Hypersensitivity Reactions of the Ocular Surface



Firstly: What is a Hypersensitivity Reaction? of the Ocular Surface



Firstly: What is a Hypersensitivity Reaction? of the Ocular Surface An exaggerated version of a normal immune response—ie, too much of good thing







Type I

Type II

Type III

Type IV

 How many Hypersensitivity Reactions of the Ocular Surface are there?

 Type I

 Type II

 Type IV

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Four? But I seem to recall from med school that there are **five** hypersensitivity reactions. What gives?

How manyHypersensitivity Reactions of the Ocular Surface are there?Type IType IIType IIType IIIType IV

7

Four? But I seem to recall from med school that there are **five** hypersensitivity reactions. What gives? There is a fifth, but it plays no role regarding the ocular surface

Hypersensitivity Reactions of the Ocular Surface

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Type I

Type II

Type III



Before proceeding further, it should be noted that the conceptualization of 4 (or 5) distinct hypersensitivity reactions is considered **outdated** by modern immunologists. In truth, most clinical conditions represent a blend of the proposed hypersensitivity mechanisms. That said, this framework for categorizing hypersensitivity reactions persists in the literature, and thus familiarity with it remains an obligation of ophthos-in-training.



Type I reactions involve...[One word that captures the nature of this rxn]Type II reactions involve...Type III reactions involve...Type IV reactions involve...Type IV reactions involve...



Type II reactions involve... Type III reactions involve... Type IV reactions involve...



Type II reactions involve... Type III reactions involve... Type IV reactions involve...

Briefly, how does an anaphylactic reaction proceed?



Type II reactions involve...Type III reactions involve...Type IV reactions involve...

Briefly, how does an anaphylactic reaction proceed?

 The binding of one word, + its abb.
 to Ig...
 receptors on cell type

 causes the cells to one word
 one word



Type I reactions involve...Anaphylaxis

Type II reactions involve... Type III reactions involve... Type IV reactions involve...

Briefly, how does an anaphylactic reaction proceed? The binding of antigen (Ag) to IgE receptors on mast cells causes the cells to degranulate



Type I reactions involve...Anaphylaxis

Type II reactions involve... Type III reactions involve... Type IV reactions involve...

Briefly, how does an anaphylactic reaction proceed? The binding of antigen (Ag) to IgE receptors on mast cells causes the cells to degranulate, with the subsequent release of and other pre-formed inflammatory mediators



Type II reactions involve... Type III reactions involve... Type IV reactions involve...

Briefly, how does an anaphylactic reaction proceed? The binding of antigen (Ag) to IgE receptors on mast cells causes the cells to degranulate, with the subsequent release of histamine and other pre-formed inflammatory mediators 15



Type I reactions involve...Anaphylaxis Type II reactions involve...

Type III reactions involve...

Type IV reactions involve...

Briefly, how does an anaphylactic reaction proceed? The binding of antigen (Ag) to IgE receptors on mast cells causes the cells to degranulate, with the subsequent release of histamine and other pre-formed inflammatory mediators

Sounds fast. How long does it take to become clinically apparent?



*Type I reactions involve...*Anaphylaxis *Type II reactions involve...*

Type III reactions involve... Type IV reactions involve...

Briefly, how does an anaphylactic reaction proceed? The binding of antigen (Ag) to IgE receptors on mast cells causes the cells to degranulate, with the subsequent release of histamine and other pre-formed inflammatory mediators

Sounds fast. How long does it take to become clinically apparent? Only minutes (which is why which is why this reaction is often referred to as *immediate hypersensitivity*)







Is the antibody (Ab) involved in Type II reactions IgE, as it is in Type I?



Is the antibody (Ab) involved in Type II reactions IgE, as it is in Type I? No, it is IgG and/or IgM



Type IV reactions involve...

Is the antibody (Ab) involved in Type II reactions IgE, as it is in Type I? No, it is IgG and/or IgM

How does a Type II reaction proceed?



Is the antibody (Ab) involved in Type II reactions IgE, as it is in Type I? No, it is IgG and/or IgM

How does a Type II reaction proceed?

Antibodies bind to antigens located on cell membranes. These cell-membrane bound Ag-Ab complexes prompt complement-system attacks on the cell.



Type II reactions involve...Cytotoxic antibodies **Type III reactions involve...** [Three words for this one] Type IV reactions involve...



Type IV reactions involve...



Type II reactions involve...Cytotoxic antibodies *Type III reactions involve*...Immune-complex reactions *Type IV reactions involve*...

Is the antibody involved in Type III IgE a la Type I, or IgG and IgM as in Type II?



Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve...

Is the antibody involved in Type III IgE a la Type I, or IgG and IgM as in Type II? IgG and/or IgM



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How does a Type III reaction proceed?



Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve...

Is the antibody involved in Type III IgE a la Type I, or IgG and IgM as in Type II? IgG and/or IgM

How does a Type III reaction proceed?

Antibodies bind to antigens circulating in the bloodstream. The resulting Ab-Ag complexes get deposited somewhere (often on the lining of a blood vessel).



Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve...

Is the antibody involved in Type III IgE a la Type I, or IgG and IgM as in Type II? IgG and/or IgM

How does a Type III reaction proceed?

Antibodies bind to antigens circulating in the bloodstream. The resulting Ab-Ag complexes get deposited somewhere (often on the lining of a blood vessel). Once ensconced in tissue, the Ab-Ag complexes precipitate attacks on the tissue by PMNs.



Types II and III are easily confused with one another. Note the key differences: --In Type II, Ab attach to **cell-bound** Ag, whereas in Type III they attach to **circulating** Ag, and



Types II and III are easily confused with one another. *Note the key differences:* --In Type II, Ab attach to *cell-bound* Ag, whereas in Type III they attach to *circulating* Ag, and --In Type II, the damage is caused by *complement*, whereas in Type III it is caused by *PMNs* Hypersensitivity Reactions of the Ocular Surface

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	
Type I	Type II	Type III	



Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve... [Three words again] Hypersensitivity Reactions of the Ocular Surface

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV

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Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve...Cell-mediated reactions AnaphylaxisCytotoxic AbImmune-complex
reactionsType IType IIImmune-complex
reactionsCell-mediated
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Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve...Cell-mediated reactions

'Cell-mediated reaction'...Which sort of immune cell is doing the mediating?

AnaphylaxisCytotoxic AbImmune-complex
reactionsType IType IIType III

Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve...Cell-mediated reactions

'Cell-mediated reaction'...Which sort of immune cell is doing the mediating? T-helper cells
37Hypersensitivity Reactions of the Ocular SurfaceAnaphylaxisCytotoxic AbImmune-complex
reactionsType IType IIType IIIType IType IIIType III

Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve...Cell-mediated reactions

'Cell-mediated reaction'...Which sort of immune cell is doing the mediating? T-helper cells

In what way are T-helper cells mediating the reaction?

³⁸Hypersensitivity Reactions of the Ocular SurfaceAnaphylaxisCytotoxic AbImmune-complex
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Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve...Cell-mediated reactions

'Cell-mediated reaction'...Which sort of immune cell is doing the mediating? T-helper cells

In what way are T-helper cells mediating the reaction? In Type IV reactions, T-helpers interact with antigens, thereby becoming activated. ³⁹Hypersensitivity Reactions of the Ocular SurfaceAnaphylaxisCytotoxic AbImmune-complex
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'Cell-mediated reaction'...Which sort of immune cell is doing the mediating? T-helper cells

In what way are T-helper cells mediating the reaction?

In Type IV reactions, T-helpers interact with antigens, thereby becoming activated. Once activated, the T-helpers release chemotactic factors that recruit and activate macrophages. AnaphylaxisCytotoxic AbImmune-complex
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That's a convoluted process. How long does it take to become clinically apparent?

AnaphylaxisCytotoxic AbImmune-complex
reactionsCell-mediated
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Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve...Cell-mediated reactions

'Cell-mediated reaction'...Which sort of immune cell is doing the mediating? T-helper cells

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In Type IV reactions, T-helpers interact with antigens, thereby becoming activated. Once activated, the T-helpers release chemotactic factors that recruit and activate macrophages.

That's a convoluted process. How long does it take to become clinically apparent? 24-72 hours, which is why this reaction is often referred to as *delayed hypersensitivity*

Hypersensitivity Reactions of the Ocular Surface

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV

Type I reactions involve...Anaphylaxis Type II reactions involve...Cytotoxic antibodies Type III reactions involve...Immune-complex reactions Type IV reactions involve...Delayed hypersensitivity

'Cell-mediated reaction'...Which sort of immune cell is doing the mediating? T-helper cells

In what way a Note that if you remember Type IV as 'delayed hypersensitivity'... In Type IV read activated, the T-helpers release chemotactic factors that fecruit and activate macrophages.

That's a convoluted process. How long does it take to become clinically apparent? 24-72 hours, which is why this reaction is often referred to as **delayed hypersensitivity**

43 Hypersensitivity Reactions of the Ocular Surface **Cell-mediated** *Immune-complex* Anaphylaxis Cytotoxic Ab reactions reactions Type IV Type I Type II Type III Type I reactions involve. Type III reactions involve...Immune-complex reactions Type IV reactions involve. .Delayed hypersensitivity 'Cell-mediated reaction'...Which sort of immune cell is doing the mediating? T-helper cells Note that if you remember Type IV as 'delayed hypersensitivity'... In what way the four forms can be remembered with the mnemonic ACID In Type IV rea activated, the T-helpers release chemotactic factors that lecruit and activate macrophages. That's a convoluted process. How long does it take to become ch cally apparent? 24-72 hours, which is why this reaction is often referred to as **delayed hypersensitivity**









Anaphylaxis

Type I

Topical anesthetics

Anaphylaxis

Cytotoxic Ab

Type II

reactions

Immune-complex



Type IV

Neomycin

IgE Histamine release Cicatricial pemphigoid Mast-cell degranulation Vasculitis Atropine Contact dermatitis Chemosis PK rejection SLE Red excematous periorbital skin Peripheral ulcerative keratitis Involves complement Phlyctenulosis

Anaphylaxis

Type I

Topical anesthetics

Anaphylaxis

IgE

Cytotoxic Ab

Type II

Immune-complex reactions

Type III



Type IV

Neomycin

Histamine release

Cicatricial pemphigoid Mast-cell degranulation Vasculitis Atropine Contact dermatitis Chemosis PK rejection SLE Red excematous periorbital skin Peripheral ulcerative keratitis Involves complement Phlyctenulosis

Anaphylaxis Type I

Topical anesthetics

Anaphylaxis IgE Histamine release Cytotoxic Ab

Immune-complex reactions

Type III



Type IV

Neomycin

Cicatricial pemphigoid

Mast-cell degranulation Vasculitis Atropine Contact dermatitis Chemosis PK rejection SLE Red excematous periorbital skin Peripheral ulcerative keratitis Involves complement Phlyctenulosis

AnaphylaxisCytotoxic AbImmune-complex
reactionsType IType IIType IIITopical anestheticsVertical and the sector of the sector

Anaphylaxis IgE Histamine release

(No question on this slide—advance to the next one)

Cicatricial pemphigoid

Mast-cell degranulation Vasculitis Atropine Contact dermatitis Chemosis PK rejection SLE Red excematous periorbital skin Peripheral ulcerative keratitis Involves complement Phlyctenulosis



Neomycin

Anaphylaxis	Cytotoxic Ab	<i>Immune-complex</i> <i>reactions</i>	Cell-mediated reactions
Туре І	Type II	Type III	Type IV
Topical anesthetics			Neomycin
Anaphylaxis IgE			Rootinyoni

Histamine release

Cicatricial pemphigoid is now referred to by what name in the BCSC Cornea book?

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Atropine Contact dermatitis Chemosis PK rejection SLE Red excematous periorbital skin Peripheral ulcerative keratitis Involves complement Phlyctenulosis

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Туре І	Type II	Type III	Type IV
lopical anesthetics			Neomycin
Anaphylaxis			

IgE

Histamine release

Cicatricial pemphigoid is now referred to by what name in the BCSC Cornea book? Mucous membrane pemphigoid (MMP)

> Atropine Contact dermatitis Chemosis PK rejection SLE Red excematous periorbital skin Peripheral ulcerative keratitis Involves complement Phlyctenulosis



OCP/MMP



For more on OCP/MMP, see slide-set K29



OCP/MMP

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV
Topical anesthetics			
Anaphylaxis IgE Histamine release			Neomycin
	Cicatricial pemphigoid		
	Mast-cell d	egranulation	
	Vas Atr	culitis	
	Contact	dermatitis	
	Che	emosis	
	PK re	eiection	
	S	SLE	
	Red excemator Peripheral ulo Involves o Phlyct	us periorbital skin cerative keratitis complement cenulosis	

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Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV
Topical anesthetics			
Anaphylaxis IgE Histamine release			Neomycin
	Cicatricial pemphigoid		
Mast-cell degranulatio	n		
	Vascu Atrop	l itis ine	
	Contact de	ermatitis	

Chemosis

PK rejection

SLE

Red excematous periorbital skin Peripheral ulcerative keratitis Involves complement Phlyctenulosis

Immune-complex Anaphylaxis Cytotoxic Ab reactions Type I Type II Type III Type IV **Topical anesthetics** Anaphylaxis IgE Histamine release **Cicatricial pemphigoid** Mast-cell degranulation Vasculitis

> **Atropine** Contact dermatitis Chemosis PK rejection SLE Red excematous periorbital skin Peripheral ulcerative keratitis Involves complement Phlyctenulosis



Neomycin

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV
Topical anesthetics			
Anaphylaxis			Neomycin
IgE Histamine release	(No question on this slid	de—advance to the next one)	
	Cicatricial pemphigoid		
Mast-cell degranulation			
		Vasculitis	
			Atropine
	Contact	dermatitis	
	Che	mosis	
	PK re	ejection	
	S	SLE	
	Red excemator	us periorbital skin	
	Peripheral ulc	erative keratitis	
	Involves of	complement	
	Phlyct	enulosis	





Patient using 1% atropine eye drops showing periocular diffuse redness and swelling involving both the lids, skin erosions with focal crusting (black arrow), post inflammatory irregular hypopigmentation around lids, and madarosis of both lower lids, with erosion around lower eye lid. (b and c) Magnified picture of right and left eyes showing the typical signs of periocular dermatitis



Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV
Topical anesthetics			
			Neomycin
Anaphylaxis			
lgE			
Histamine release			
	Cicatricial pemphigoid		
Mast-cell degranulatio	'n		
-		Vasculitis	
			Atropine

Contact dermatitis

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Chemosis

PK rejection SLE Red excematous periorbital skin Peripheral ulcerative keratitis Involves complement Phlyctenulosis



Contact dermatitis



Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV
Topical anesthetics			
Anaphylaxis IgE Histamine release	Cicatricial pemphigoid		Neomycin
Mast-cell degranulation	1	Vasculitis	
		Vasountis	Atropine Contact dermatitis
Chemosis			
	PK rej SL Red excematous Peripheral ulce Involves co	ection (PK = Penetrating keratoplasty) E s periorbital skin erative keratitis omplement	
	Phlycte	nulosis	

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV
Topical anesthetics			
Anaphylaxis IgE Histamine release			Neomycin
	Cicatricial pemphigoid		
Mast-cell degranulation	ו		
		Vasculitis	
			Atropine
			Contact dermatitis
Chemosis	(No question on this slide	∋—advance)	
			PK rejection
	SI	E	
	Red excematou	s periorbital skin	
	Peripheral ulce	erative keratitis	
	Involves co	omplement	

Phlyctenulosis









Hu	vnersensitivity Reactions	s of the Ocular Surface	
, i y	Divvy 'er	m up	
Ir Anaphylaxis	li Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
<i>Type I</i> Topical anesthetics	Type II	Type III	Type IV
Anaphylaxis IgE Histamine release	Cicatricial pemphigoid		Neomycin
Mast-cell degranulatio	n	Vasculitis	Atropine
Chemosis	 Which layer of the graft is The endothelium What is the classic exame A line of inflammatory pression What is the eponymous restance 	s involved in PK rejection? finding in endothelial rejection ecipitates on the endothelial su name for this finding?	PK rejection
	Phlycter	iulosis	

٢	lypersensitivity Reactions Divvy 'er	s of the Ocular Surface m up	
Ir Anaphylaxis	li Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Туре І	Type II	Type III	Type IV
Topical anesthetics Anaphylaxis IgE			Neomycin
Thistarnine release	Cicatricial pemphigoid		
Mast-cell degranulat	ion	Vasculitis	Atropine
Chemosis	<i>Which layer of the graft is</i> The endothelium <i>What is the classic exam</i> A line of inflammatory pre	<i>involved in PK rejection?</i> <i>finding in endothelial rejection</i> cipitates on the endothelial su	PK rejection
	What is the eponymous r A Khodadoust line	name for this finding?	
	Phlycten	ulosis	





Khodadoust line

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV
Topical anesthetics			
Anaphylaxis IgE Histamine release	Cicatricial pemphigoid		Neomycin
Mast-cell degranulatio	n		
		Vasculitis	Atropine Contact dermatitis
Chemosis			
	SLI Red excematous Peripheral ulcer Involves cor Phlycten	<i>Next</i> periorbital skin rative keratitis mplement pulosis	PK rejection
Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
---	------------------------	-----------------------------	-------------------------
Type I	Type II	Type III	Type IV
Topical anesthetics			
Anaphylaxis IgE Histomine release			Neomycin
T IIStalline Telease	Cicatricial pemphidoid		
Mast-cell degranulation	n		
0		Vasculitis	
			Atropine
			Contact dermatitis
Chemosis			
			PK rejection
		SLE	
	Red excematous	periorbital skin	
	Peripheral ulcera	ative keratitis	
	Involves con	nplement	
	Phlycten	ulosis	

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV
Topical anesthetics			
Anaphylaxis IgE Histamine release			Neomycin
	Cicatricial pemphigoid		
Mast-cell degranulation	n		
		Vasculitis	
			Atropine
			Contact dermatitis
Chemosis			
			PK rejection
		SLE	Red excematous
	Peripheral ulcera Involves con Phlycten	ative keratitis (PUK) nplement ulosis	periorbitai skin

Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type II	Type III	Type IV
Cicatricial pemphigoid		Neomycin
on in the second se		
	Vasculitis	
		Atropine Contact dermatitis
		PK rejection
(No question here—¡Vamos	s!) SLE	Red excematous
Involves com	PUK plement	periorbital skin
	Cytotoxic Ab Type II Cicatricial pemphigoid (No question here—; Vamos	Cytotoxic Ab Immune-complex reactions Type II Type III Cicatricial pemphigoid Vasculitis v Vasculitis (vo question here—j vamos!) SLE PUK Involves complement Debuttered Debuttered



Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV
Topical anesthetics			Neomycin
Anaphylaxis IgE Histamine release			NCONTYON
Mast-cell degranulat	What classes of systemic co Connective-tissue diseases	onditions are associated with PUK (CTDs) and vasculitides	?
Chemosis			ne ermatitis
			ction
		PUK	natous I skin
	Involves o Phlycte	complement enulosis	





PUK 2ndry to CTD/vasculitis

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-me reacti	diated ions
Туре І	Type II	Type III	Туре	e IV
Topical anesthetics			Neom	vcin
Anaphylaxis IgE Histamine release			Neony	CIT
Mast-cell degranulat	What classes of systemic co i Connective-tissue diseases	onditions are associated with PUK? (CTDs) and vasculitides		
Chomosis	With which CTDs and/or vas	sculitides has PUK been associated?	>	ne ermatitis
Chemosis				ction
	Involves o	omplement		natous I skin
	Phlycte	enulosis		

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-me reacti	diated ons
Туре І	Type II	Type III	Туре	e IV
lopical anesthetics			Neomy	vcin
Anaphylaxis IgE				
Histamine release				
Mast-cell degranulati	What classes of systemic co Connective-tissue diseases	onditions are associated with PUK? (CTDs) and vasculitides		
	<i>With which CTDs and/or vas</i> Pretty much all of them	sculitides has PUK been associated?		ne ermatitis
Chemosis				ction
				natous I skin
	Involves o	complement		
	Phiyct	enuiosis		

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-me reacti	diated ions
Туре І	Type II	Type III	Туре	e IV
Topical anesthetics				
Anaphylaxis IgE Histamine release			Neomy	vcin
Mast-cell degranulation	What classes of systemic co Connective-tissue diseases	onditions are associated with PUK? (CTDs) and vasculitides		
	<i>With which CTDs and/or vas</i> Pretty much all of them	sculitides has PUK been associated?		ne ermatitis
Chemosis	Which three conditions are	most likely to present with PUK?		ction
	Involves d			natous I skin
	Phlyct	enulosis		

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-me reacti	diated ions
Туре І	Type II	Type III	Туре	e IV
Topical anesthetics				
Anaphylaxis IgE Histamine release			Neomy	/cin
Mast-cell degranulation	What classes of systemic co Connective-tissue diseases	onditions are associated with PUK (CTDs) and vasculitides	?	
	<i>With which CTDs and/or vas</i> Pretty much all of them	sculitides has PUK been associate	∋d?	ne ermatitis
Chemosis	Which three conditions are a Rheumatoid arthritis, Weger	most likely to present with PUK? her's granulomatosis, and polyarte	eritis nodosa	ction
		(PUK)		natous I skin
	Involves o Phlyct	complement enulosis		

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-meo reacti	diated ons
Туре І	Туре II	Type III	Туре	e IV
Topical anesthetics				
Anaphylaxis IgE Histamine release			Neomy	rcin
Mast-cell degranulation	What classes of systemic co Connective-tissue diseases	onditions are associated with PUK (CTDs) and vasculitides	?	
	With which CTDs and/or vas Pretty much all of them	sculitides has PUK been associate	d?	ne ermatitis
Chemosis	<i>Which three conditions are r</i> Rheumatoid arthritis, Weger	nost likely to present with PUK? her's granulomatosis, and polyarte	ritis nodosa	ction
	Of these three, which is mos	st likely to be associated with PUK	?	natous I skin
	Involves of		1	
	Phyce	CI 1010212		

Anaphylaxis	Cytotoxic Ab	<i>Immune-complex</i> <i>reactions</i>	Cell-me react	diated ions
Туре І	Type II	Type III	Туре	e IV
Topical anesthetics				
Anaphylaxis IgE Histamine release			Neomy	/cin
Mast-cell degranulation	What classes of systemic co Connective-tissue diseases	onditions are associated with PUK: (CTDs) and vasculitides	7	
	With which CTDs and/or vas Pretty much all of them	sculitides has PUK been associate	d?	ne ermatitis
Chemosis	Which three conditions are in Rheumatoid arthritis, Weger	<i>most likely to present with PUK?</i> her's granulomatosis, and polyarte	ritis nodosa	ction
	Of <i>these three, which is mos</i> RA, by a substantial margin	st likely to be associated with PUK	?	natous I skin
	Involves o Phlyct	complement enulosis		

Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Type I	Type II	Type III	Type IV
Topical anesthetics			
Anaphylaxis IgE			Neomycin
Histamine release			
	Cicatricial pemphigoid		
Mast-cell degranulatio	n		
		Vasculitis	
			Atropine
			Contact dermatitis
Chemosis			
			PK rejection
		SLE	Red excematous
	\	PUK	periorbital skin
	Next Involves cor	nplement	
	r Phlycten	ulosis	

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Anaphylaxis IgE Histamine release	Cicatricial pemphigoid		Neomycin
Mast-cell degranulatior)		
Ū		Vasculitis	Atropine Contact dermatitis
Chemosis			PK rejection
		SLE	Red excematous
		PUK	periorbital skin
	Involves complement		
	Phlycten	ulosis	

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Anaphylaxis IgE			Neomycin
Histamine release	Cicatricial pemphidoid		
Mast-cell degranulatio	n		
		Vasculitis	
			Atropine
Chemosis			Contact dermatitis
			PK rejection
		SLE	Ded executeurs
		PUK	periorbital skin
	Involves complement		
			Phlyctenulosis



Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	
Туре І	Туре II	Type III	
Topical anesthetics			
Anaphylaxis			
IgE	Cytotoxic		
What is phlyctenulosis	s?		
Ma	inition characterized by the pi	resence of phyclenules	
			С
			R



Neomycin

Atropine Contact dermatitis

PK rejection







Neomycin

Atropine Contact dermatitis

PK rejection



Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	(
Туре І	Type II	Type III	
Topical anesthetics			
Anaphylaxis			
IgE	Cytotoxic		
An inflammatory con Ma <i>OK, what are</i> phlycte Nodules composed of	dition characterized by the pr nules? of chronic inflammatory cells	resence of phlyctenules	Co
			Re
			F

Cell-mediated reactions Type IV

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Neomycin

Atropine Contact dermatitis

PK rejection



Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Ce
Туре І	Туре II	Type III	-
Topical anesthetics			
Ananhylavis			Ν
IgE	Cytotoxic		
What is phlyctenulos	is?		
An inflammatory con	dition characterized by the p	resence of phlyctenules	
OK, what are phlycte	nules?		
			/ Cont
vvnat do pniyctenule	S IOOK IIKE?		Cont
			Р
			Red
			per
			Phl

Neomycin

Atropine Contact dermatitis

PK rejection



	Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
	Туре І	Type II	Type III	Type IV
То	pical anesthetics			
	Anaphylaxis IgE	Cytotoxic		Neomycin
H	What is phlyctenulosis An inflammatory cond OK, what are phlycter Nodules composed of What do phlyctenules They are small nodule exuberantly hyperemi	s? lition characterized by the pr nules? f chronic inflammatory cells <i>look like?</i> es, gray or yellow in color, th c vessels	nat are associated with	Atropine Contact dermatitis PK rejection Red excematous periorbital skin





Phlyctenules

	Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediate reactions
	Туре І	Type II	Type III	Type IV
То	pical anesthetics			
	Anaphylaxis			Neomycin
	IgE	Cytotoxic		
M	What is phlyctenulosis An inflammatory conc OK, what are phlycter Nodules composed of	s? lition characterized by the p nules? f chronic inflammatory cells	resence of phlyctenules	Atropine
	They are small nodule exuberantly hyperemi	es, gray or yellow in color, the color is the color of th	at are associated with	PK rejection
	Where are phlyctenul	es located?		Red excemato periorbital ski
				Phlyctenulos

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	Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-media reaction
	Туре І	Type II	Type III	Туре Г
То	pical anesthetics			
				Neomycir
	Anaphylaxis			
	IgE	Cytotoxic		
F	What is phlyctenulosis	s?		
5.4	An inflammatory cond	lition characterized by the p	resence of phlyctenules	
IVI	OK what are phlycter	nules?		
	Nodules composed of	f chronic inflammatory cells		Atronine
				Contact dern
	They are small nodule	: IOOK IIKE ? es. grav.or.vellow in color.th	at are associated with	Contact denn
	exuberantly hyperemi	c vessels		PK rejecti
	Where are phlyctenul	es located?		<i></i>
	They can be on the co	onj, at the limbus or on the c	ornea	Red excema
				periorbital s
				Phlyctenul



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Phlyctenule



Same phlyctenule (pic to show elevation)

Corneal phlyctenule

Anaphyla	xis Cyte	otoxic Ab	Immune-complex reactions	c Cell-mediated reactions
Туре І	7	iype II	Type III	Type IV
Topical anesth	netics			
Anaphylax IgE	is C	ytotoxic		Neomycin
H What is phly An inflamma Ma OK, what al	vctenulosis? atory condition char re phlyctenules?	acterized by the	presence of phlyctenules	
Nodules con	mposed of chronic i	nflammatory cell	S	Atropine
What do ph	lyctenules look like?	,		Contact dermatitis
They are sn exuberantly	nall nodules, gray or hyperemic vessels	yellow in color,	that are associated with	PK rejection
Where are They can be	ohlyctenules located e on the conj, at the	/? limbus or on the	cornea	Red excematous periorbital skin
What is the	inciting antigen?			
				Phlyctenulosis

Anaphylax	cis Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Туре І	Type II	Type III	Type IV
Topical anesthe	etics		
Anaphylaxis IgE	cytotoxic		Neomycin
H What is phlyd An inflammat Ma OK, what are Nodules com	tenulosis? ory condition characterized by the p phlyctenules?	presence of phlyctenules	
What do phly They are sma exuberantly h	<i>ctenules look like?</i> all nodules, gray or yellow in color, the hyperemic vessels	hat are associated with	Atropine Contact dermatit PK rejection
<i>Where are pl</i> They can be	nlyctenules located? on the conj, at the limbus or on the	cornea	Red excematous periorbital skin
<i>What is the ii</i> In developed	nciting antigen? nations, usually ^{bug}		Phlyctenulosis

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Anaphy	laxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
Туре	1	Type II	Type III	Type IV
Topical anes	sthetics			
Anaphyla IgE	axis	Cytotoxic		Neomycin
H What is p An inflam Ma	hlyctenulosis? matory conditi	on characterized by the p	resence of phlyctenules	
OK, what Nodules of	<i>are</i> phlyctenu composed of c	les? hronic inflammatory cells		Atropine
What do p	ohlyctenules k	ook like?	at are esseciated with	Contact dermatitis
exuberan	tly hyperemic	vessels	ial are associated with	PK rejection
Where an They can	e <i>phlyctenules</i> be on the con	; <i>located?</i> j, at the limbus or on the c	cornea	Red excematous periorbital skin
<i>What is th</i> In develop	ne <i>inciting anti</i> Ded nations, u	gen? sually <i>S aureus</i>		Phlyctenulosis

	Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
	Туре І	Type II	Type III	Type IV
То	pical anesthetics			
	Anaphylaxis IgE	Cytotoxic		Neomycin
F Ma	What is phlyctenulos An inflammatory con	is? dition characterized by the p	resence of phlyctenules	
	OK, what are phlycte Nodules composed c	nules? If chronic inflammatory cells		Atropine
	What do phlyctenules	s look like?		Contact dermatitis
	They are small nodul exuberantly hyperem	es, gray or yellow in color, th ic vessels	at are associated with	PK rejection
	<i>Where are phlyctenu</i> They can be on the c	les located? onj, at the limbus or on the c	ornea	Red excematous periorbital skin
	What is the inciting a In developed nations is often bug	<i>ntigen?</i> , usually <i>S aureus</i> ; howeve	r, in developing nations it	Phlyctenulosis

	Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-media reactions
	Туре І	Type II	Type III	Туре /\
То	pical anesthetics			
	Anaphylaxis			Neomycin
	IgE	Cytotoxic		
Ma	What is phlyctenulosi An inflammatory cond OK. what are phlycter	s? dition characterized by the p nules?	resence of phlyctenules	
	Nodules composed o	f chronic inflammatory cells		Atropine
	What do phlyctenules	s look like?		Contact derm
	They are small nodule exuberantly hyperem	es, gray or yellow in color, th ic vessels	nat are associated with	PK rejection
	<i>Where are phlyctenul</i> They can be on the c	<i>les located?</i> onj, at the limbus or on the c	cornea	Red excemat periorbital sl
	What is the inciting an In developed nations, is often TB	<i>ntigen?</i> , usually S <i>aureus</i> ; howeve	r, in developing nations it	Phlyctenulo

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	Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-mediated reactions
	Туре І	Type II	Type III	Type IV
То	pical anesthetics			
	Anaphylaxis IqE	Cvtotoxic		Neomycin
H	<i>What is</i> phlyctenulosi An inflammatory cond	resence of phlyctenules		
	<i>OK, what are</i> phlycte Nodules composed o		Atropine	
	What do phlyctenules They are small nodul	at are associated with	Contact dermatitis	
	exuberantly hyperem		PK rejection	
	<i>Where are phlyctenules located?</i> They can be on the conj, at the limbus or on the cornea			Red excematous periorbital skin
	What is the inciting a In developed nations is often TB (especia	r, in developing nations it at-risk pop. (two words)	Phlyctenulosis	

	Anaphylaxis	Cytotoxic Ab	Immune-complex reactions	Cell-media reaction
	Туре І	Type II	Type III	Type I\
То	pical anesthetics			
	Apophyloxia			Neomycin
	IgE	Cytotoxic		
H	What is phlyctenulosi			
	An inhammatory conc	esence of phyclenules		
	OK, what are phlycter Nodules composed or		Atropino	
	What do phlyctenules		Contact derm	
	They are small nodule	at are associated with		
	exuberantly hyperem		PK rejection	
	Where are phlyctenul	ornea	Red excemat	
			periorbital s	
	In developed nations,	r, in developing nations it		
	is often TB (especia	urished children)	Phlyctenulo	

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