



HSM 2433
MIKROBIOLOGI, PENYAKIT BERJANGKIT DAN
KESIHATAN PEKERJAAN

JENIS-JENIS HIPERSENSITIVITI

Objektif

- . Definisi hipersensitiviti.
- Jenis-jenis hipersensitiviti I, II, III dan IV.
- Tindakbalas dan contoh.

Definisi

- **Hypersensitivity** (also called **hypersensitivity reaction**) refers to undesirable reactions produced by the normal immune system, including allergies and autoimmunity.
- These reactions may be damaging, uncomfortable, or occasionally fatal.



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graph TD; A[HIPERSENSITIVITI] --- B[Type I]; A --- C[Type II]; A --- D[Type III]; A --- E[Type IV];
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HIPERSENSITIVITI

Type I

Type II

Type III

Type IV

Type-I Hypersensitivity

- Juga dipanggil *immediate hypersensitivity* atau *allergy* (alergi).
- Antigen yang menyebabkan Type-I Hypersensitivity dipanggil *allergen*.
- Tindakbalas wujud selepas beberapa minit/jam selepas kemasukan alergen.

Type-I Hypersensitivity

- Allergen:
 - *Pollen* (debunga)
 - *Dust mites* (kutu)
 - *Fungal spores* (spora kulat)
 - Makanan tertentu, terutama makanan laut.
 - Sesetengah antibiotik, terutama penicillin.
 - Ubat2 lain.
- Faktor penyumbang (predisposing factors) – keturunan.

Type I Hypersensitivity: Brochial asthma

- Allergen:
 - Persekitaran – asap rokok
 - Debunga .
 - bulu kucing, anjing, hamster, burung dll
 - kutu/hama
 - Indoor insect allergens (lipas, dll)
 - Outdoor insect allergens – stinging insects

Type I Hypersensitivity: Brochial asthma

- Exercise:
 - Exercise is not risk factor for asthma, but can triggers asthma.
 - Oleh itu, asthma ini dipanggil EIB (Exercise Induced Asthma).
 - Symptoms:
 - Shortness of breath (sesak nafas)
 - Chest tightness (sakit dada)
 - Cough (batuk)
 - Symptoms relieved by rest.

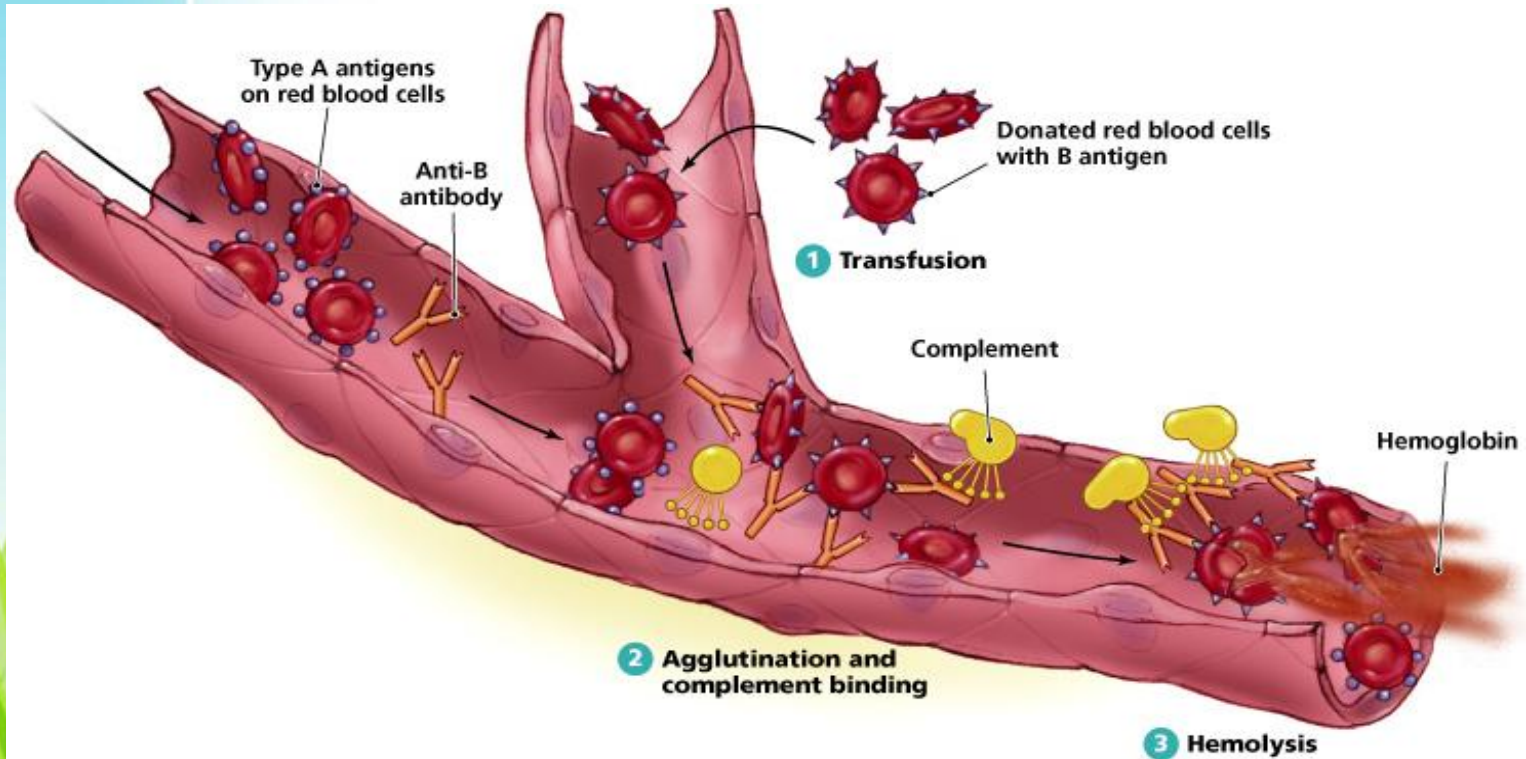
Type I Hypersensitivity: Brochial asthma

- Other triggers:
 - Emotional stress
 - Cold air
 - Medicines: aspirin, β -blockers, respiratory infection

Type II Hypersensitivity

- Juga dipanggil *cytotoxic hypersensitivity*.
- Wujud kerana gabungan Antigen dgn Antibodi pada permukaan satu2 sel.
- Ini menyebabkan *complement activation* dan *lysis*.
- Contoh:
 - *Blood transfusion* dengan darah yang tak serasi.
 - Haemolytic disease of the newborn (HDN).

Type II Hypersensitivity



Blood Receivers

A can only take A and O

B can only take B and O

AB can take A, B, O and AB

O can only take O

Rh + can take Rh+ and Rh -

Rh - can only take Rh-

O- **cannot** take blood from A+-, B+-, AB+- or O+.

Because they have anti-A, anti-B and Anti-Rh

(universal donor)

They can only take O-.

AB+ **can** take A+-, B+-, AB+-, or O+-.

Because they do not have any antibodies

(universal acceptor)

They can only donate to AB+.

Blood Donors

O can give to O, A, B, and AB

A can give to A and AB

B can give to B and AB

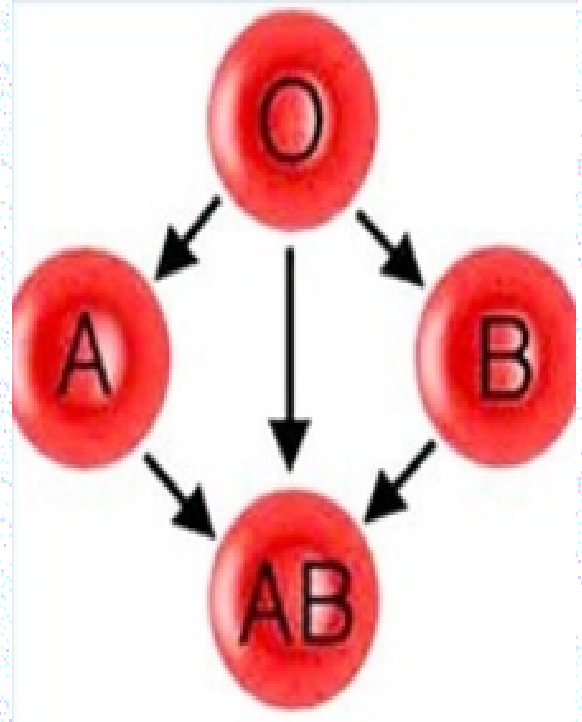
AB can only give to AB

Rh - can give to Rh- and Rh+

Rh + can only give to Rh+

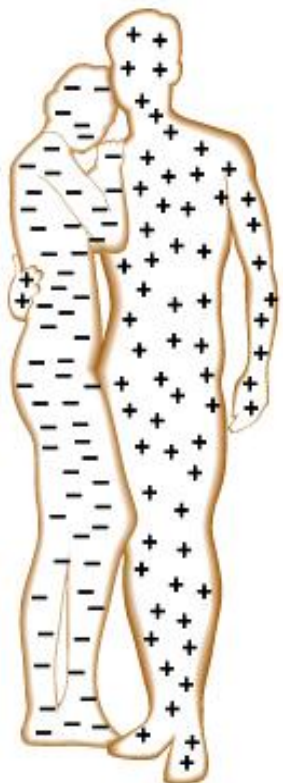
Universal donor has no antigens: O-

(can give to all types)



http://www.ehow.com/how_4806951

If a patient receives the wrong blood type they will have a **transfusion reaction**.



Rh-negative woman and Rh-positive man conceive a child



Rh-negative woman with Rh-positive fetus



Cells from Rh-positive fetus enter woman's bloodstream



Woman becomes sensitized—antibodies (◇) form to fight Rh-positive blood cells

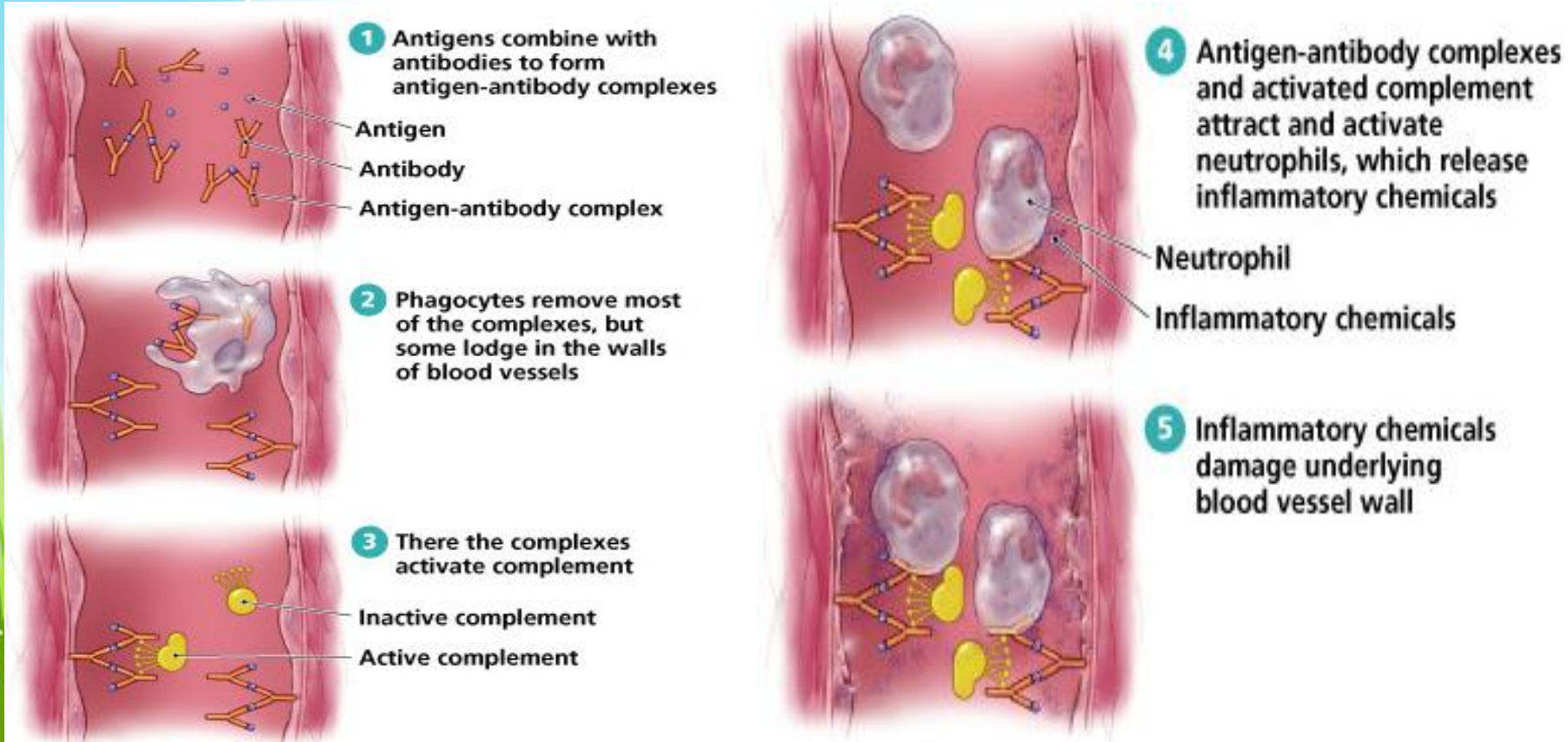


In the next Rh-positive pregnancy, maternal antibodies attack fetal red blood cells

Type II Hypersensitivity: HDN

- Jika ibu Rhesus –ve, bayi Rhesus +ve.
- RBC bayi ada Ag-D (Rh+), serum ibu ada Ab-D (Rh-).
- Ab-D sejenis IgG, jadi boleh masuk melalui placenta.
- Bila darah ibu (ada Ab-D) masuk ke dlm bayi (ada Ag-D), Ab-D akan binding dgn Ag-D RBC bayi, dan menyebabkan pemusnahan RBC (haemolysis).

Type III Hypersensitivity



Type III Hypersensitivity

- *immune complex hypersensitivity.*
- *Immune complex = Antigen-Antibody complex.*
- *Apabila Antigen-antibody complexes terbentuk , ianya mengambil masa utk hilang dari tubuh badan*
- *Lazimnya, immune complexes dimusnahkan dgn fagosit.*

Type III Hypersensitivity

- *Immune complexes* boleh diserap ke dlm renal , sendi, salur darah, sistem respiratori
- Contoh:
 - Acute glomerulonephritis (AGN)
 - Systemic lupus erythematosus (SLE)
 - Rheumatoid arthritis
 - Serum sickness

Type III Hypersensitivity



SLE



Arthritis

Type IV Hypersensitivity

- 'cell mediated hypersensitivity' or 'delayed type hypersensitivity'.
- Example is tuberculin (Mantoux) test, which peaks 48 hours after injection of antigen (PPD or old tuberculin).
- Mantoux test is diagnostic tool for tuberculosis.
- The lesion is characterized by induration or erythema.
- Induration – palpable raised hardening area.
- Erythema – redness of the skin, caused by hyperemia.

Type IV Hypersensitivity

- Involved in pathogenesis of:
 - Autoimmune and infectious diseases – blastomycosis, histoplasmosis, toxoplasmosis, leishmaniasis, etc).
 - Granulomas – tuberculosis, leprosy.
 - Contact dermatitis – poison ivy, chemicals, heavy metals.



Mantoux intradermal tuberculin skin test for tuberculosis.

Delayed type reactions

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Type	Reaction time	Clinical appearance	Histology	Antigen and site
Contact	48-72 hours	Eczema	Lymphocytes, followed by macrophages, edema of epidermis	Epidermal (organic chemicals, poison ivy, heavy metals, etc)
Tuberculin	48-72 hours	Local induration	Lymphocytes, monocytes, macrophages	Intradermal (tuberculin, lepromin, etc)
Granuloma	21-28 days	Hardening	Macrophages, epitheloid and giant cells, fibrosis	Persistent antigen or foreign body presence (tuberculosis, leprosy)

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	Tissue & organ
Response time	15-30 minutes	Minutes-hours	3-8 hours	48-72 hours
Appearance	Weal & flare	Lysis and necrosis	Erythema, edema, necrosis	Erythema and induration
Histology	Basophils and eosinophils	Antibody and complement	Complements and neutrophils	Monocytes and lymphocytes
Transferred with	Antibody	Antibody	Antibody	T-cells



Thank You!