EDITING FILE

check this frequently

HYPERSENSITIVITY

Color Index:

Main Text

Important

Female Slides

Male Slides

Dr's Notes

Extra

OBJECTIVES

01

To know that hypersensitivity reactions are over and excessive immune responses that can be harmful to body in four different ways

02

To be familiar with inflammatory processes in Type I hypersensitivity reaction that mediates allergic inflammation

03

To recognize that Type II hypersensitivity deals with immune responses against antigens that are integral part of cell membrane and are usually associated with autoimmune disorders

04

To know that Type III hypersensitivity reactions are mediated by immune complexes and cause vasculitis

05

To describe Type IV hypersensitivity is a purely cell mediated immune response associated with chronic inflammation

IMMUNE REACTIONS

Desirable reaction
(Protective Immunity)

Undesirable reaction
(Hypersensitivity)

Immediate

Type I (IgE)

Type II (IgG or IgM)

Type III
(Ag-Ab complex)

ANTIBODY BINDING TO ANTIGEN

Delayed

TYPE IV (T CELLS)

CELL MEDIATED REACTIONS TO CHEMICALS OR PROTEINS

WATCH VIDEO

WATCH VIDEO

Type I Hypersensitivity:

Also named as:

- Immediate Hypersensitivity
- Allergic reaction
- Anaphylactic reaction

WHICH IS SEVERE AND RAPIDLY PROGRESSING SYSTEMIC FORM WHICH CAN BE QUICKLY LIFE THREATENING. IT CAN OCCUR WITHIN MINUTES TO HOURS

-BRONCHOCONSTRICTION AND AIRWAY OBSTRUCTION

- BLOOD VESSEL CONTRACTION

Antigens (Allergens): pollens - dust mites - animal dander - nuts - shellfish - various drugs

★ LOW MOLECULAR WEIGHT
★ HIGH SOLUBILITY

Cellular components: mast cells - basophils - eosinophils

Antibody type: IgE → Atopic individuals respond by producing large amounts of IgE in response to those otherwise harmless substances. In the other hand Non-allergic individuals respond to these allergens by producing IgG antibodies

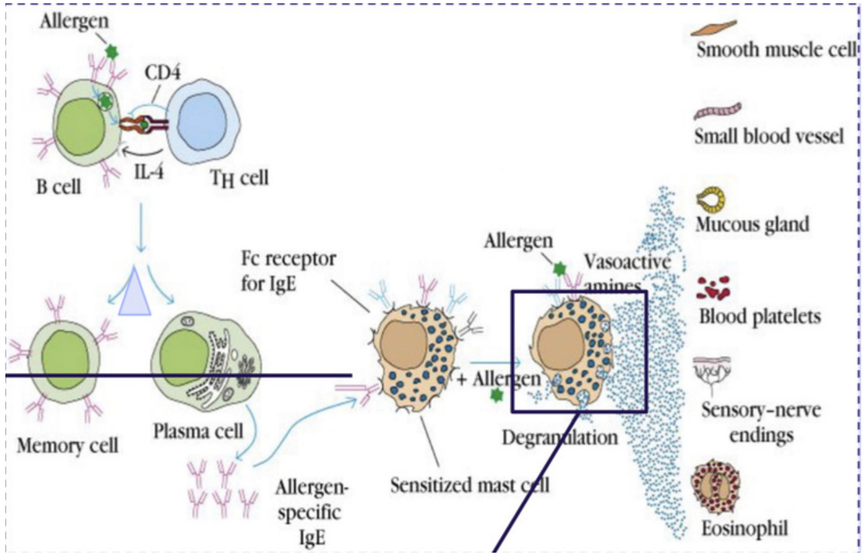
Atopic >> has allergy
Non-Atopic (non-allergic) >> has NO allergy

TYPE I HYPERSENSITIVITY - 2 PHASES

SENSITIZATION PHASE

FIRST CONTACT WITH ALLERGENS

B CELL DISPLAYS ANTIGEN TO TH2 CELL ACTIVATING PLASMA CELLS THAT WILL PRODUCE ALLERGEN SPECIFIC IGE THAT BINDS TO FC RECEPTOR ON MAST CELL SURFACE

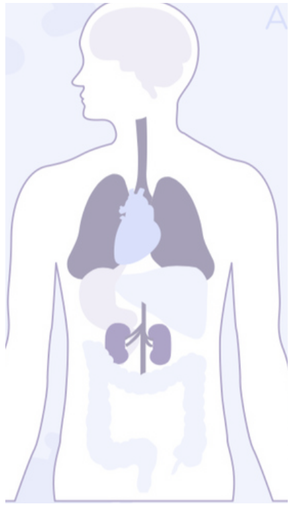


CHALLENGE PHASE

SUBSEQUENT CONTACT WITH ALLERGENS

-ALLERGEN CROSSLINKS WITH SENSITIZED MAST CELL STIMULATING DEGRANULATION AND RELEASE OF VASOACTIVE AMINES - SYMPTOMS APPEAR IN THIS PHASE

ALLERGY IS A SYSTEMIC DISORDER

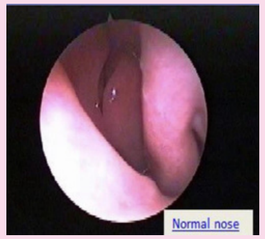


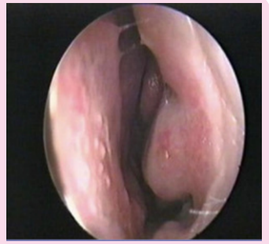
ALLERGIES CAN BE DIVIDED INTO:

INGESTED ALLERGIES
:FOOD ALLERGY
ESOPHAGUS-
STOMACH-

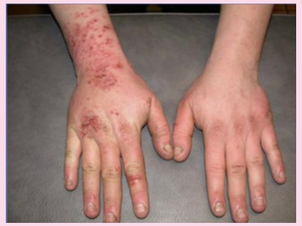
CONTACT ALLERGIES
ECZEMA
URTICARIA
ALLERGIC DERMATITIS
SKIN-

INHALED ALLERGIES
ALLERGIC RHINITIS ASTHMA
NOSE-
PHARYNX-
LUNGS-

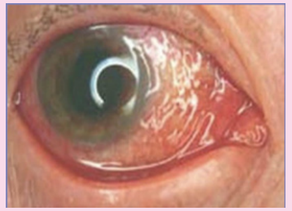




RHINITIS
(INFLAMMATION OF MUCOUS MEMBRANES INSIDE THE NOSE)



ECZEMA



CONJUNCTIVITIS
(INFLAMMATION OF THE OUTER LAYER OF THE EYE AND INNER SURFACE OF THE EYELID)

INJECTED ALLERGENS:

VENOM: POISONOUS SUBSTANCE SECRETED BY ANIMALS

HYMENOPTERA (BEES, WASPS, ANTS):
STING VENOM ENTERS THE BLOODSTREAM.

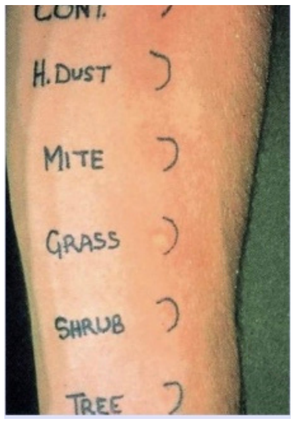
CAN CAUSE:
- SYSTEMIC INFLAMMATION
- ANAPHYLACTIC SHOCK (LIFE THREATENING)

ANAPHYLACTOID REACTIONS:
- ARE NON - IGE MEDIATED
- MAY RESULT FROM CONTRAST MEDIA (INJECTED TO IMPROVE SCAN READING) OR LOCAL ANESTHETICS

NON-IGE MEDIATED IS LIKE AN ANAPHYLAXIS BUT HAS SIMILAR EFFECTS (NON IMMUNOLOGICAL: MAST CELLS ARE DIRECTLY ACTIVATED WITHOUT ANTIBODIES)

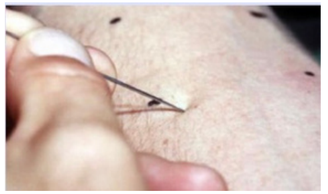
DIAGNOSIS OF ALLERGY

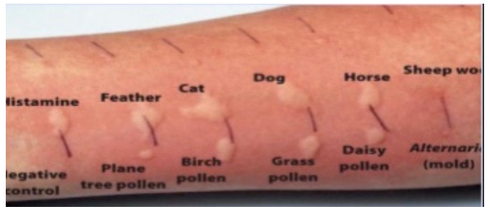
SKIN PRICK TEST (SPT) PUTTING A .1
SMALL AMOUNT OF ALLERGEN ON SKIN THEN PRICKING IT AND WAITING 15-20 MINS TO SEE IF THERE IS ANY REACTION



SPECIFIC IGE MEASUREMENT .2
TESTING IGE IN SERUM (RAST)

ELIMINATION /PROVOCATION .3 TEST (FOOD ALLERGY) AVOIDING CERTAIN
TYPES OF FOOD UNTIL THE ALLERGY CAUSING ONE IS FOUND





PRIMARY AND SECONDARY MEDIATORS:

Mediator	Effects
	PRIMARY Pre-formed and immediately released
Histamine, heparin	Increased vascular permeability; smooth-muscle contraction
Serotonin	Increased vascular permeability; smooth-muscle contraction
Eosinophil chemotactic factor (ECF-A)	Eosinophil chemotaxis
Neutrophil chemotactic factor (NCF-A)	Neutrophil chemotaxis
Proteases	Bronchial mucus secretion; degradation of blood-vessel basement membrane; generation of complement split products
	SECONDARY Newly synthesized
Platelet-activating factor	Platelet aggregation and degranulation; contraction of pulmonary smooth muscles
Leukotrienes (slow reactive substance of anaphylaxis, SRS-A)	Increased vascular permeability; contraction of pulmonary smooth muscles
Prostaglandins	Vasodilation; contraction of pulmonary smooth muscles; platelet aggregation
Bradykinin	Increased vascular permeability; smooth-muscle contraction
Cytokines	
IL-1 and TNF-α	Systemic anaphylaxis; increased expression of CAMs on venular endothelial cells
IL-2, IL-3, IL-4, IL-5, IL-6, TGF-β, and GM-CSF	Various effects (see Table 12-1)

ENVIRONMENTAL AND GENETIC BASIS FOR TYPE I HYPERSENSITIVITY:

1- ENVIRONMENTAL FACTORS

ENVIRONMENTAL FACTORS INCLUDE AIR POLLUTION THROUGH TO DIET,AND GENETICS BOTH INFLUENCE SUSCEPTIBILITY TO ALLERGIES

2- THE HYGIENE HYPOTHESIS

THE HYGIENE HYPOTHESIS HAS BEEN ADVANCED TO EXPLAIN INCREASE IN ALLERGY INCIDENCE:

- IT PROPOSES THAT EXPOSURE TO SOME PATHOGENS EARLY IN LIFE PROVIDES A BETTER T-CELL BALANCE. AVOIDS DOMINANCE OF TH2 SUBSET, WHICH PROMOTES IGE PRODUCTION BY B CELLS (STIMULATING ALLERGIC RESPONSE)

MAY EXPLAIN WHY COUNTRIES WITH IMPROVED HYGIENE ARE EXPERIENCING, INCREASES IN ASTHMA AND ALLERGY RATES

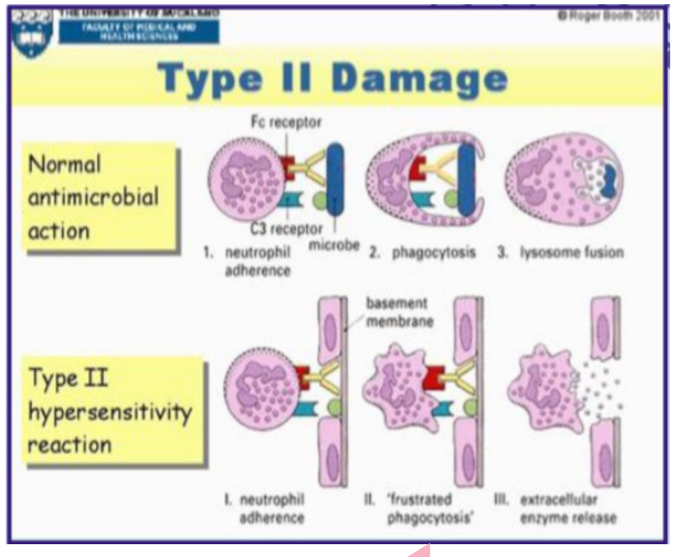
WATCH VIDEO

WATCH VIDEO

TYPE II HYPERSENSITIVITY

ANTIBODY TYPE	IGG(OR IGM)
ANTIGENS	BOUND TO CELL MEMBRANES → SELF ANTIGENS (AUTOIMMUNITY= ATTACK THEIR OWN BODY) → EXOGENOUS ANTIGENS (MICROBIAL)
DIAGNOSIS	DETECTION OF ANTIBODIES AND ANTIGENS BY: IMMUNOFLUORESCENCE IN TISSUE BIOPSY SPECIMENS. E.G. KIDNEY, SKIN ETC.

★ SPECIAL FOR IT'S INVARIABLE COMPLEMENT ACTIVATION (CONSTANT).



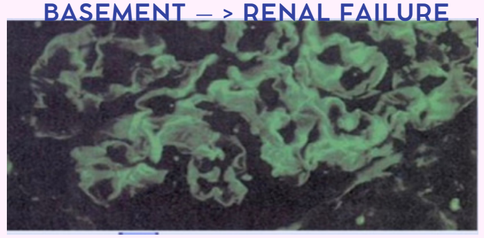
IN THE NORMAL CONDITION, NEUTROPHILS ATTACK MICROBES AS ANTIMICROBIAL ACTION BUT IN TYPE II, NEUTROPHILS ATTACK THE BASEMENT MEMBRANE LIKE BLOOD VESSELS.

TYPE II HYPERSENSITIVITY

CLINICAL EXAMPLES

GLOMERULONEPHRITIS (ANTI-GLOMERULAR BASEMENT MEMBRANE)

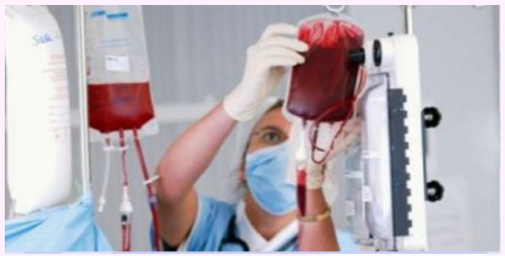
PRODUCING ANTIBODIES AGAINST GLOMERULAR BASEMENT — > RENAL FAILURE



MISMATCHED BLOOD TRANSFUSION

RBCS OF DONOR WILL BE ATTACKED BY THE IMMUNE

RESPONSE OF THE RECIPIENT)



Type III Hypersensitivity (immune-complex mediated):

It is related to some of the **autoimmune diseases**

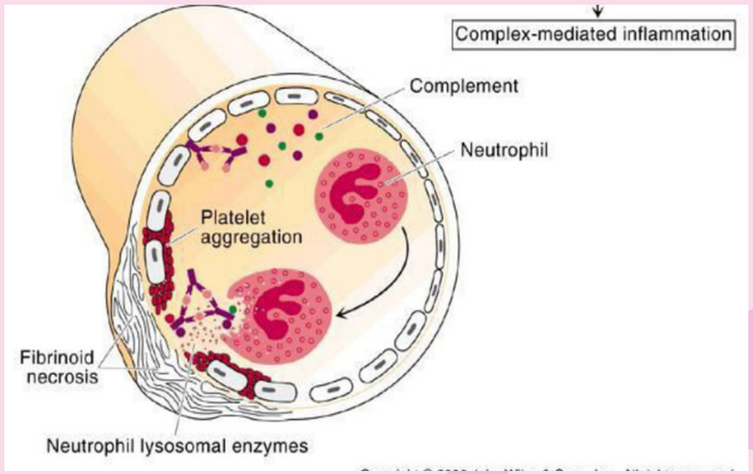
Antibody	IgG or (IgM)
Antigen	Free soluble antigens

important

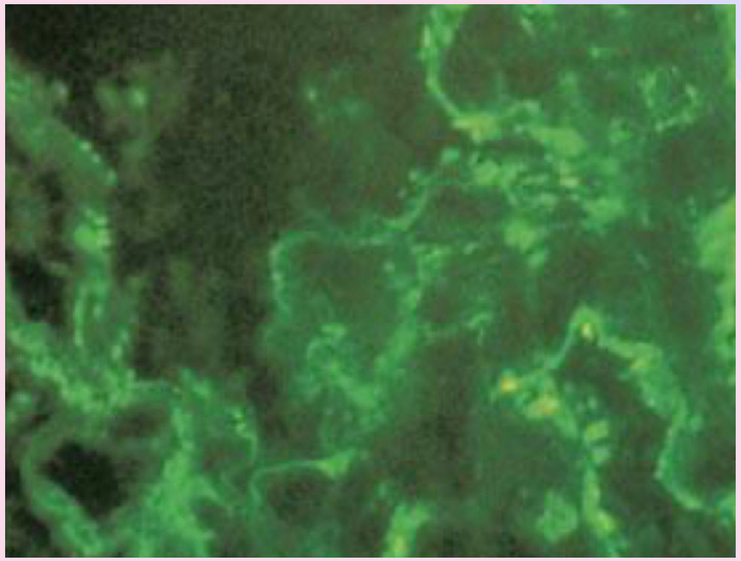
- When an antigen reacts with an antibody the product they product they form is called an **immune complex** which is capable of inducing an inflammatory response

- immune complex are disposition in tissue like **kidneys**(nephritis), **joint**(arthritis) or **blood vessels**(vasculitis).

HOW DOES IT OCCUR
ANTIBODY(IGG/IGM) + FREE ANTIGEN (SOLUBLE)
IMMUNE-COMPLEX FORMATION (AG-AB COMPLEX
COMPLEMENT ACTIVATION (CLASSICAL PATHWAY)
ATTRACTION OF INFLAMMATORY CELLS



CLINICAL EXAMPLE



1 Glomerulonephritis

inflammation of the part of the kidneys that filters blood (glomeruli

2 Systemic Lupus Erythematous(SLE)

It's the common type of lupus, SLE is an autoimmune disease in which the immune system attacks its own tissues, causing widespread inflammation and tissue damage in the affected organs.

3 Rheumatoid arthritis

long-term autoimmune disorder that primarily affects joints

DIAGNOSIS

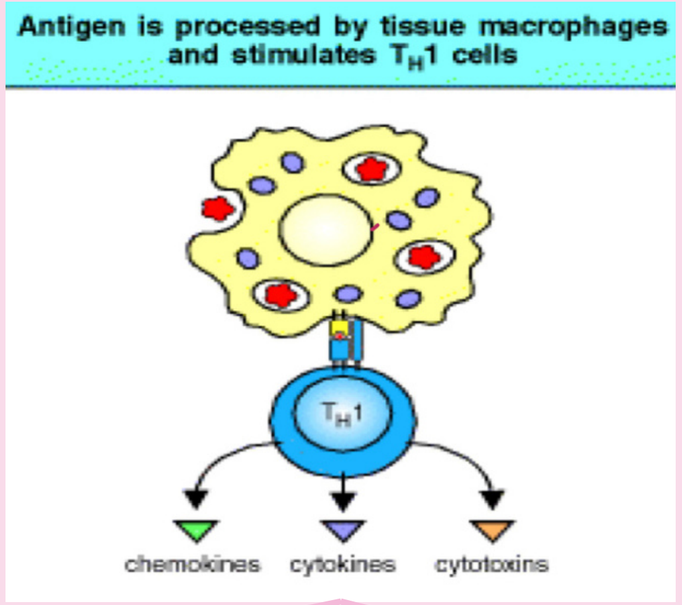
Demonstration of specific immune complexes in the blood or tissue by:

Immunofluorescence

Type IV Hypersensitivity (Delayed Type Hypersensitivity) DTH

Antibody	No antibodies (Cell-mediated)
Cellular components	CD4 generally and CD8 occasionally CD activates macrophages via Th1
Antigens	Presented to T cells by APCs (involving both MHC classes I or II).

- Delayed onest(2-4 days)
- Abnormal cellular response(Granuloma formation)



CHEMOKINES

Recruit macrophage to site of Antigen deposition.

IFN-Y

- Induces expression of vascular adhesion molecules .
- Activates macrophages
- Increase release of inflammatory mediators

IL-3/GM-CSF

- Cause local tissue destruction
- Increase expression of adhesion molecules on local blood vessels

TNF-α , TNF-B

- Stimulate monocytes production by bone marrow stem cells.

chemokines important the other just read it

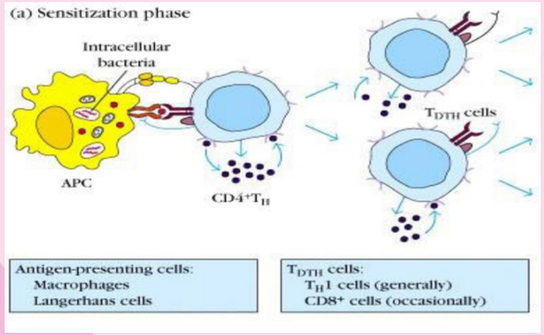
Type IV Hypersensitivity (Delayed Type Hypersensitivity) DTH

Development of DTH Response

PHASE 1-SENSITIZATION PHASE

1-2 week period

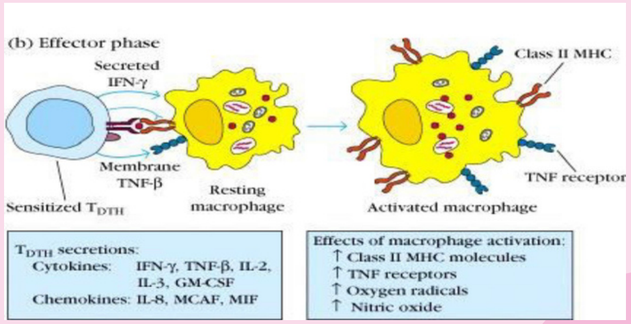
CD4+ Th1 (generally) or CD8+ (occasionally) are activated by APCs like (macrophages and langerhans) via MHC Class I or II and become T-DTH (delayed type T cell).



PHASE 2-EFFECTOR PHASE

24-72 hours

Sensitized T-DTH secretes chemical mediators to (activate macrophages) that act non-specifically



Type IV Hypersensitivity (Delayed Type Hypersensitivity) DTH

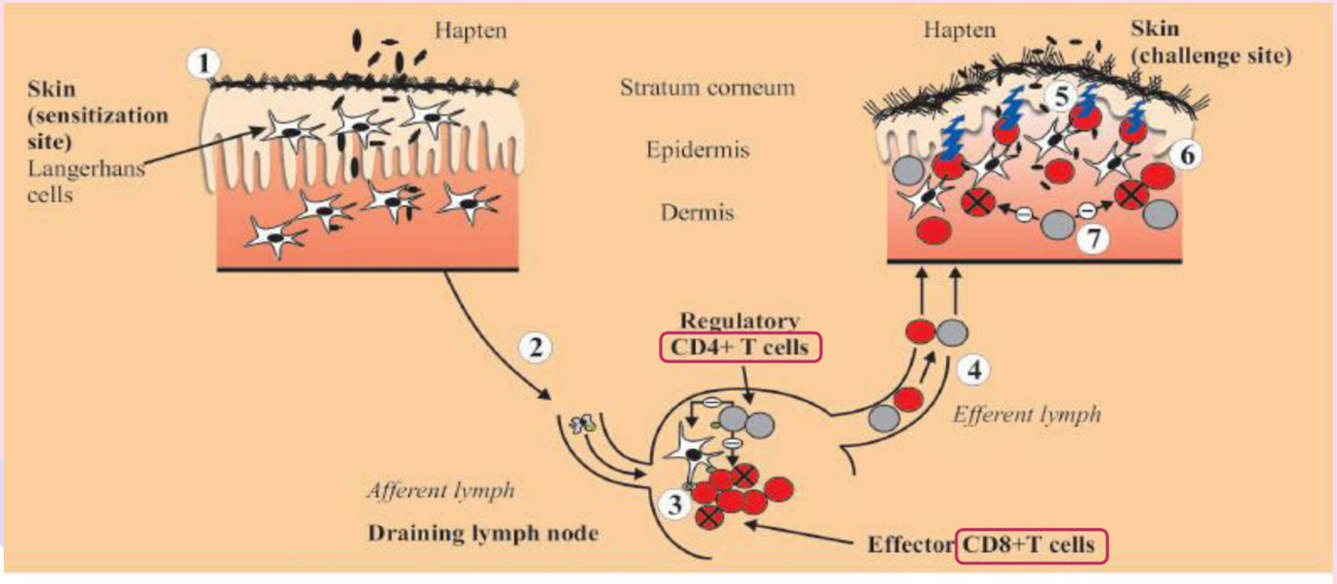
CLINICAL EXAMPLE

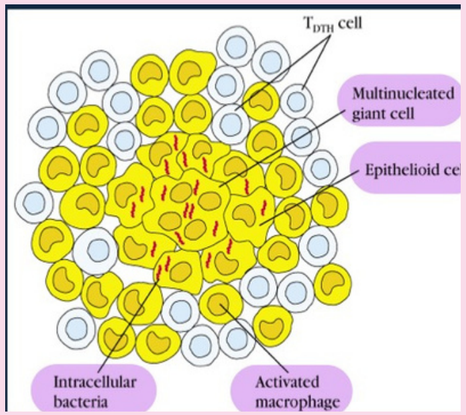
1. Contact dermatitis
   - Allergic dermatitis—>Type 1
   - Contact dermatitis—>Type 4
2. TB granuloma formation (persistent antigen)

DIAGNOSIS

- Delayed skin test (Mantoux test)
- Patchtest(Contact dermatitis)
- Lymphocytetransformationtest

PATHOPHYSIOLOGY OF CONTACT DERMATITIS





TB granuloma formation (persistent antigen)

Taken from team 441

Summary of Hypersensitivity Types

Alternative name	Immediate Hypersensitivity; Allergy	Cytotoxic Hypersensitivity	Complex-mediated Hypersensitivity	Cell-mediated Hypersensitivity
Antibody	IgE	IgG (or IgM)	Ag-Ab Complex	N/A (Mediated by T cells)
Mechanism	Allergen causes IgE binding to mast cells and basophils (sensitization) followed by crosslinking and release of vasoactive amines (challenge	Ab directed against cell surface antigens which mediates cell destruction by complement activation	Ag-Ab complexes deposited in various tissues induce complement activation creating an inflammatory response mediated by neutrophils	Sensitized" TH1 cells release cytokines that activate macrophages or Tc cells which mediate direct cellular damage (effector
Examples	-Anaphylaxis -Eczema -Asthma -Rhinitis -Urticaria -Food allergies	-Mismatched Blood transfusion -Glomerulonephritis (anti-glomerular basement membrane	-Necrotizing vasculitis -Glomerulonephritis (Rheumatoid Arthritis) -SLE	-Contact Dermatitis -Tb granuloma
Diagnosis	-Skin prick test (SKT) -Specific IgE measurement (RAST) -Elimination/ Provocation test.	-Immunofluorescence	-Immunofluorescence	-Delayed skin test -Patch test -Lymphocyte transformation

TAKE HOME MESSAGES

01

Type I (IgE), II (IgG) and III (IgG) hypersensitivity reactions are mediated by antibodies whereas Type IV hypersensitivity reaction is a cell mediated immune response.

02

Hypersensitivity reactions are undesirable, excessive, and aberrant immune responses associated with disorders such as allergy, autoimmunity and chronic inflammation

MCQ'S

ANSWERS:

1-D 2-B 3-B

1 Antibody type in hypersensitivity II

A	IgE	B	IgM	C	IgG	D	IgM & IgG

2 contact dermatitis is caused by:

A	type I	B	type IV	C	type II	D	type III

3 which type of hypersensitivity doesn't produce antibodies

A	Type I	B	Type IV	C	type II	D	Type III

MCQ'S

ANSWERS:

4-A 5-A 6-D

4 type 1 hypersensitivity produces which type of antibodies

A	IgE	B	IgM	C	IgG	D	IgM & IgM

5 how we can diagnose type II hypersensitivity:

A	Immunofluore scence	B	patch test	C	prick test	D	RAST

6 which type of hypersensitivity can cause autoimmune disease

A	Type I	B	Type IV	C	Type I and IV	D	Type III and II

MEET THE TEAM

LEADERS

Abdullah Alzoom

Sadeem Alsaadoon

MEMBERS

Abdulhadi Alqahatani

Bandar Alzaaidi

Faisal Alaowairdhi

Homoud Alsuhali

Omar Alattas

Ziyad Bukhari

Alanoud Alnajawi

Basmah Alghamdi

Lama Alhayan

Manar Alqahtani

Shahad Alzenaidy

Shaden Alotaibi

Contact us on immunologyteam444@gmail.com