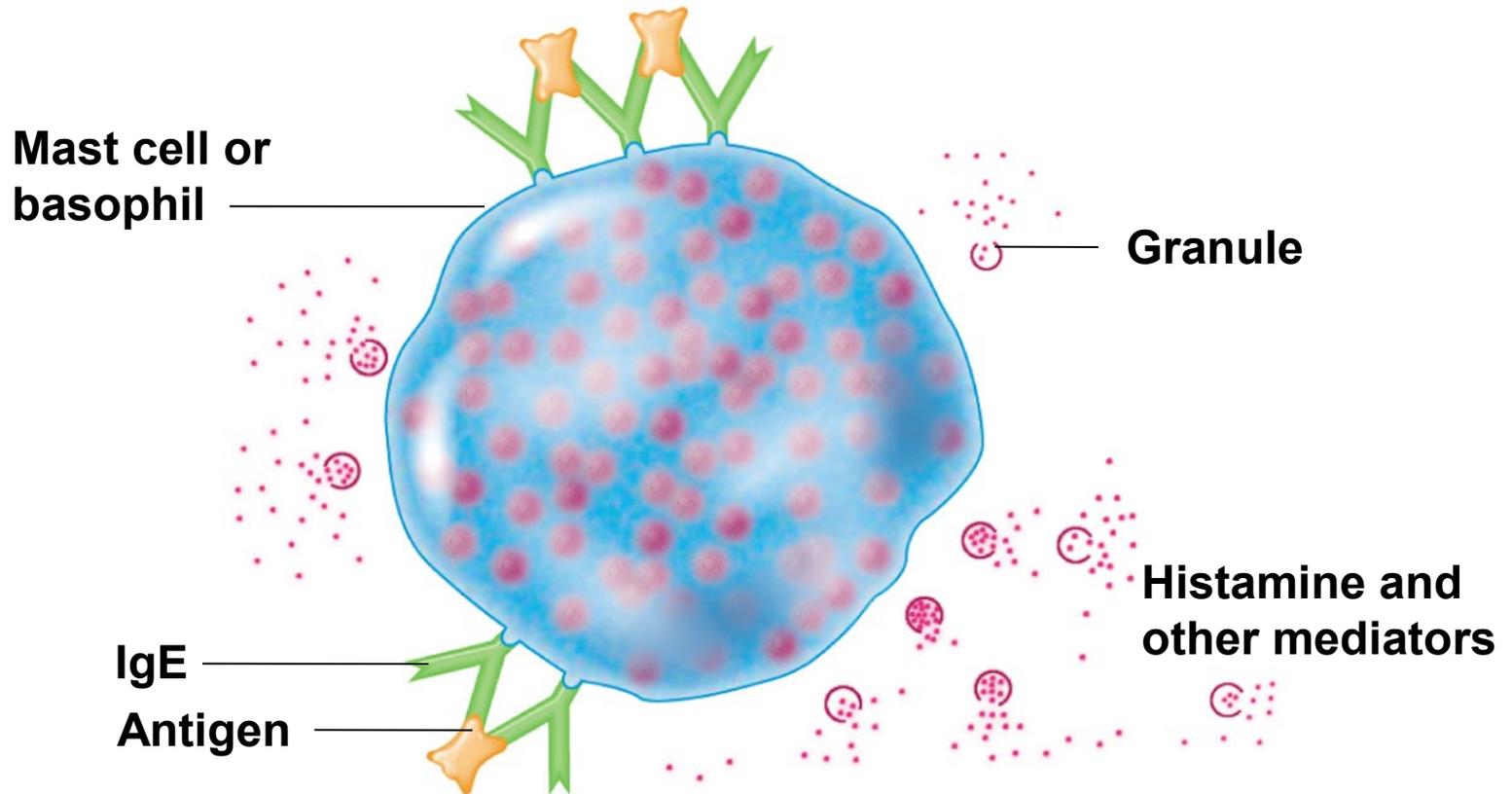


SEM

55 μm

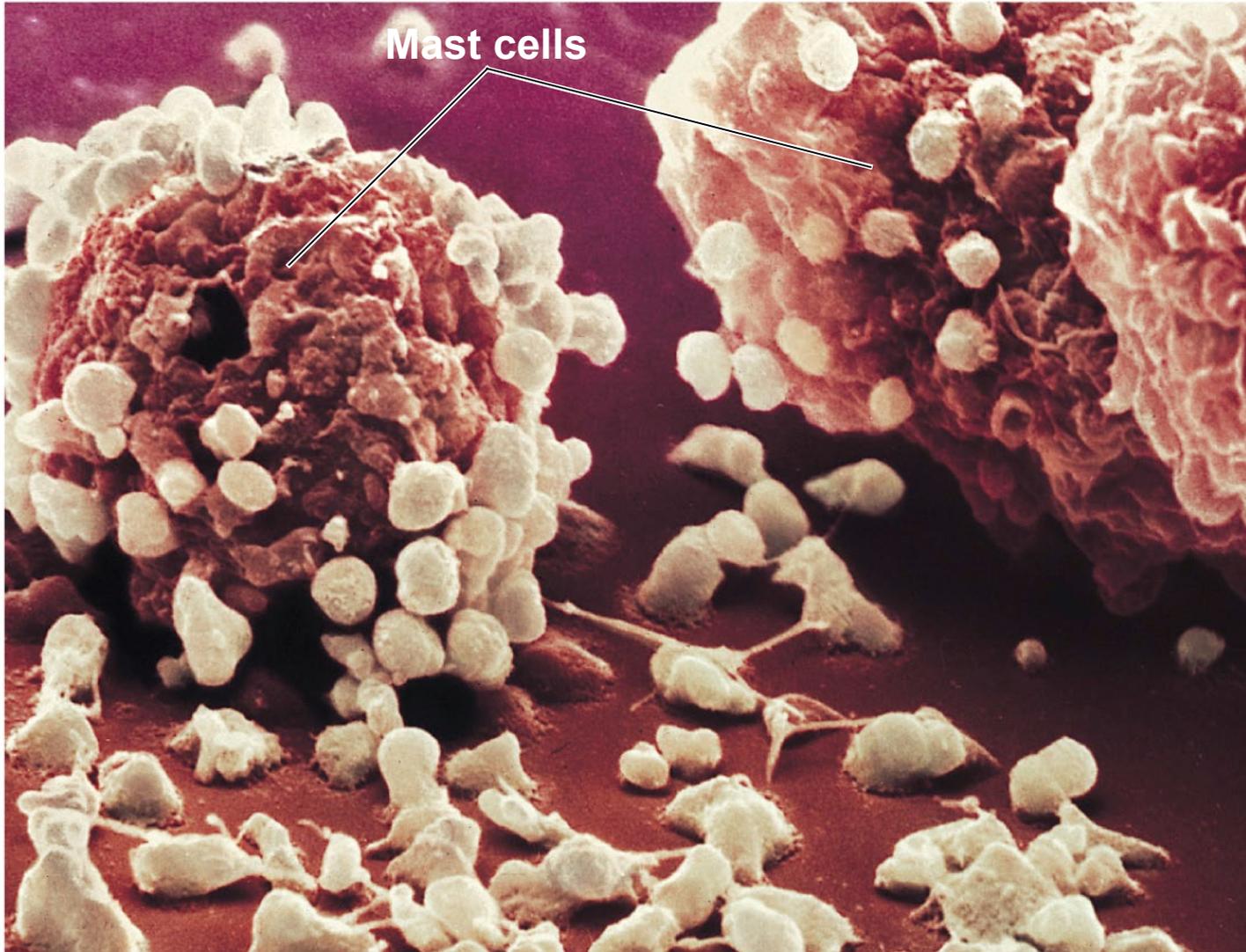
(b) A micrograph of a house mite on fabric

Type I // The Mechanism of Anaphylaxis



(a) IgE antibodies, produced in response to an antigen, coat mast cells and basophils. When an antigen bridges the gap between two adjacent antibody molecules of the same specificity, the cell undergoes degranulation and releases histamine and other mediators.

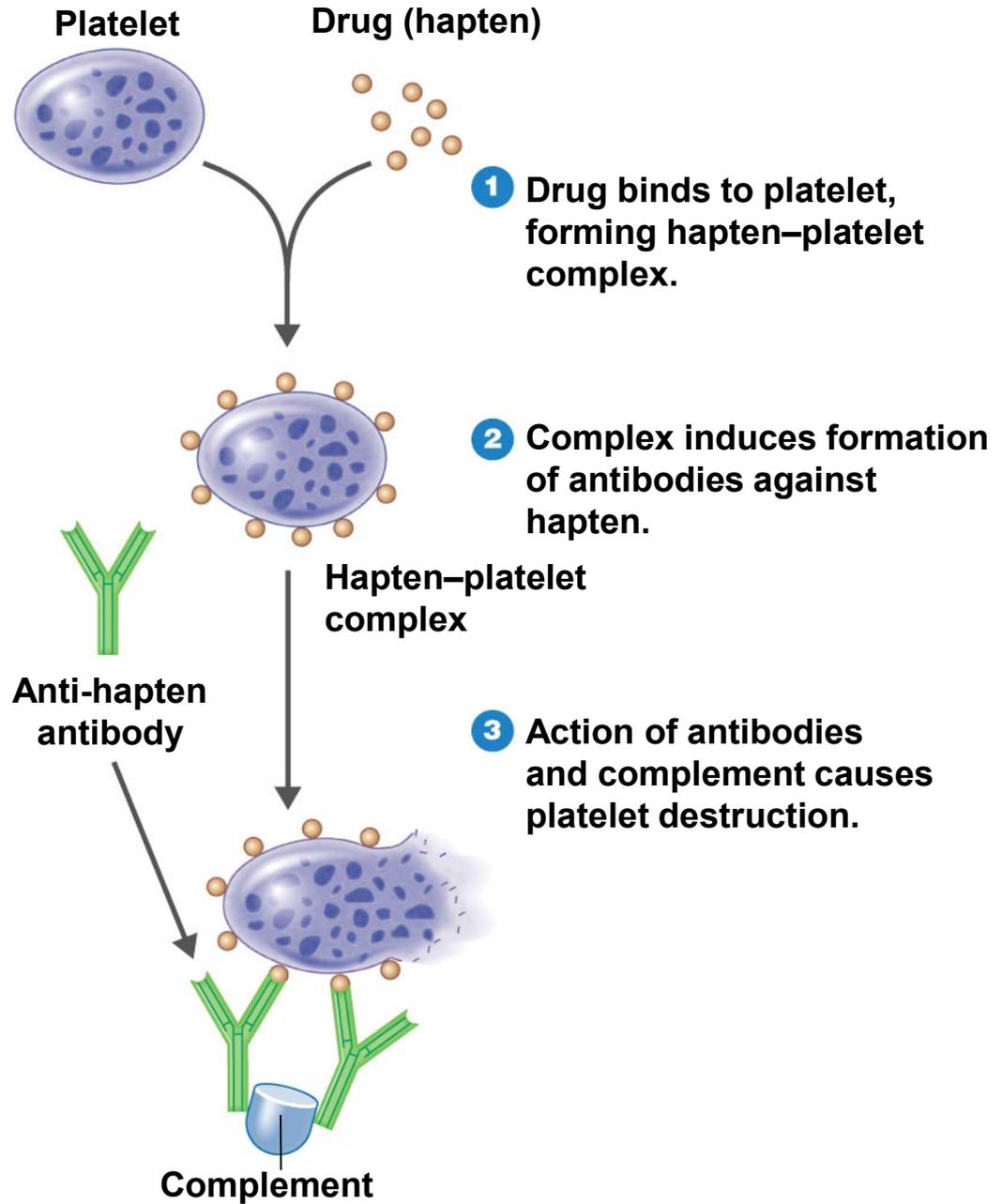
Type I - The mechanism of anaphylaxis.



SEM | 10 μ m

A degranulated mast cell that has reacted with an antigen and released granules of histamine and other reactive mediators

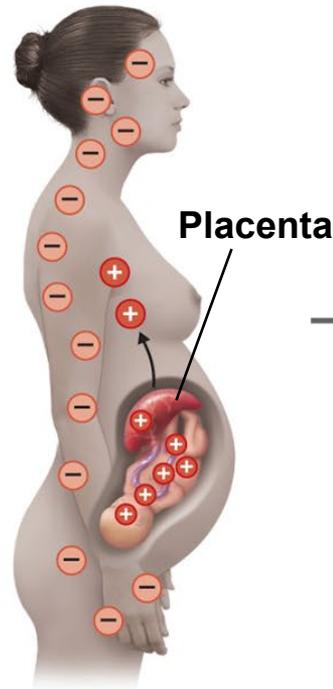
Type II - Drug-induced thrombocytopenic purpura.



Type II - Hemolytic disease of the newborn.



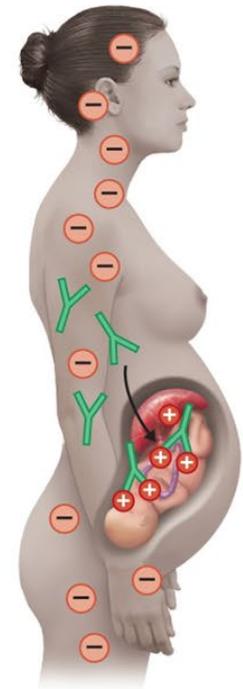
1 Rh⁺ father.



2 Rh⁻ mother carrying her first Rh⁺ fetus. Rh antigens from the developing fetus can enter the mother's blood during delivery.



3 In response to the fetal Rh antigens, the mother will produce anti-Rh antibodies.



4 If the woman becomes pregnant with another Rh⁺ fetus, her anti-Rh antibodies will cross the placenta and damage fetal red blood cells.

Type III - Immune complex-mediated hypersensitivity.

Basement membrane of blood vessel

1 Immune complexes are deposited in wall of blood vessel.

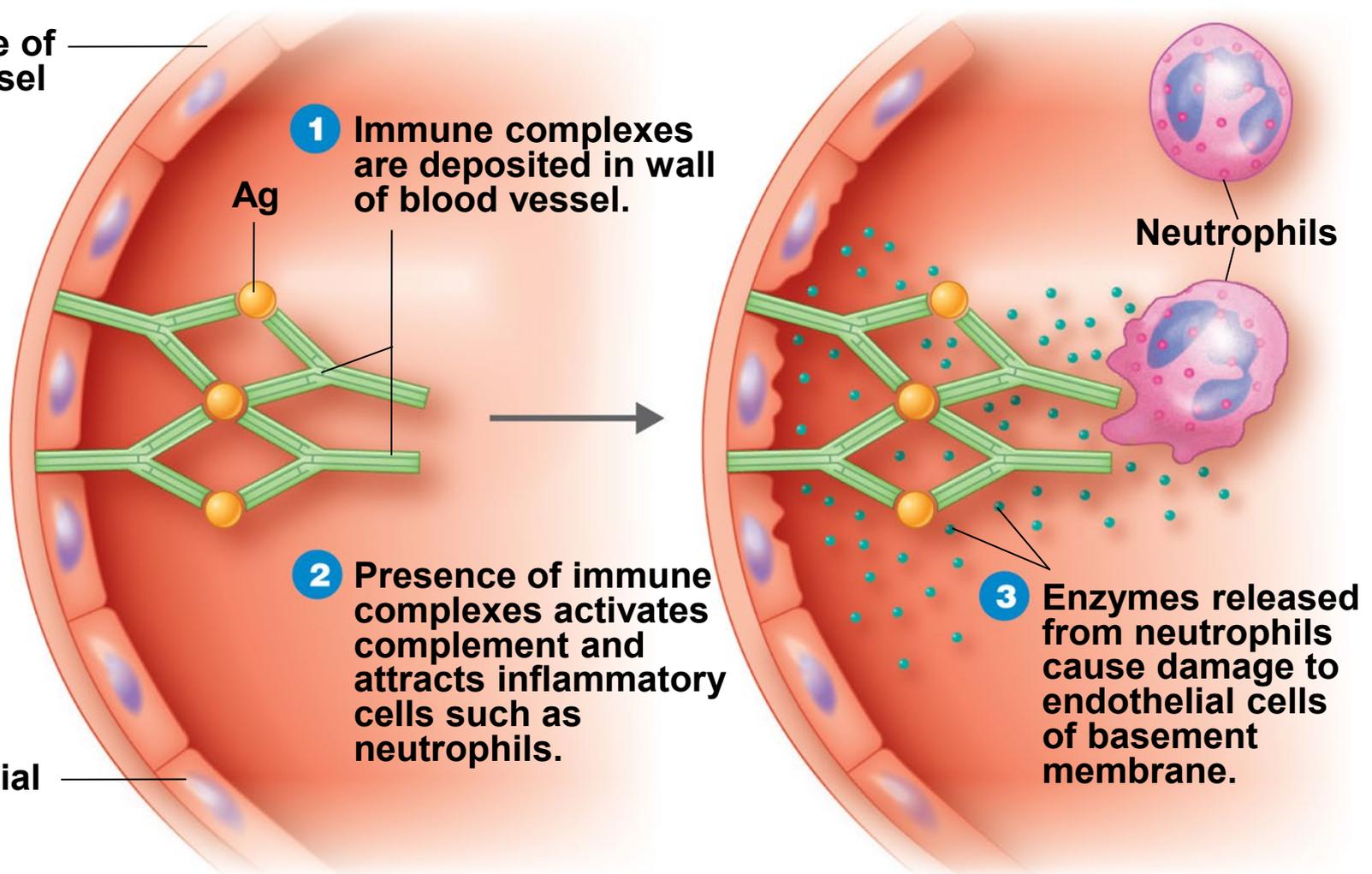
Ag

2 Presence of immune complexes activates complement and attracts inflammatory cells such as neutrophils.

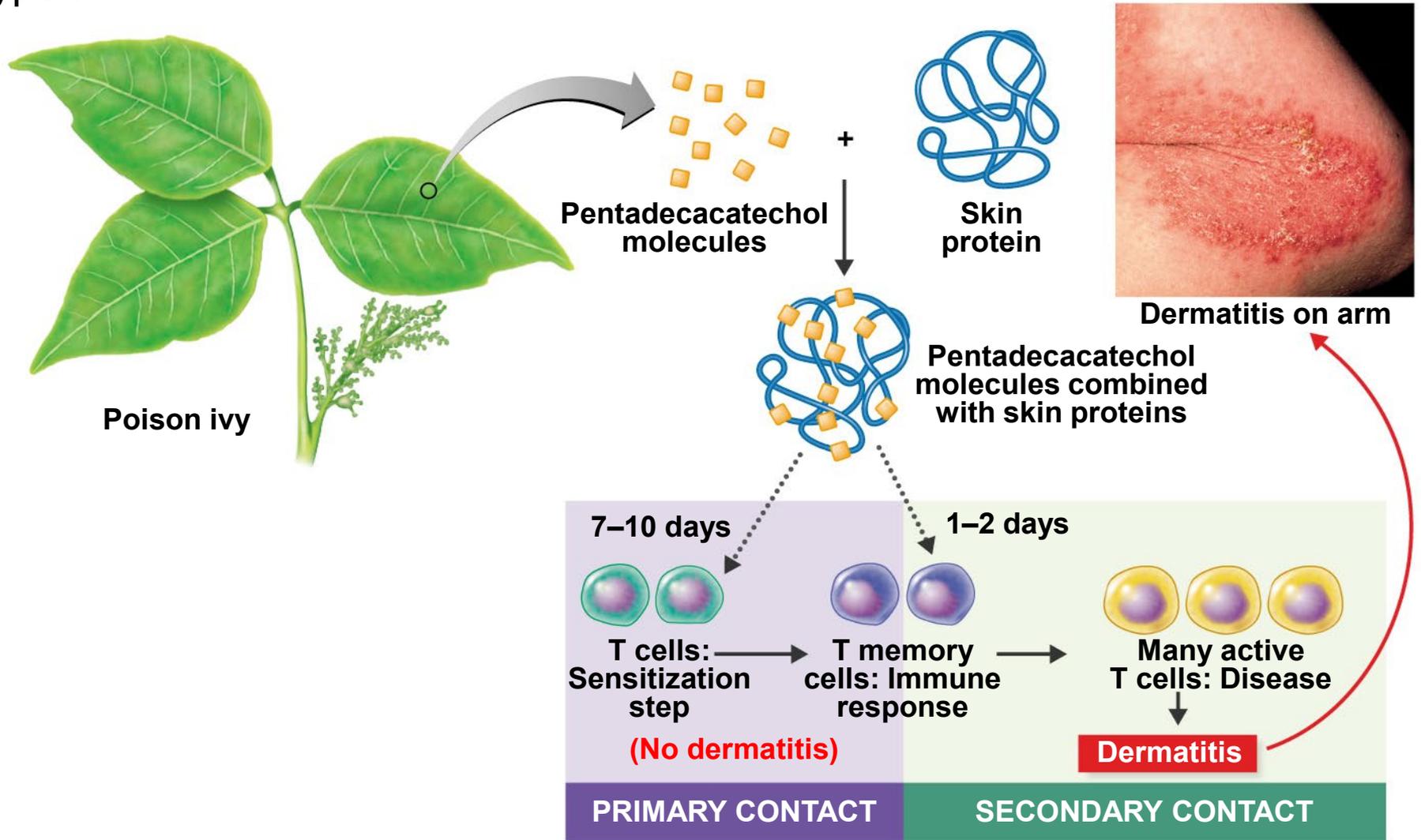
Endothelial cell

3 Enzymes released from neutrophils cause damage to endothelial cells of basement membrane.

Neutrophils



Type IV



The development of an allergy (allergic contact dermatitis) to catechols from the poison ivy plant.

Type IV – Allergic Contact Dermatitis

