疾病與免疫的奧秘

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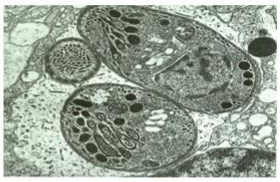
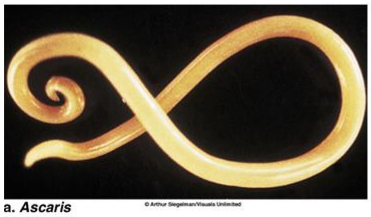
人類很早就知道別人肚子裡可以有蛔蟲
卻不知道肚子裡蛔蟲並不能知道主人的想法
更不知道人類與病原體之間的戰爭

誰在吃你？

Cryptococcus（隱球菌）



Toxoplasma



a. ***Ascaris***

蛔蟲

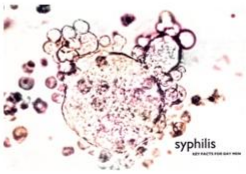


Figure 1-1
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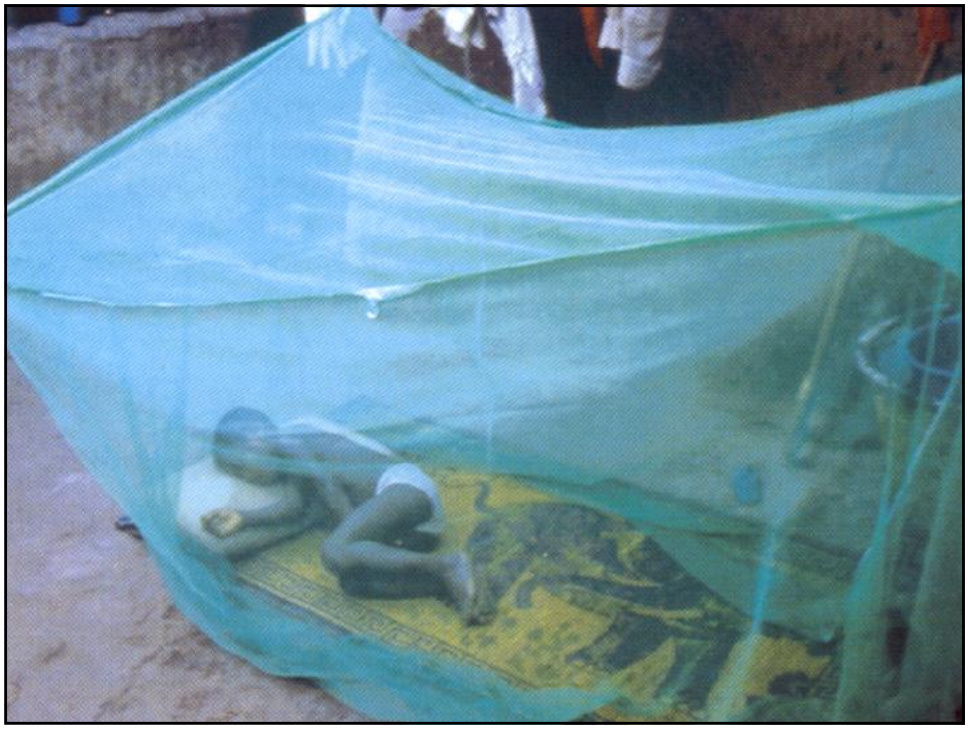
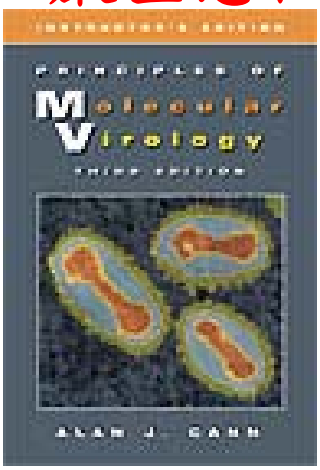
感染人類的利什曼原蟲
皮膚型
利什曼原蟲

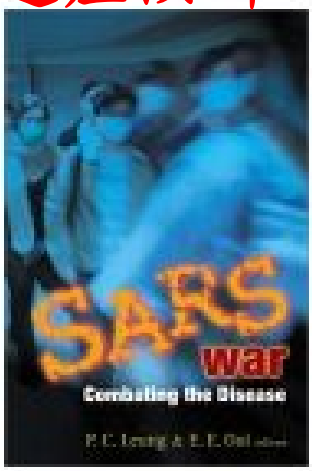

太麻里鄉
驚爆瘧疾 溫
金崙村一清潔隊員出現忽冷忽熱症狀 台東馬偕緊急



Severe Acute Respiratory Syndrome

嚴重急性呼吸道症候群





The global SARS outbreak

Estimated annual deaths worldwide of children under 5 years of age, by pathogen

Pathogen	Deaths (thousands)
*Pneumococcus**	841
Measles	530
Haemophilus (strains a–f)†	945
Rotavirus†	800
Malaria	700
HIV	500
RSV	500
Pertussis	285
Tetanus	201
Tuberculosis	100

*Bold signifies pathogens for which an effective vaccine exists.

†A licensed vaccine is being tested for possible side effects.

SOURCE: Data derived from WHO publications.

Unnumbered table pg 476
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免疫學發展史

一.古代免疫學

1.古希臘人以爲體液不平衡引發疾病
2.古中國人有天花痂皮散的應用

二.近代免疫學

1. 1883年俄國**Elie Metchnikoff** 發現有些白血球會吞噬微生物稱爲吞噬細胞**(phagocytes)**，吞噬細胞在具免疫性的動物中特別強，假設細胞是免疫的主因。

2. 1888年抗血清**(antiserum)**可殺死細菌，認爲免疫是由體液性免疫**(humoral immunity)**主宰，體液中的物質**(humoral substance)**擔負身體防衛系統的大任。

二.近代免疫學

3. 1890 年**Von Behring** 和 **Kitasato** 證明血清中有抗毒素**(antitoxin)**存在，有中和或沉澱毒素的作用，可藉血液輸送。抗毒素中溶解、沉澱、凝集細菌的物質分別爲溶菌素**(bacterolysin)**、沉澱素**(precipitin)**、凝集素**(agglutinin)**，**1930**年代把血清中能中和、沉澱有毒物質、分解細菌及聚集細菌的東西稱作抗體，因抗體常存在於體液中，所以稱爲體液性免疫。

二.近代免疫學

4. 二十世紀中葉到**1950**年之前，體液學派始終佔優勢，此段期間發現的細胞性免疫事件都被忽視。

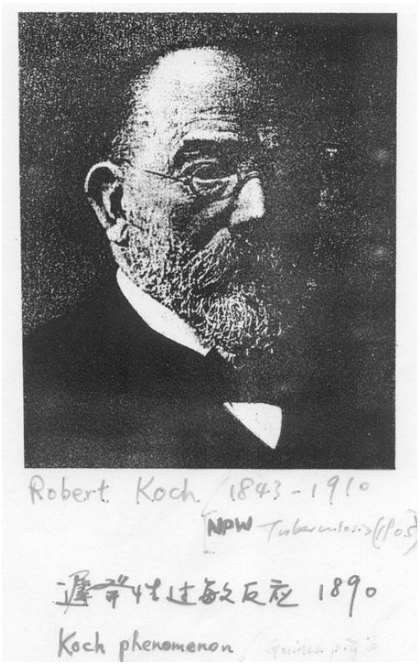
5. 1950年發展器官移植，細胞免疫才再被重視，胸腺**(thymus)**的重要性亦被發現。

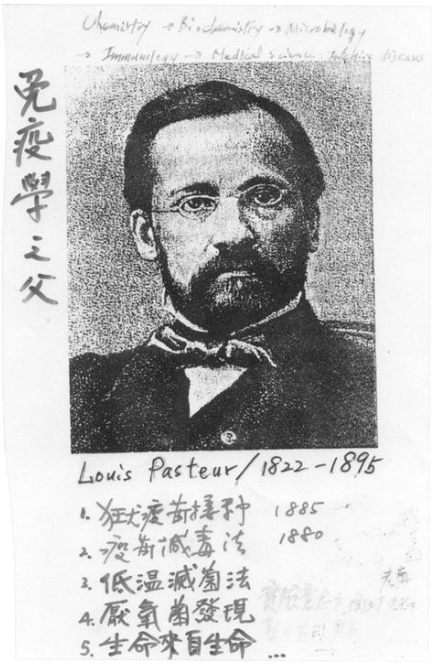
6. 1972年免疫球蛋白構造確定之後，免疫學突飛猛進成爲一門學問，如今特別熱門起來。

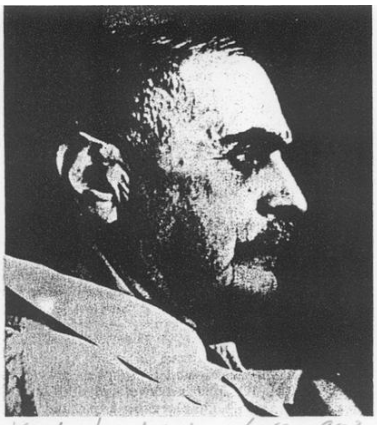
免疫學發展史

三.諾貝爾獎得主的免疫學家

年代	得　主	國藉	得獎主要研究
1901	Emil von Behring	德國	血清抗毒素
1905	Robert Koch	德國	抗結核病之細胞性免疫
1908	Elie Metchnikoff Paul Ehrlich	俄羅斯 德國	吞噬作用 (Metchnikoff) 及抗毒素 (Ehrlich)
1913	Charles Richet	法國	過敏症
1919	Jules Bordet	比利時	補體性溶菌作用
1930	Karl Landsteiner	美國	人類血型的發現
1951	Max，Theiler	南非	黃熱病疫苗
1957	Daniel Bovet	瑞典	抗組織胺







Karl . Landsteiner / 1868 - 1943

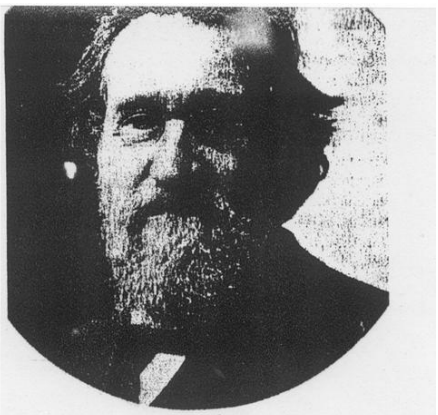
[NPW ABO type (1930)

Hapten 研究 1917

人血 isoagglutinin 1901

Rh 抗原 1940

50yr → Research 75yr 此. 247有 / 87 papers

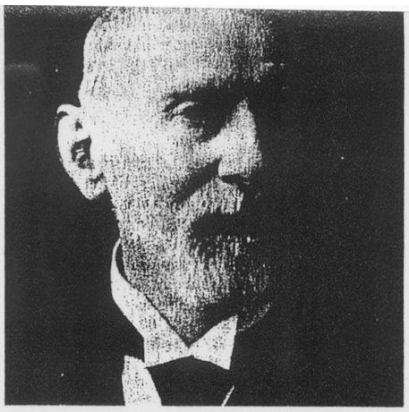


Elie Metchnikoff / 1845 - 1916

Phagocytosis 1884 ~~phagocytosis~~ [NPW 1908]

細胞性免疫 1906

Starfish larva

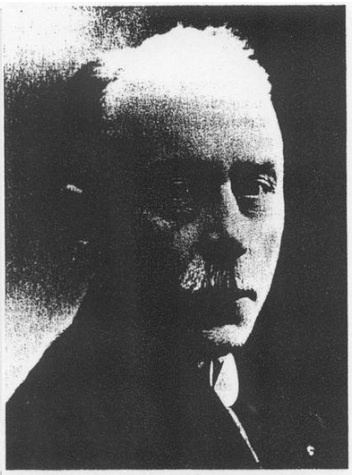


Paul Ehrlich / 1854 - 1915

[NPW Fundamental Immunology

抗体形成学説 1908

① mast cell 発現



Jules Bordet / 1870 - 1961

[NPW complement (補体)

補体結合試験法 1901

補体及抗体的 Cytolysis 1898

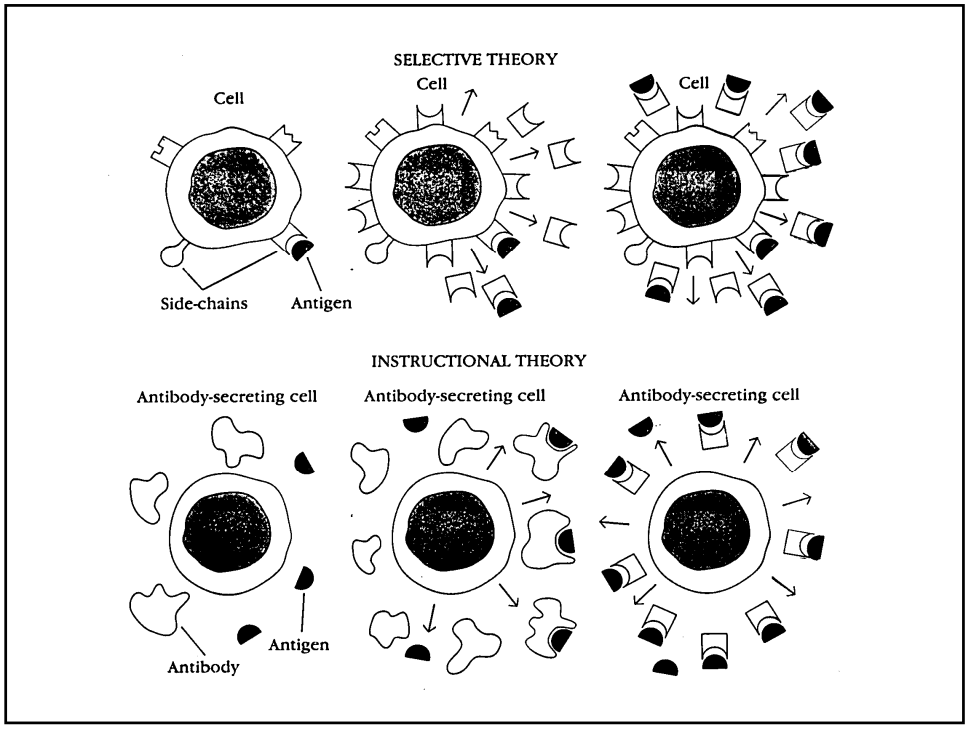
諾貝爾獎得主中有許多是免疫學家

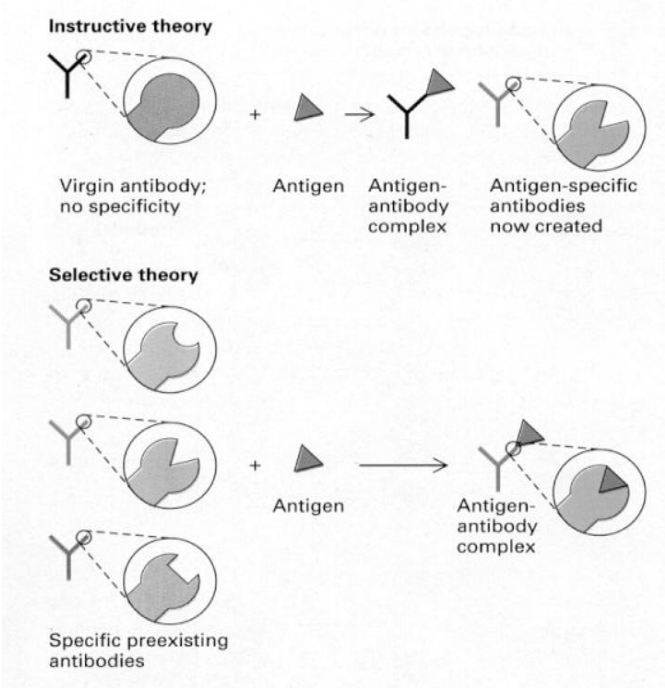
年代	得　主	國藉	得獎主要研究
1960	F. Macfarlane Burnet Peter Medawar	澳洲 英國	免疫耐受性
1972	Gerald Edelman Rodney Porter	美國 英國	抗體的化學構造
1977	Rosalyn Yalow	美國	免疫放射測定法
1980	George Snell Jean Darsset Baruj Benacerraf	美國 法國 美國	主要組織相容複體
1984	Georges Koehler Cesar Milstein Niels Jerne	德國 英國 丹麥	單株抗體 免疫調節理論
1991	E. Donnall Thomas Joseph Murray	美國 美國	移植免疫學

免疫性早期的理論：

一、選擇說 (Selective theory)：如鎖與鑰匙(lock and key)，即抗原(Ag)選擇一細胞上的支鏈受器(side-chain)接受器receptor (Ab)結合，再釋放。

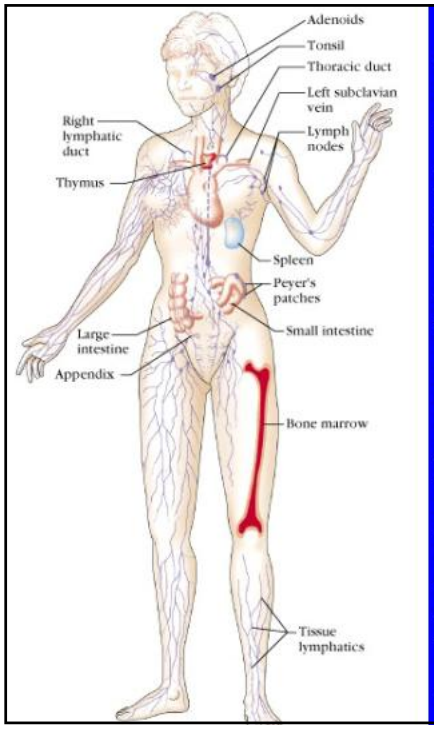
二、指示說 (Instructional theory)：即抗原當模子，細胞分泌的抗體過去包住抗原。


SELECTIVE THEORY
Cell
Cell
Cell
Side-chains
Antigen
INSTRUCTIONAL THEORY
Antibody-secreting cell
Antibody-secreting cell
Antibody-secreting cell
Antigen
Antibody


Instructive theory
Virgin antibody; no specificity
Antigen
Antigen-antibody complex
Antigen-specific antibodies now created
Selective theory
Antigen
Antigen-antibody complex
Specific preexisting antibodies

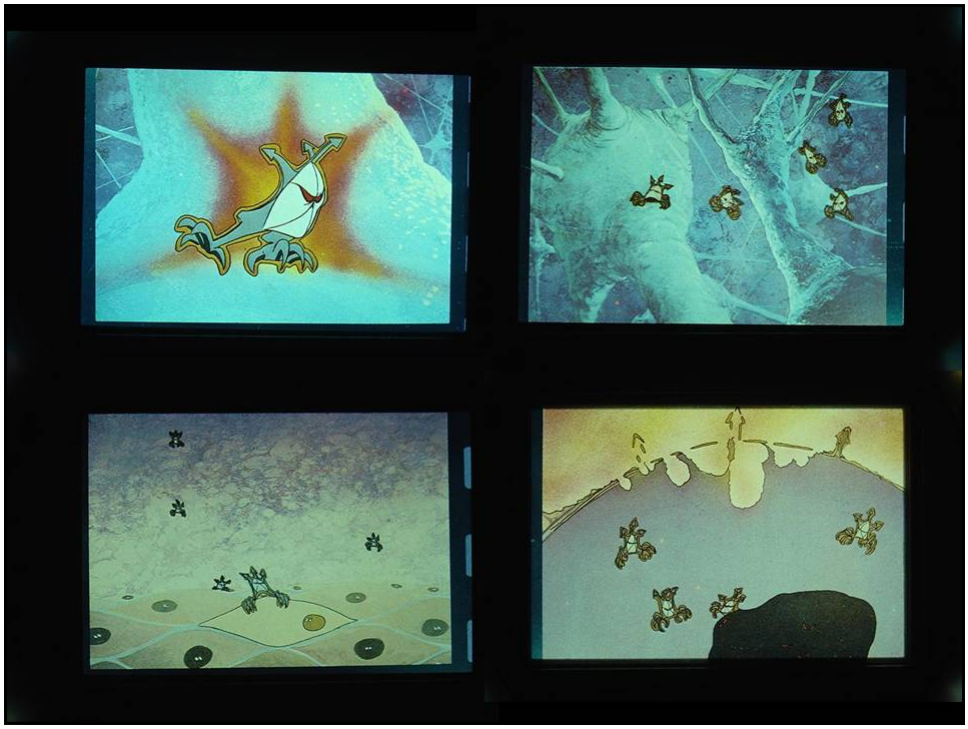
免疫性的二早期理論中以選擇說較爲正確，往後發展成株落選擇說 **(clonal-selection theory)**，理論即由一淋巴球生成細胞膜受器**(membrance receptors; Ab)**，可結合特殊抗原，結合後可激發淋巴細胞之增生使生成之株落細胞有產生跟母 細胞一樣抗體的能力。

Fungal infection in a drosomycin$^-$ fruit fly



免疫系統

一天24小時備戰的體內防衛系統，時刻有病源體不經宣戰就向我們出擊，並要有能力儘早偵測出潛在的敵人。平時不能把太多資源消耗在國防預算上，但緊急時，動員系統必須非常有效率，不能讓敵人坐大。不但外患，體內常有不正常細胞出現，也要由防衛系統定期移除，否則內亂也好，外患也好，一旦戰敗就要亡國。



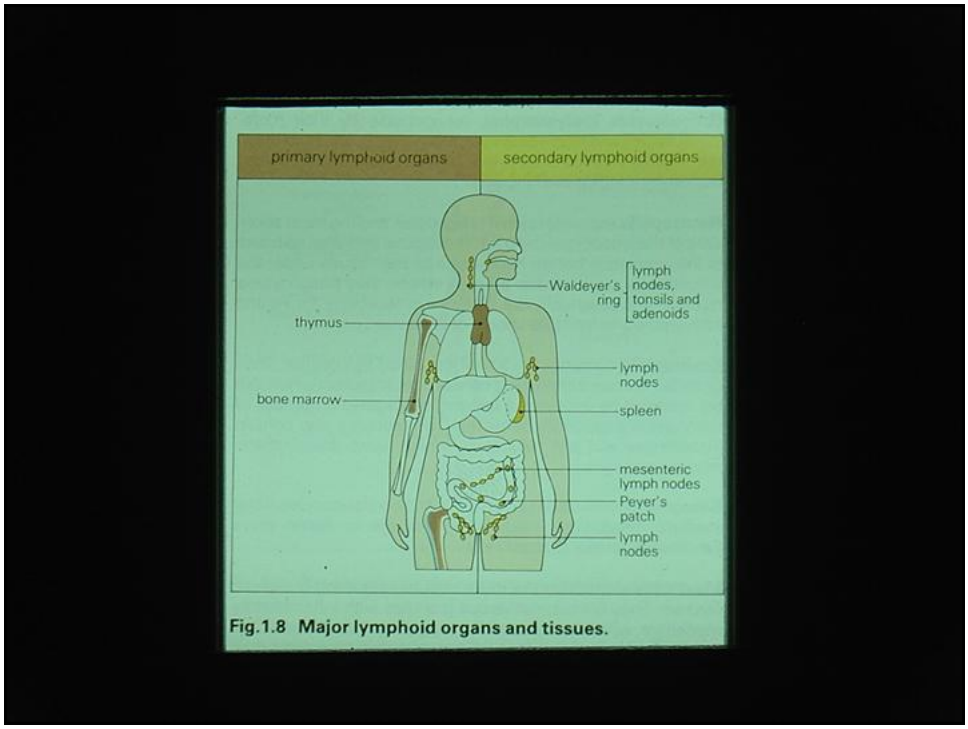
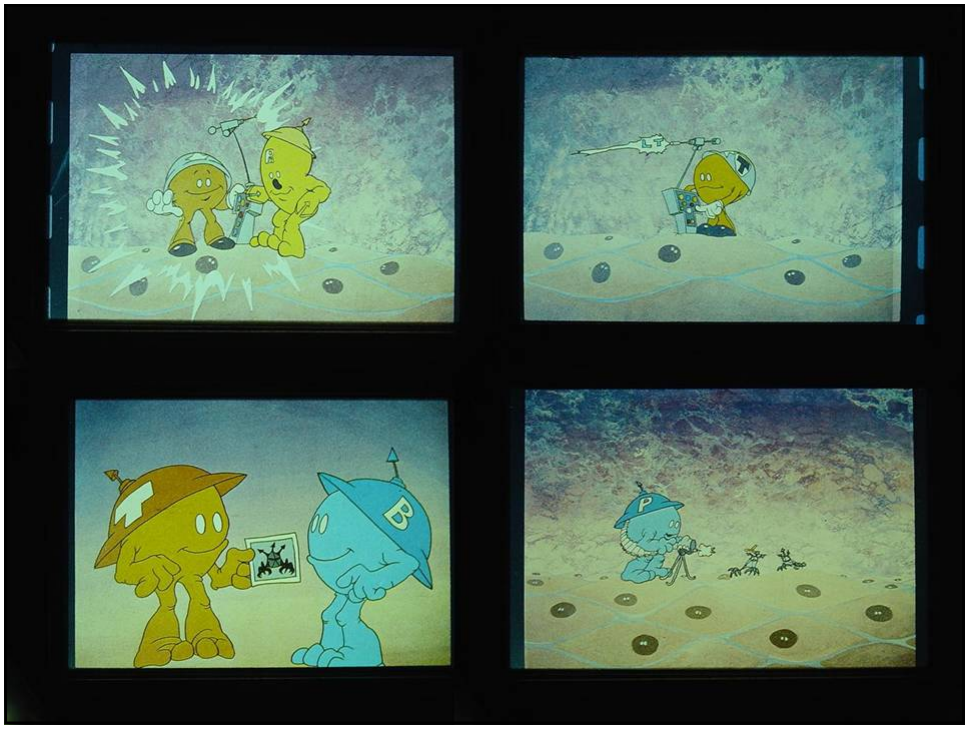
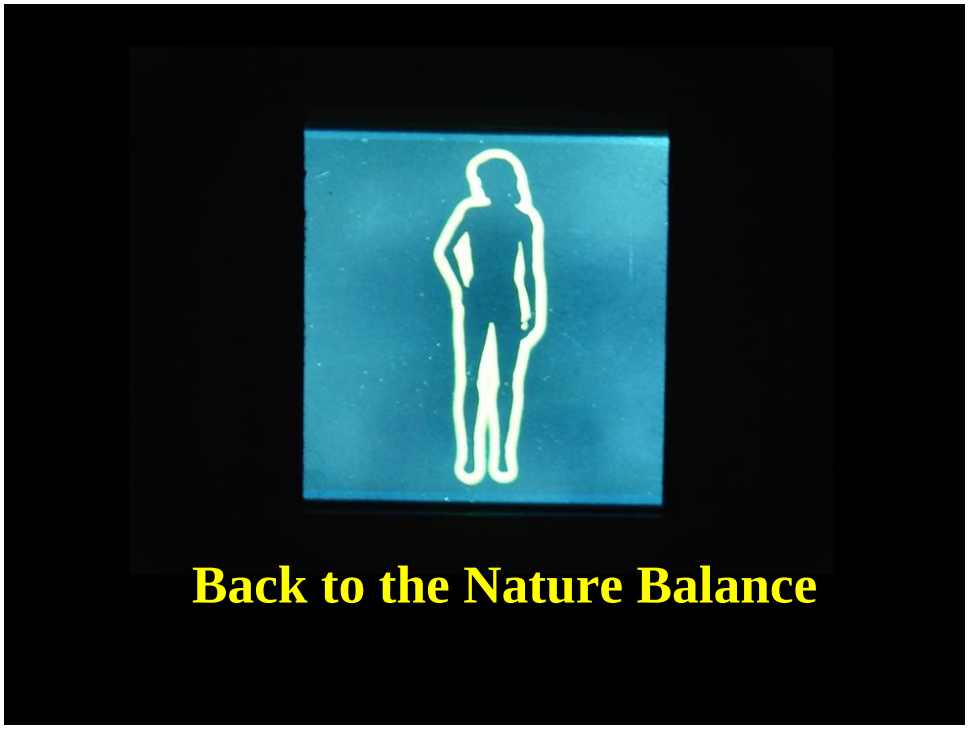


Fig.1.8 Major lymphoid organs and tissues.




Back to the Nature Balance

免疫力的種類

免疫力的種類：

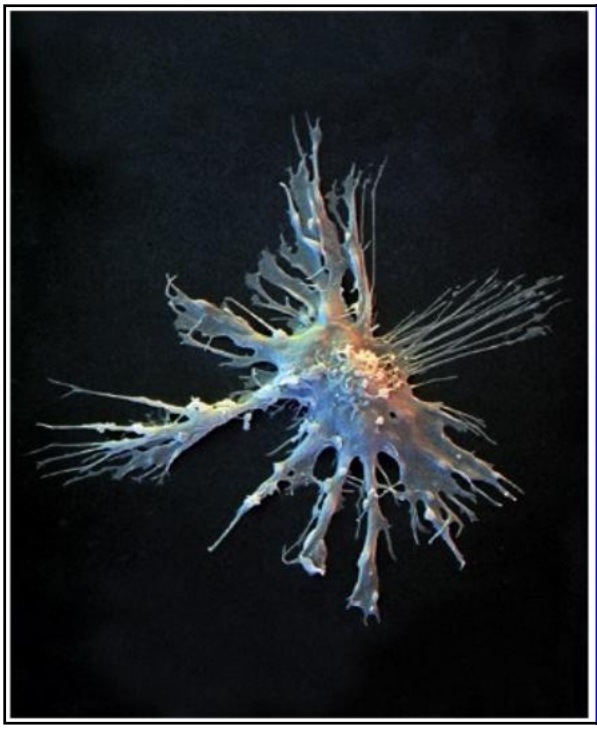
液遞性免疫(Humoral Immunity)

一、依免疫力能產生的作用物質單元來區分：

1. 液遞性免疫(Humoral immunity)：由 Von Behring 和 Kitasato 從1890年開始提出，1930年代把血清中能中和有毒物質，沈澱有毒物質，分解細菌及聚集細菌的東西稱作抗體 (Antibody,Ab)。因Ab存在於體液中能與抗原(Antigen,Ag)作用，所以稱為遞減性免疫。
2. 細胞性免疫(Cellular immunity)：1883年 Elile Metchnikoff 發現有些白血球會吞噬微生物，稱為吞噬細胞(phogocytes)，且觀察到吞噬細胞在具在免疫性動物非常的活躍，所以他假設細胞(而非Ab)是免疫性的主因。

細胞性免疫(Cellular Immunity)

3. 唯後來發現二者皆為正常免疫中必須的反應。



細胞性免疫

梅里可夫1883發現吞噬微生物的白血球，稱吞噬細胞(phagocytes)

內在的防衛系統的種類

抵抗力分類	防衛系統	抵抗對象
第一道防線		
(非專一性)	皮膚及黏膜	無選擇性
第二道防線		
(非專一性)	發炎反應及吞噬作用	無選擇性
第三道防線		
(專一性)	抗體免疫及細胞免疫	有選擇性

自然免疫力的防衛機制

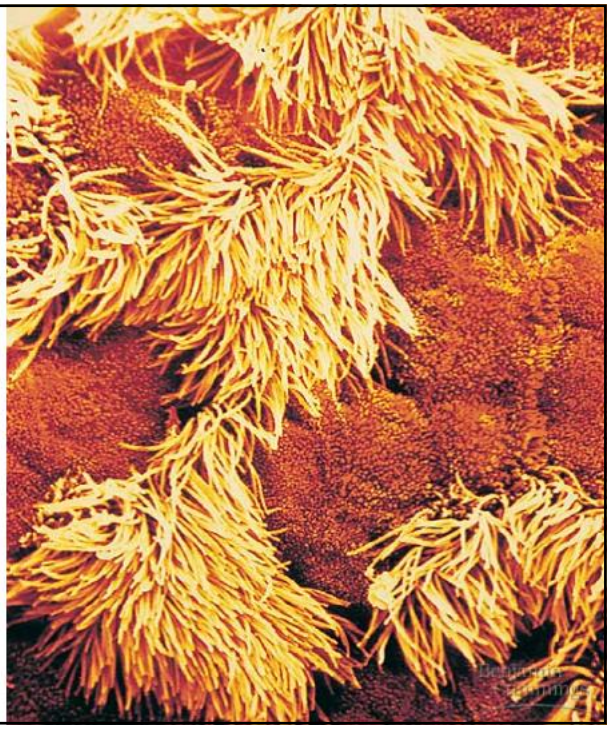
	物理性屏障	分泌化學性抑菌物質
皮膚	完整的皮膚是極有效的屏障	汗腺分乳酸及皮脂腺分泌脂肪酸使表面pH值降低，抑制細菌生長
黏膜	體表黏膜分泌黏液形成一道屏障，並與病毒競爭表面受器，使病毒無法進入細胞，黏液可黏住異物，再藉機械性原理如咳嗽、打噴嚏、纖毛擺動將之排出。	呼吸道分泌液、眼淚、唾液中含有溶菌酵素可破壞細菌之細胞壁。胃酸可使pH值降低殺菌。尿酸能抑制細菌生長。陰道中有乳酸桿菌，製造乳酸使pH維持4-5之間，可抑制腸道桿菌侵入繁殖。

An overview of the body's defenses

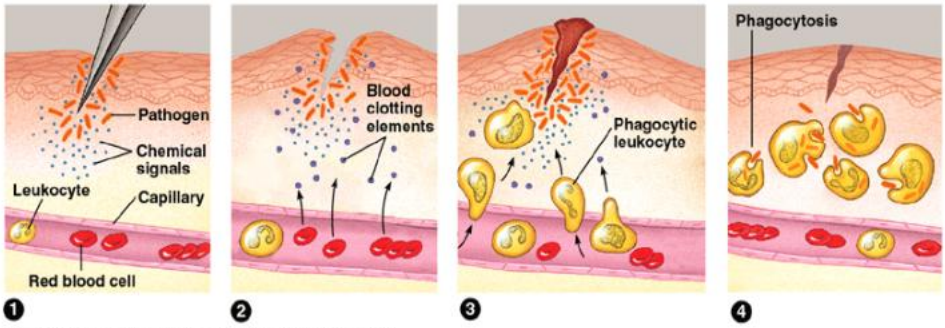
Nonspecific defense mechanisms		Specific defense mechanisms (immune system)
First line of defense	Second line of defense	Third line of defense
• Skin • Mucous membranes • Secretions of skin and mucous membranes	• Phagocytic white blood cells • Antimicrobial proteins • The inflammatory response	• Lymphocytes • Antibodies

Respiratory defenses

沖刷免疫



A simplified view of the inflammatory response



Phagocytic cells

Neutrophils are cells that become phagocytic in infected tissue: Comprise 60% - 70% of total white cells; Attracted by chemical signals, they enter infected tissues by amoeboid movement; Only live a few days as they destroy themselves when destroying pathogens.

Monocytes comprise only about 5% of the WBC, but they provide an even more effective phagocytic defense. They mature, circulate for a few hours, then migrate to the tissues where they enlarge and become macrophages.

Microfilaria attacked by macrophages

Figure 1-5d
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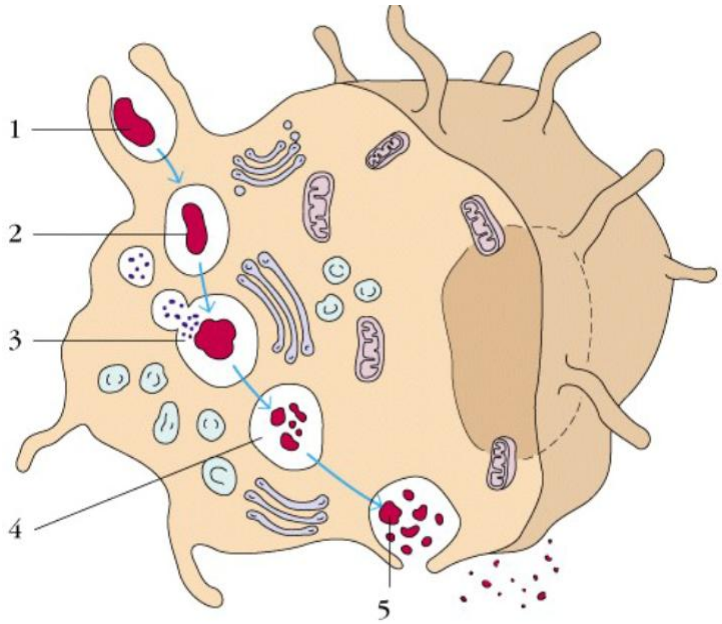
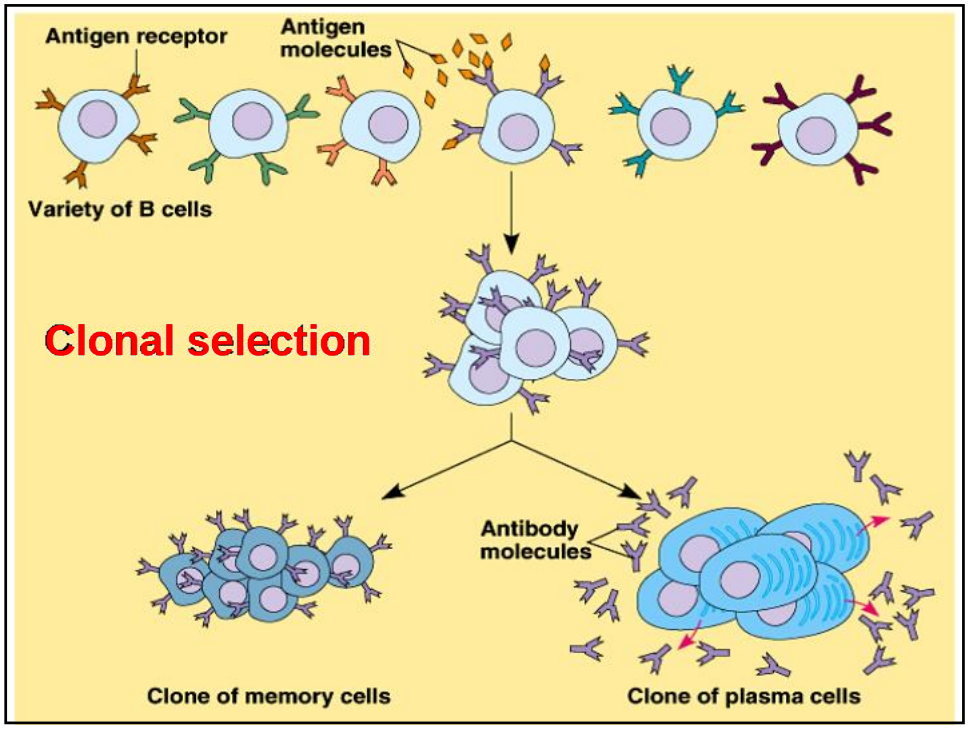


TABLE 2-5 MEDIATORS OF ANTIMICROBIAL AND CYTOTOXIC ACTIVITY OF MACROPHAGES AND NEUTROPHILS

Oxygen-dependent killing	Oxygen-independent killing
Reactive oxygen intermediates	Defensins
$O_2^{\cdot -}$ (superoxide anion)	Tumor necrosis factor α
$OH^{\cdot}$ (hydroxyl radicals)	(macrophage only)
H_2O_2 (hydrogen peroxide)	Lysozyme
ClO^- (hypochlorite anion)	Hydrolytic enzymes
Reactive nitrogen intermediates	
NO (nitric oxide)	
NO_2 (nitrogen dioxide)	
HNO_2 (nitrous acid)	
Others	
NH_2Cl (monochloramine)	

免疫性的理論

- **選擇學說**
  Selective theory
- **指示學說**
  Instructional theory
- **株落選擇學說**
  Clonal selection theory



獲得性免疫力的特性

專一性（specificity）

歧異性（diversity）

記憶性（memory）

自體辨認性（self/nonself recognition）

影響先天免疫力的因素

- 物種
- 品系
- 營養、藥物、環境
- 年齡
- 激素

被動免疫 (Passive immunization)

將免疫球蛋白（即抗體）直接引入人體以提供保護力，但時效短，無記憶性。

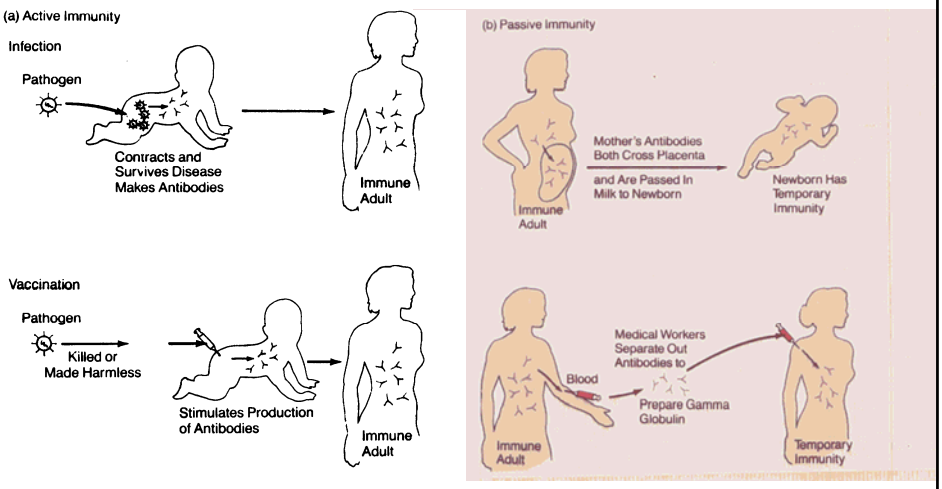
1. 自然的：經由胎盤輸送給胎兒；哺乳
2. 人為的：將由其他動物製備得到的免疫球蛋白免疫人類，例如：抗毒蛇血清

主動免疫 (Active immunization)

將外來物（即抗原）引入人體後，引起免疫反應，以提供保護力，時效長，具記憶性。

1. 自然的：經由感染而獲得免疫力
2. 人為的：將改造後無毒的抗原（疫苗）免疫人體，引起免疫力以獲得長時效的保護力。

主動免疫與被動免疫的比較



主動免疫與被動免疫區別

	主動免疫	被動免疫
抗體來源	動物自製	非動物自製
奏效	慢(數週)	即刻發揮作用
免疫期	長(數年)	短(數週)
醫療應用	預防： 注射類毒素疫苗	治療： 注射抗毒素急救

TABLE 19-2 Common agents used for passive immunization

Disease	Agent
Black widow spider bite	Horse antivenin
Botulism	Horse antitoxin
Cytomegalovirus	Human polyclonal Ab
Diphtheria	Horse antitoxin
Hepatitis A and B	Pooled human immunoglobulin
Measles	Pooled human immunoglobulin
Rabies	Human or horse polyclonal Ab
Respiratory disease	Monoclonal anti-RSV*
Snake bite	Horse antivenin
Tetanus	Pooled human immunoglobulin or horse antitoxin
Varicella zoster virus	Human polyclonal Ab

*Respiratory syncytial virus

SOURCE: *Adapted from A. Casadevall, 1999, *Clinical Immunology* 93:5.

Table 19-2
Kuby IMMUNOLOGY, Sixth Edition

Immunological memory

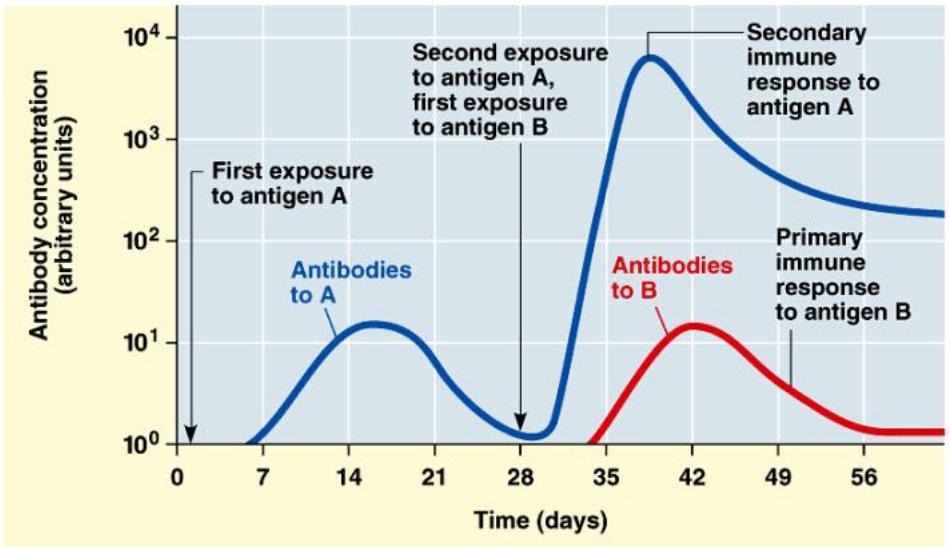
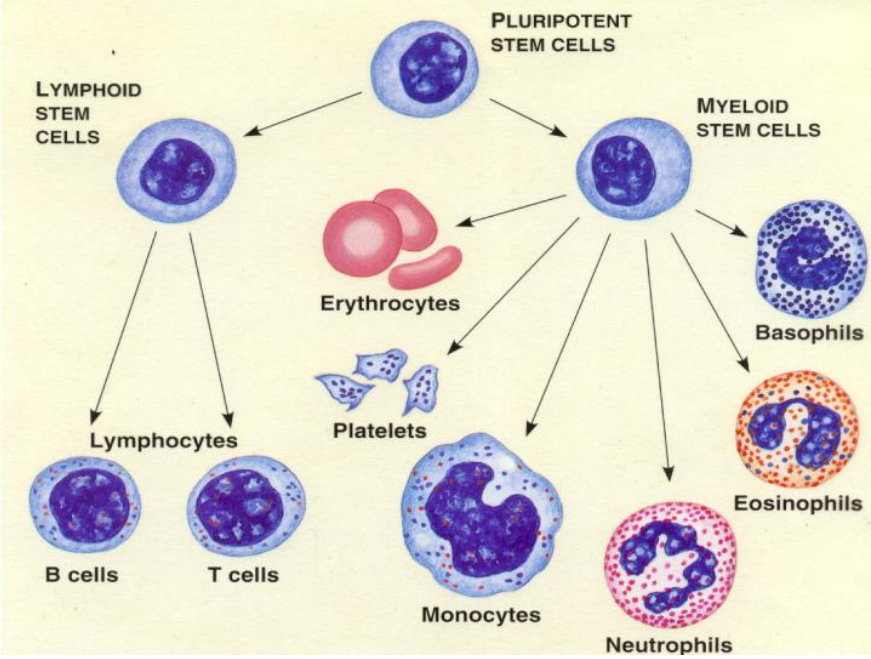
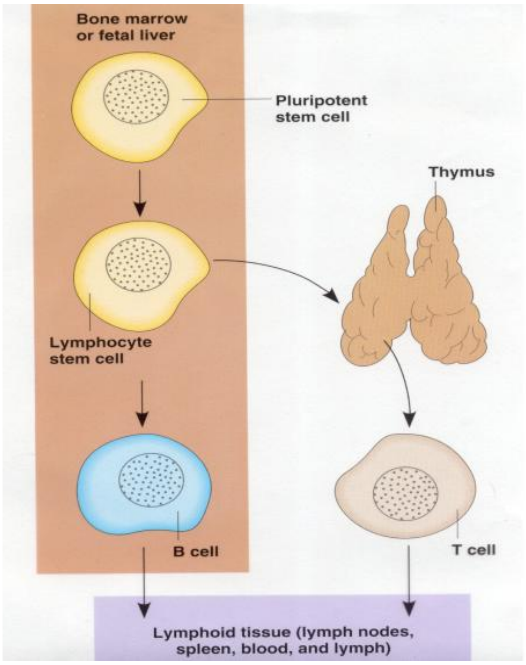
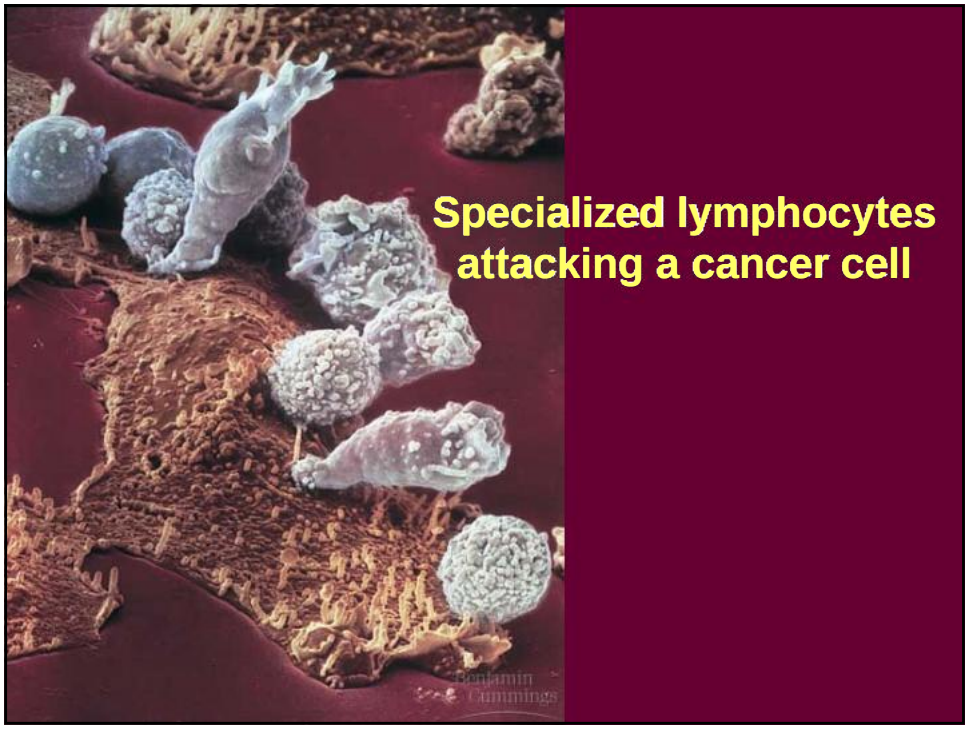


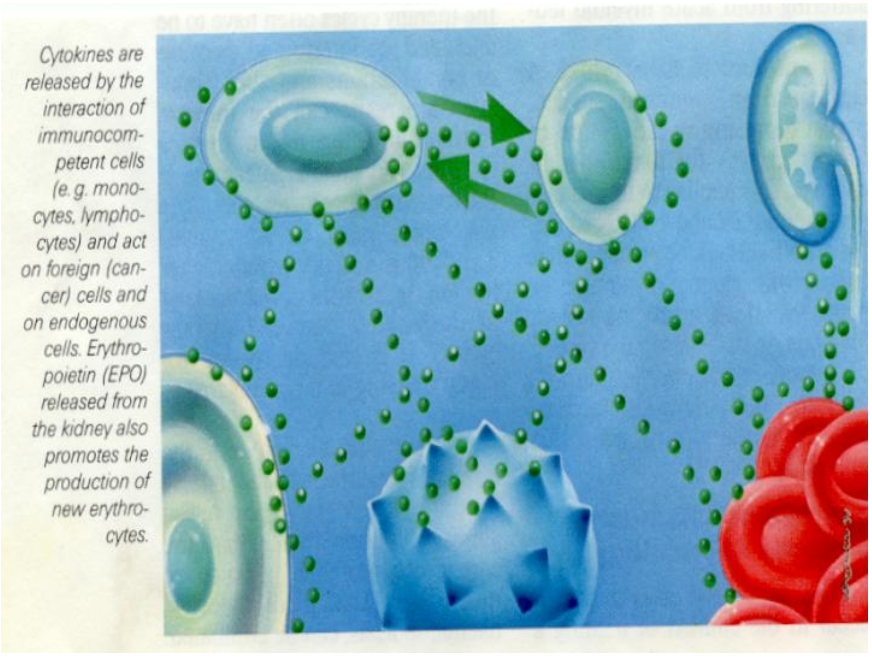
TABLE 2-3 NORMAL ADULT BLOOD-CELL COUNTS

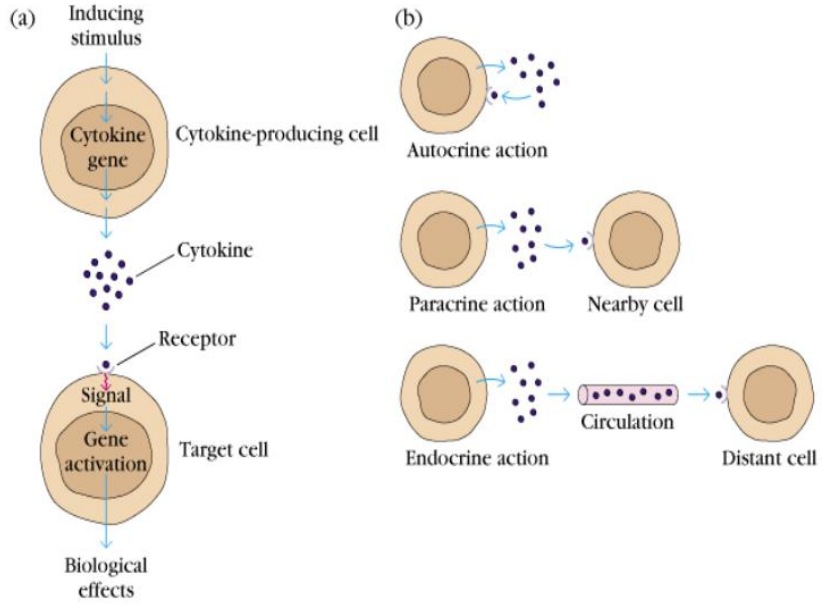
Cell type	Cells/mm^3	%
Red blood cells	5.0×10^6	
Platelets	2.5×10^5	
Leukocytes	7.3×10^3	
Neutrophil		50–70
Lymphocyte		20–40
Monocyte		1–6
Eosinophil		1–3
Basophil		<1

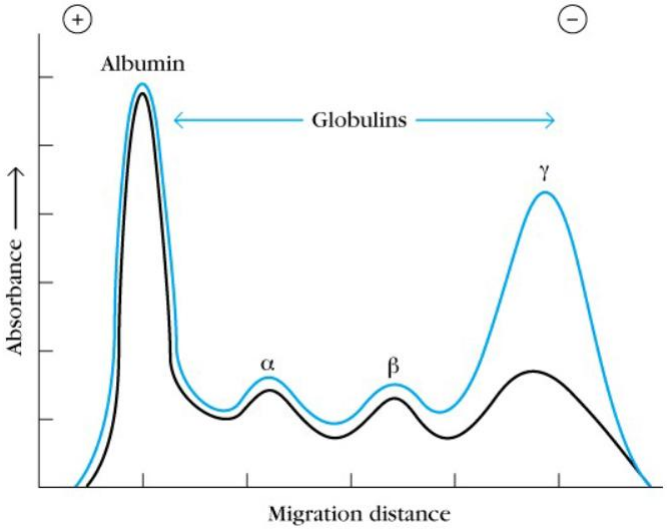


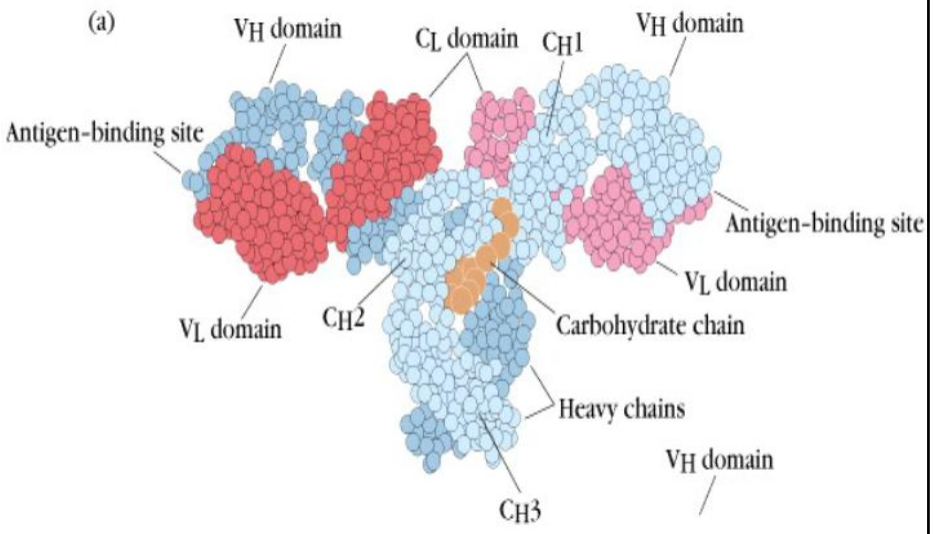

Bone marrow
or fetal liver
Pluripotent
stem cell
Thymus
Lymphocyte
stem cell
B cell
T cell
Lymphoid tissue (lymph nodes,
spleen, blood, and lymph)

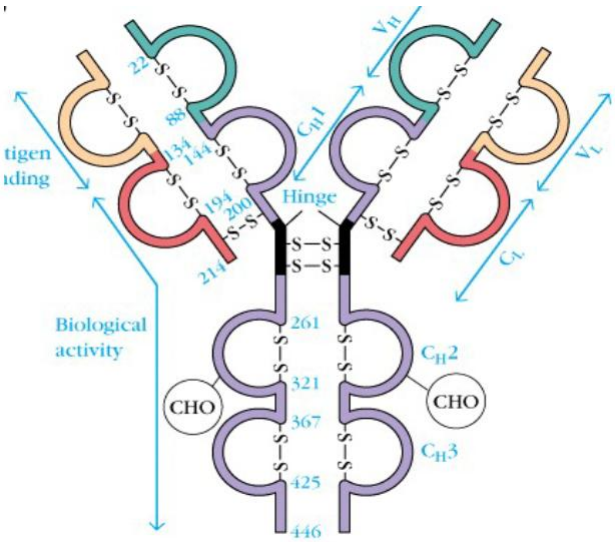

Specialized lymphocytes
attacking a cancer cell

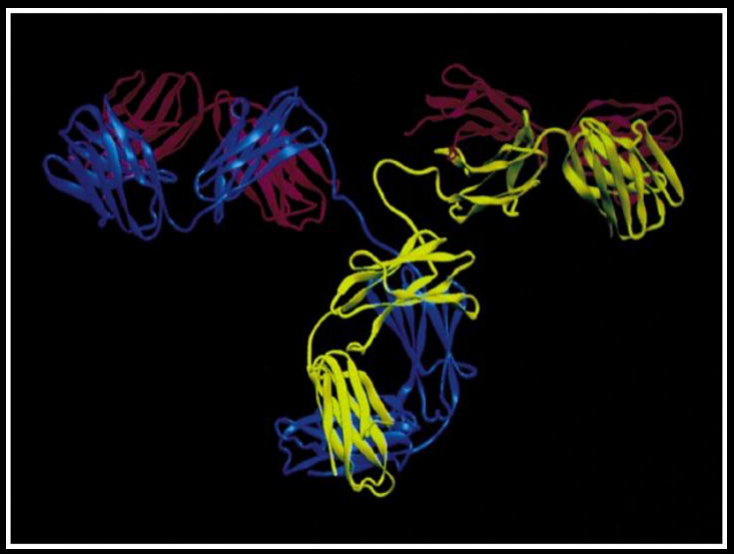

Cytokines are released by the interaction of immunocompetent cells (e.g. monocytes, lymphocytes) and act on foreign (cancer) cells and on endogenous cells. Erythropoietin (EPO) released from the kidney also promotes the production of new erythrocytes.

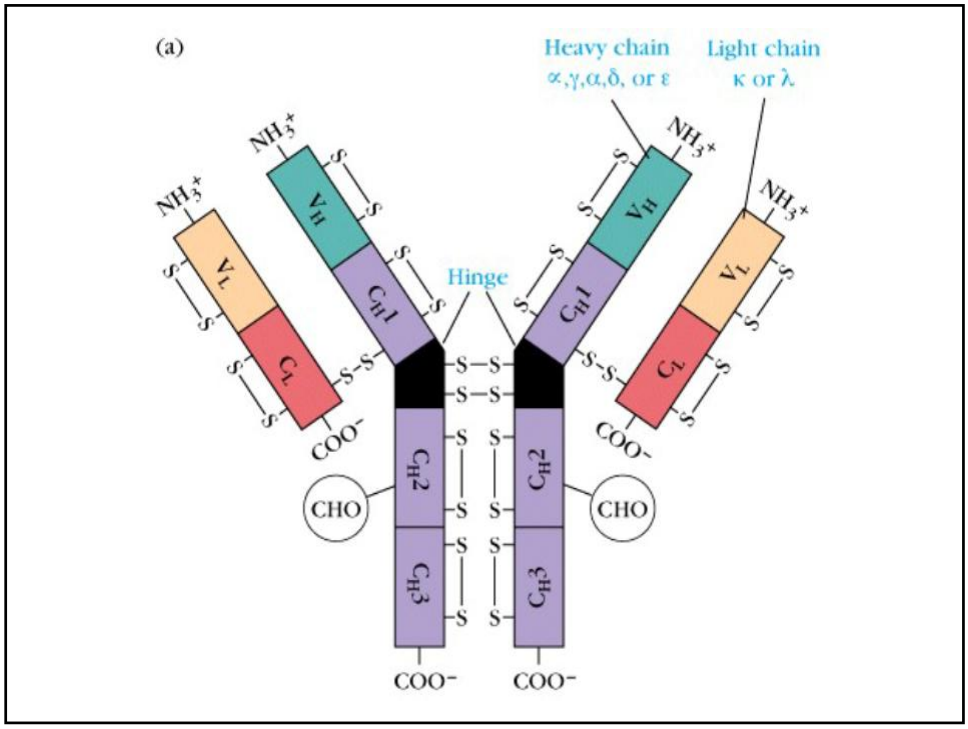

(a)
Inducing stimulus
Cytokine gene
Cytokine-producing cell
Cytokine
Receptor
Signal
Gene activation
Target cell
Biological effects
(b)
Autocrine action
Paracrine action
Nearby cell
Circulation
Endocrine action
Distant cell

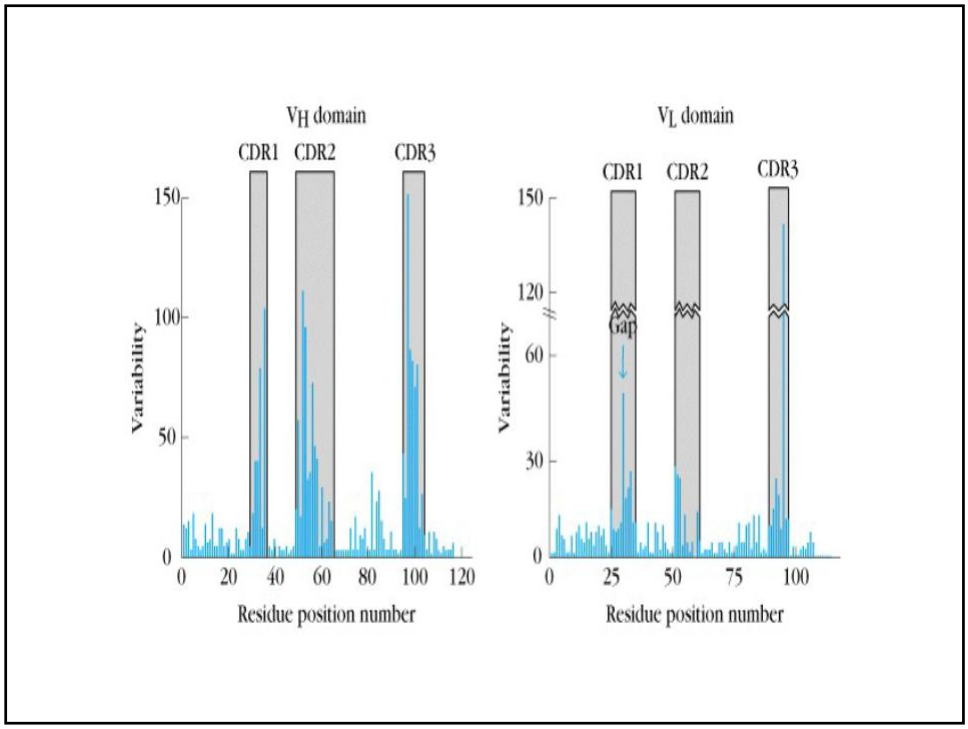

+
−
Albumin
Globulins
γ
α
β
Absorbance
Migration distance

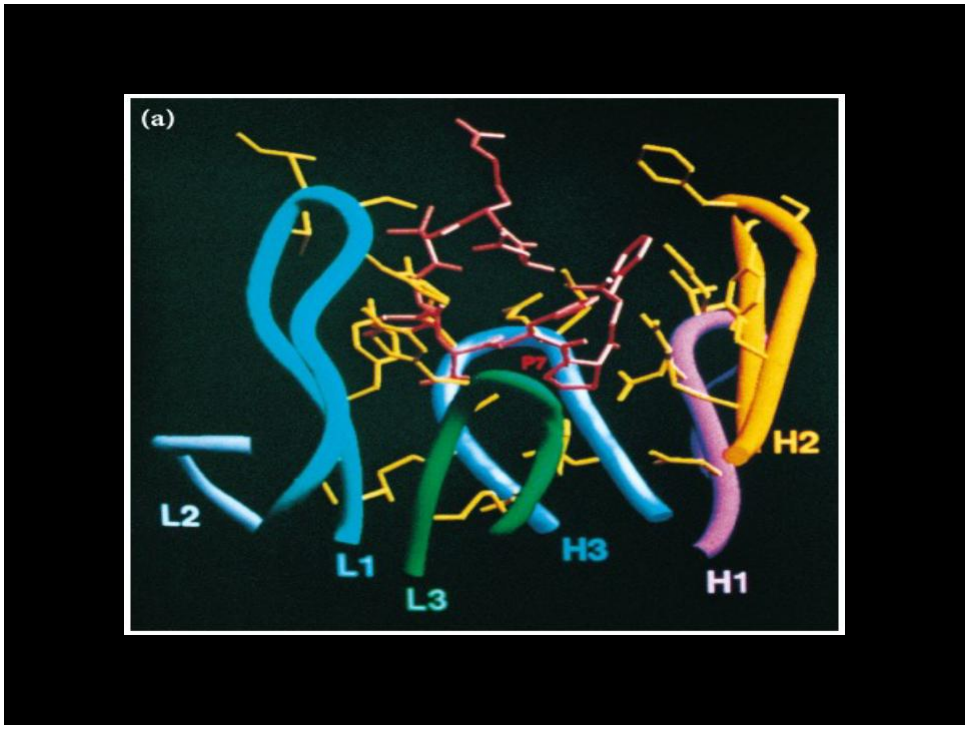

(a)
VH domain
CL domain
CH1
VH domain
Antigen-binding site
Antigen-binding site
VL domain
VL domain
CH2
Carbohydrate chain
Heavy chains
VH domain
CH3


tigen
ding
Biological
activity
Hinge
CHO
CHO
261
321
367
425
446
214
200
194
144
134
88
22

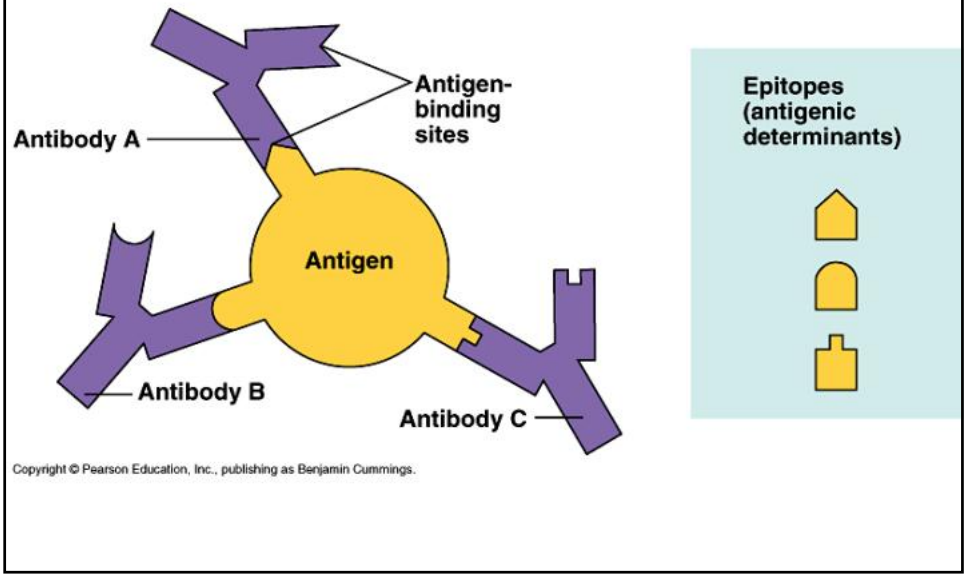



(a)
Heavy chain
α,γ,α,δ, or ε
Light chain
κ or λ
Hinge
NH_3^+
V_H
V_L
C_H1
C_L
C_H2
C_H3
CHO
COO^-

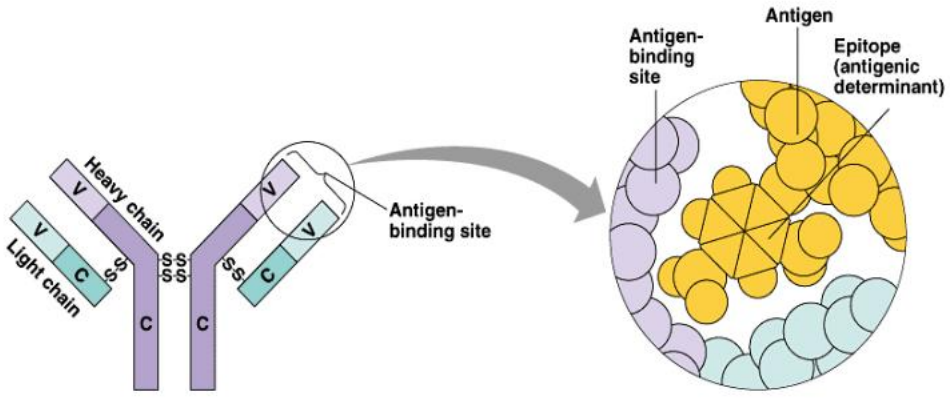

V_H domain
CDR1
CDR2
CDR3
Variability
Residue position number
V_L domain
Gap



Epitopes (antigenic determinants)

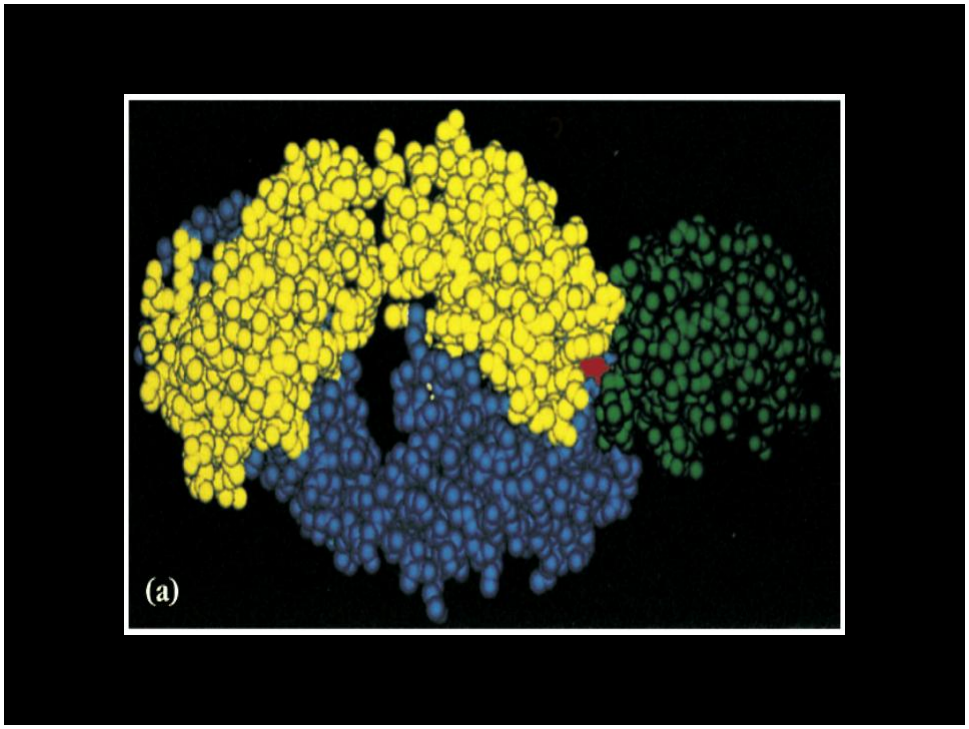


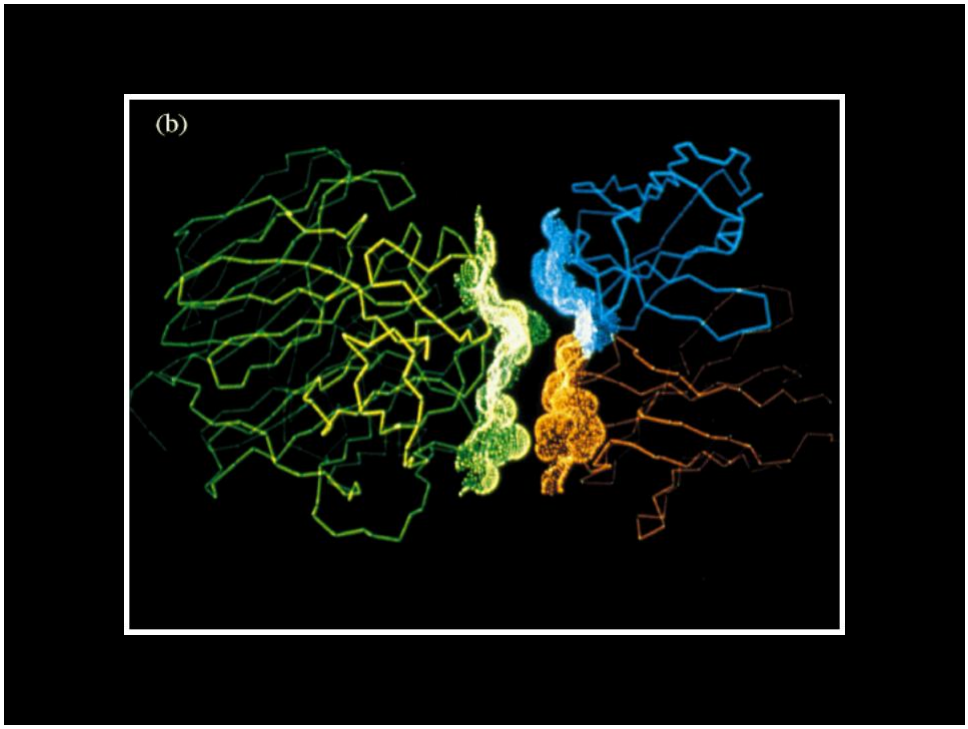
The structure of a typical antibody molecule

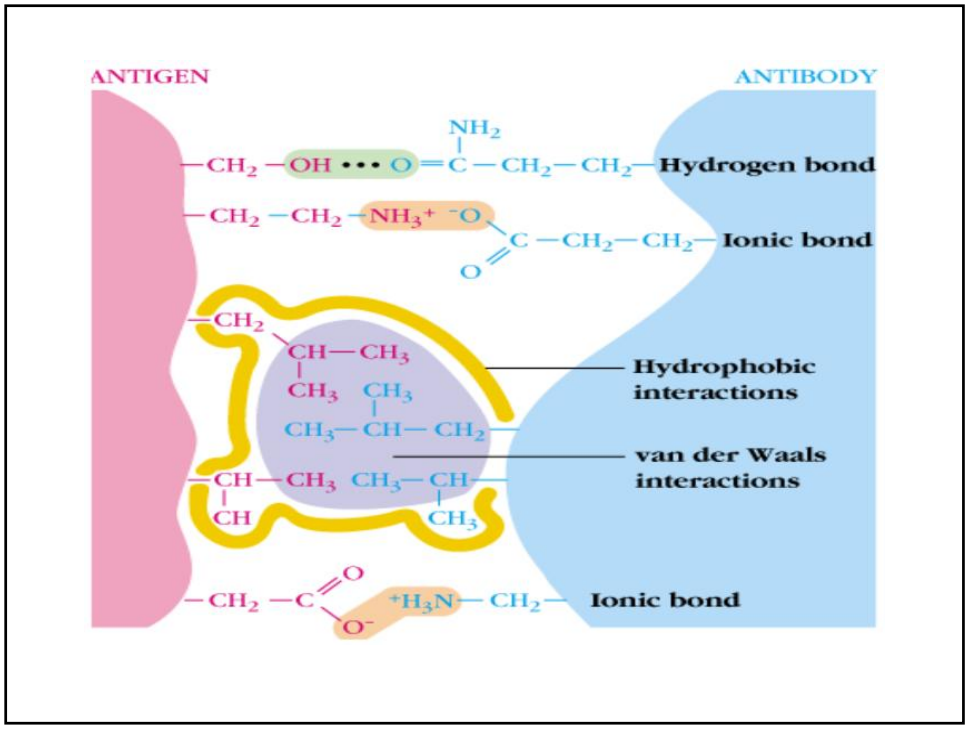


(a) Basic structure of an antibody molecule

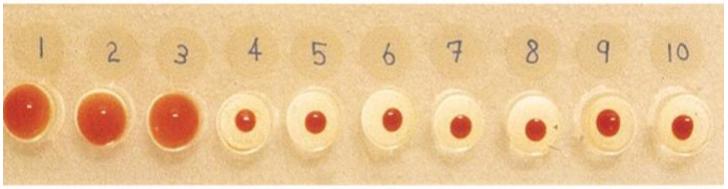
(b) Close-up view of an antigen-binding site with bound antigen



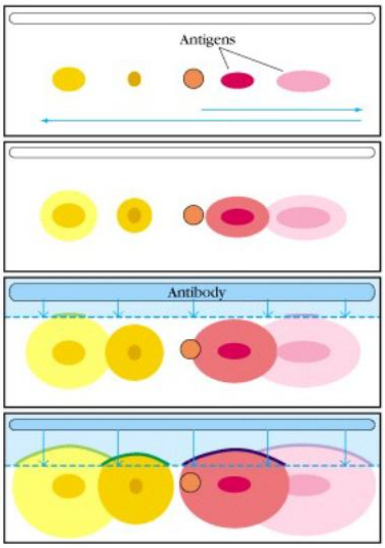

(b)

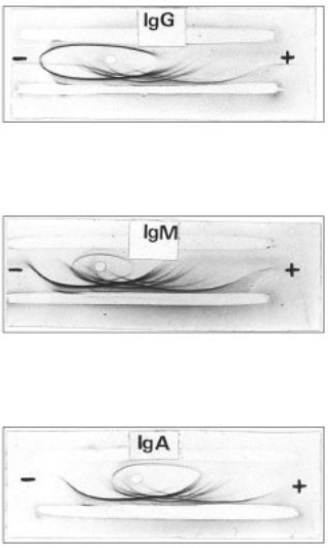

ANTIGEN
ANTIBODY
Hydrogen bond
Ionic bond
Hydrophobic interactions
van der Waals interactions
Ionic bond

抗原抗體間的反應

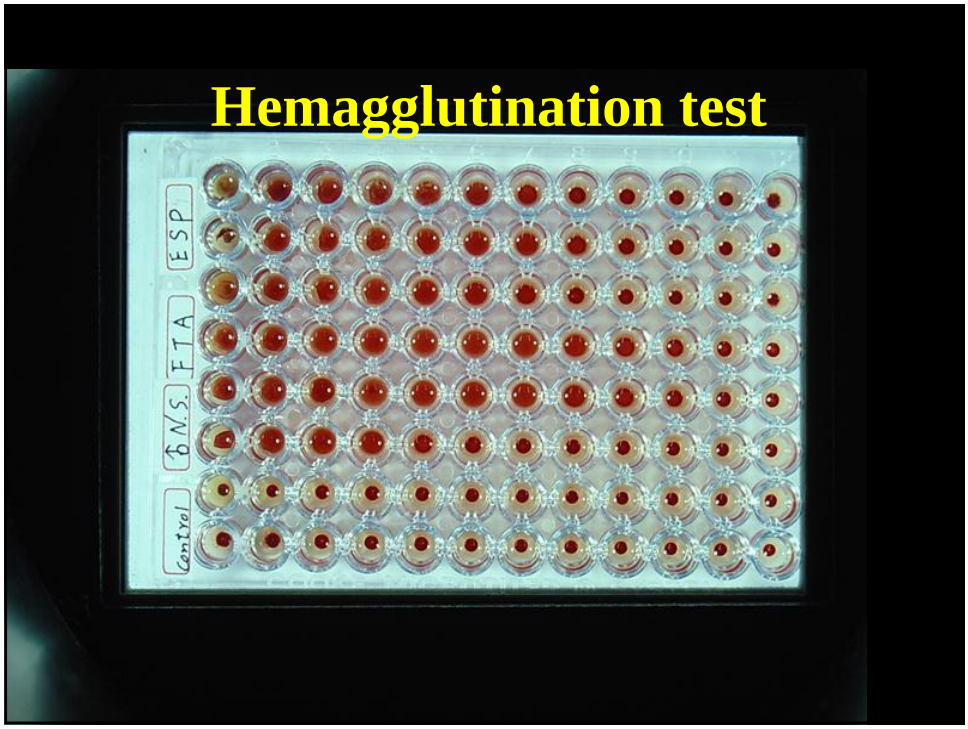


抗原抗體間的反應





Hemagglutination test



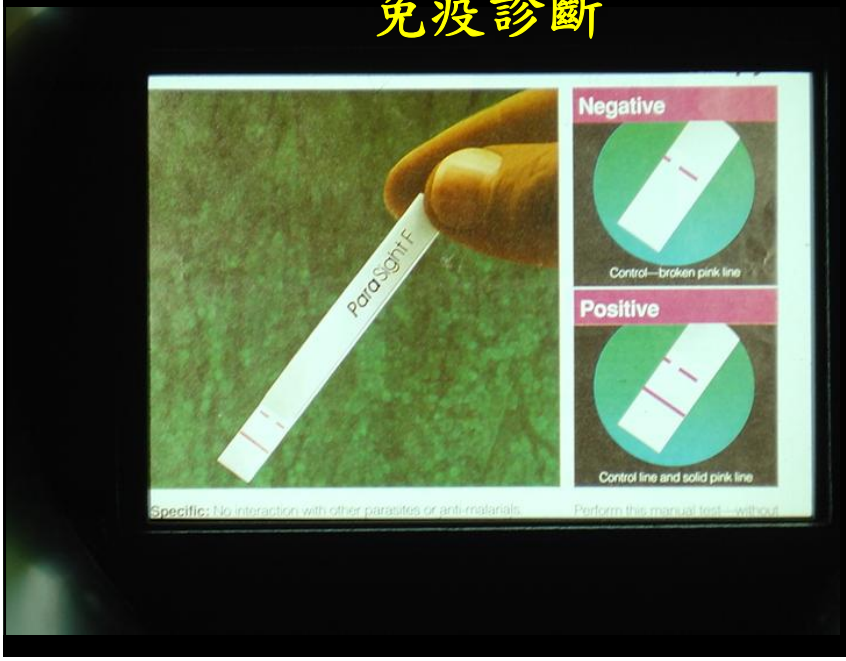
ELISA

免疫學對人類的貢獻...

免疫學在醫學上的應用

1. 免疫診斷
2. 免疫治療
3. 免疫預防

免疫診斷



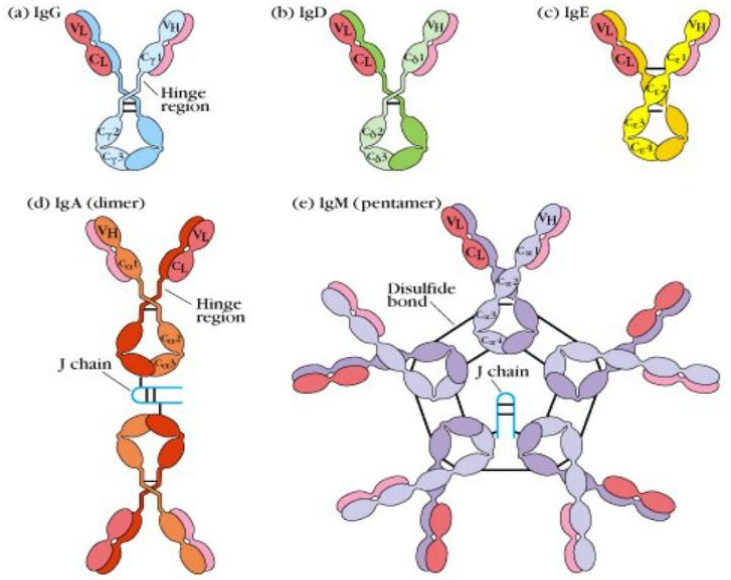
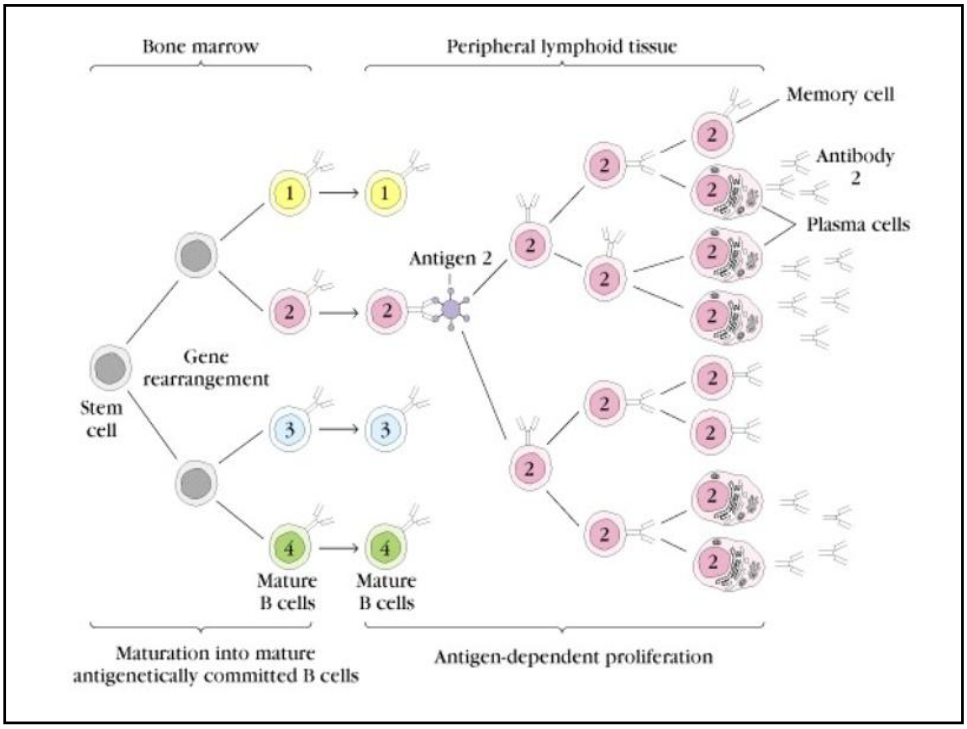
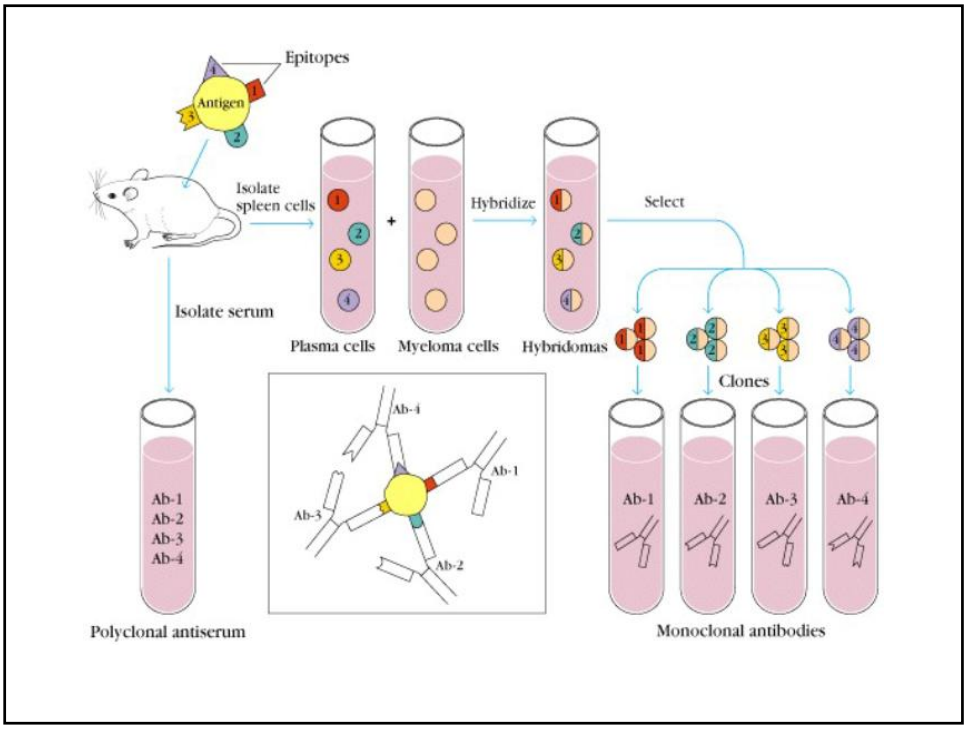
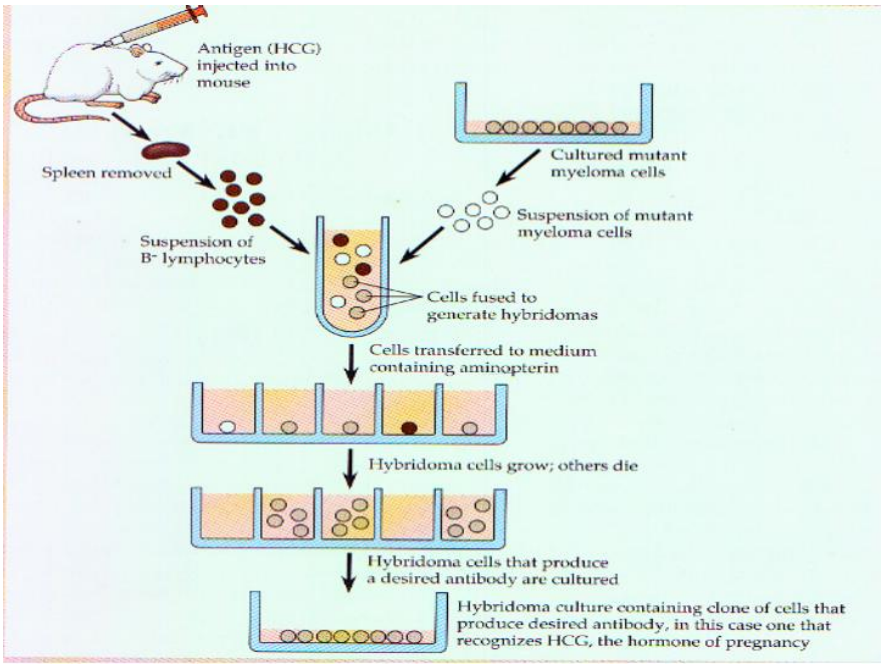


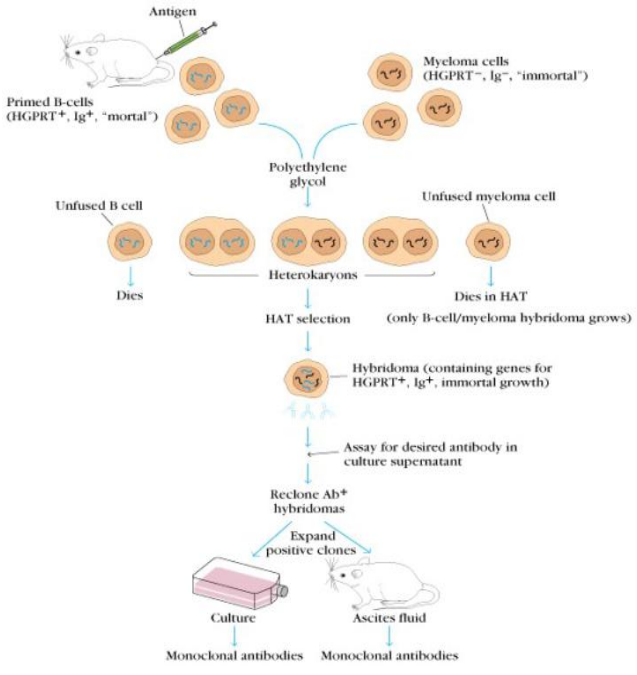
TABLE 4-2 PROPERTIES AND BIOLOGICAL ACTIVITIES* OF CLASSES AND SUBCLASSES OF HUMAN SERUM IMMUNOGLOBULINS

Property/Activity	IgG1	IgG2	IgG3	IgG4	IgA1	IgA2	IgM†	IgE	IgD
Molecular weight†	150,000	150,000	150,000	150,000	150,000–600,000	150,000–600,000	900,000	190,000	150,000
Heavy-chain component	γ1	γ2	γ3	γ4	α1	α2	μ	ε	δ
Normal serum level (mg/ml)	9	3	1	0.5	3.0	0.5	1.5	0.0003	0.03
In vivo serum half life (days)	23	23	8	23	6	6	5	2.5	3
Activates classical complement pathway	+	+/−	++	−	−	−	+++	−	−
Crosses placenta	+	+/−	+	+	−	−	−	−	−
Present on membrane of mature B cells	−	−	−	−	−	−	+	−	+
Binds to Fc receptors of phagocytes	++	+/−	++	+	−	−	?	−	−
Mucosal transport	−	−	−	−	++	++	+	−	−
Induces mast-cell degranulation	−	−	−	−	−	−	−	+	−

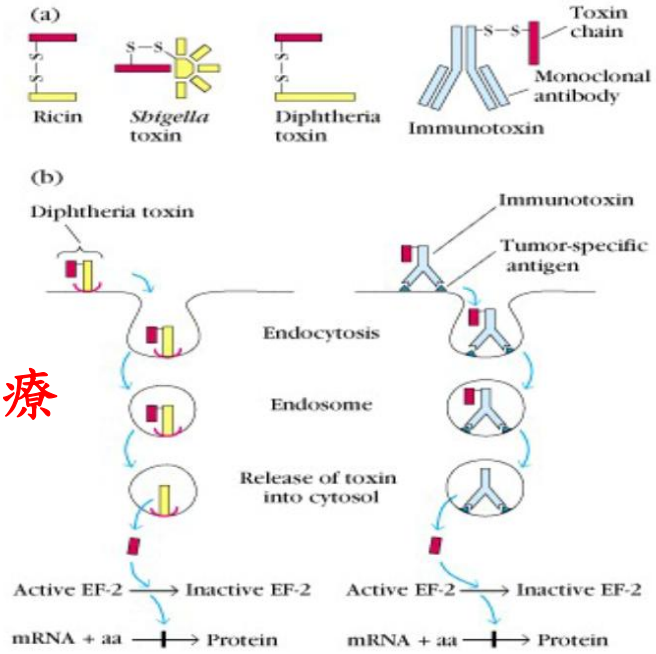

Bone marrow
Peripheral lymphoid tissue
Memory cell
Antibody 2
Plasma cells
Antigen 2
Gene rearrangement
Stem cell
Mature B cells
Mature B cells
Maturation into mature antigenetically committed B cells
Antigen-dependent proliferation


Epitopes
Antigen
Isolate spleen cells
Hybridize
Select
Isolate serum
Plasma cells
Myeloma cells
Hybridomas
Clones
Ab-1
Ab-2
Ab-3
Ab-4
Polyclonal antiserum
Monoclonal antibodies


Antigen (HCG) injected into mouse
Spleen removed
Suspension of B⁻ lymphocytes
Cultured mutant myeloma cells
Suspension of mutant myeloma cells
Cells fused to generate hybridomas
Cells transferred to medium containing aminopterin
Hybridoma cells grow; others die
Hybridoma cells that produce a desired antibody are cultured
Hybridoma culture containing clone of cells that produce desired antibody, in this case one that recognizes HCG, the hormone of pregnancy


Antigen
Primed B-cells (HGPRT⁺, Ig⁺, "mortal")
Myeloma cells (HGPRT⁻, Ig⁻, "immortal")
Polyethylene glycol
Unfused B cell
Unfused myeloma cell
Dies
Heterokaryons
Dies in HAT
HAT selection
(only B-cell/myeloma hybridoma grows)
Hybridoma (containing genes for HGPRT⁺, Ig⁺, immortal growth)
Assay for desired antibody in culture supernatant
Reclone Ab⁺ hybridomas
Expand positive clones
Culture
Ascites fluid
Monoclonal antibodies
Monoclonal antibodies

免疫治療



免疫預防

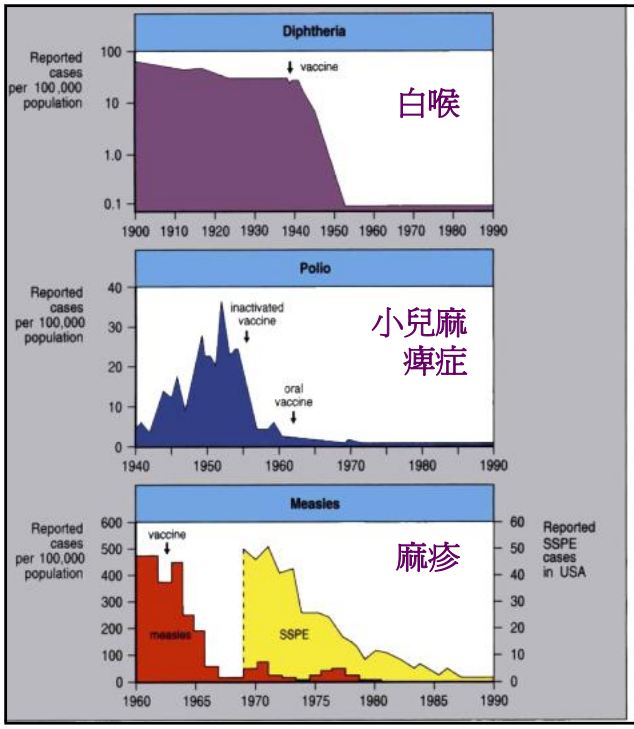
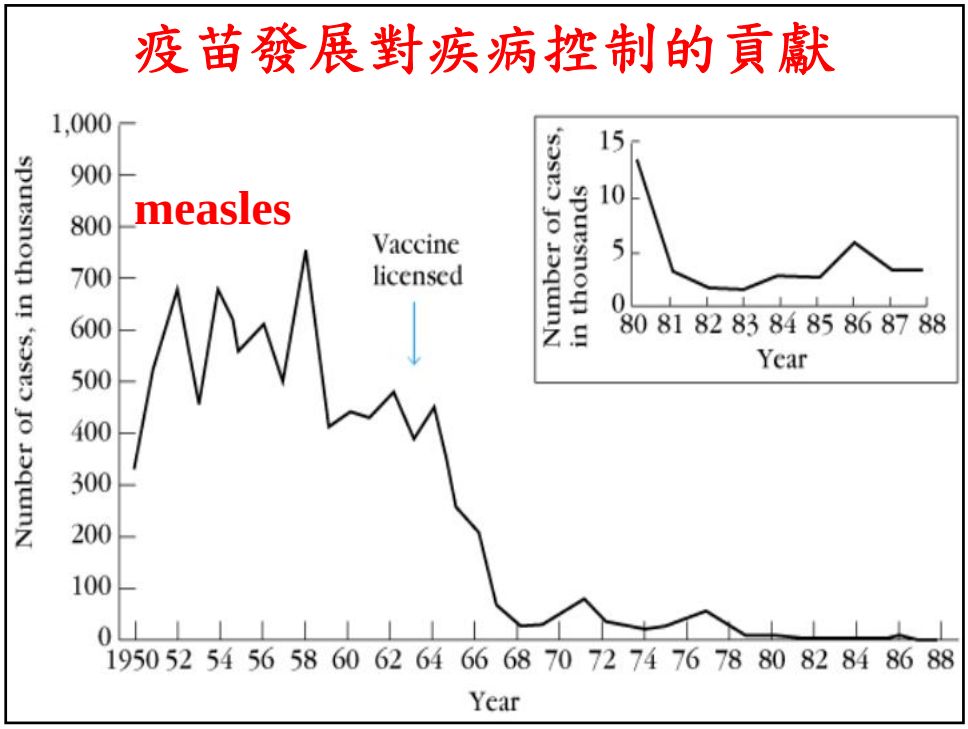
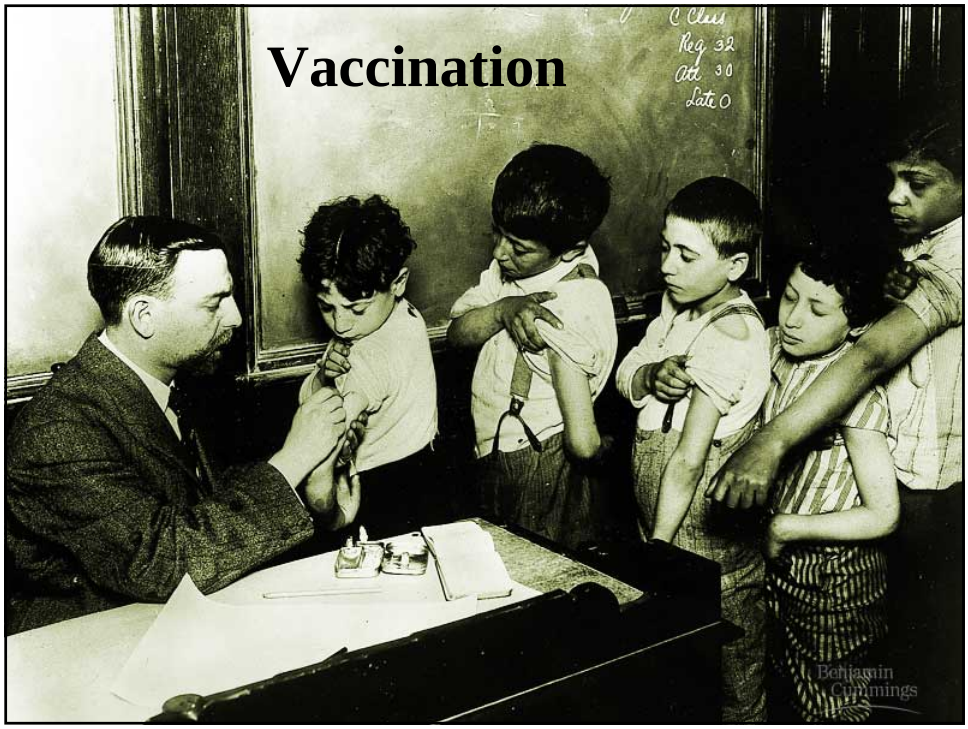


Figure 1.27 Successful vaccination campaigns. Diphtheria, poliomyelitis and measles have been virtually eliminated from the USA, as shown by these three graphs. The arrows indicate when the vaccination campaigns began Subacute sclerosing panencephalitis (SSPE) is a brain disease that is a late consequence of measles infection for a minority of patients. Reduction of measles was paralleled by a reduction in SSPE 15 years later. Because these diseases have not been eradicated worldwide and the volume of international travel is so high, immunization must be maintained in much of the population to prevent disease recurrence.

疫苗發展對疾病控制的貢獻





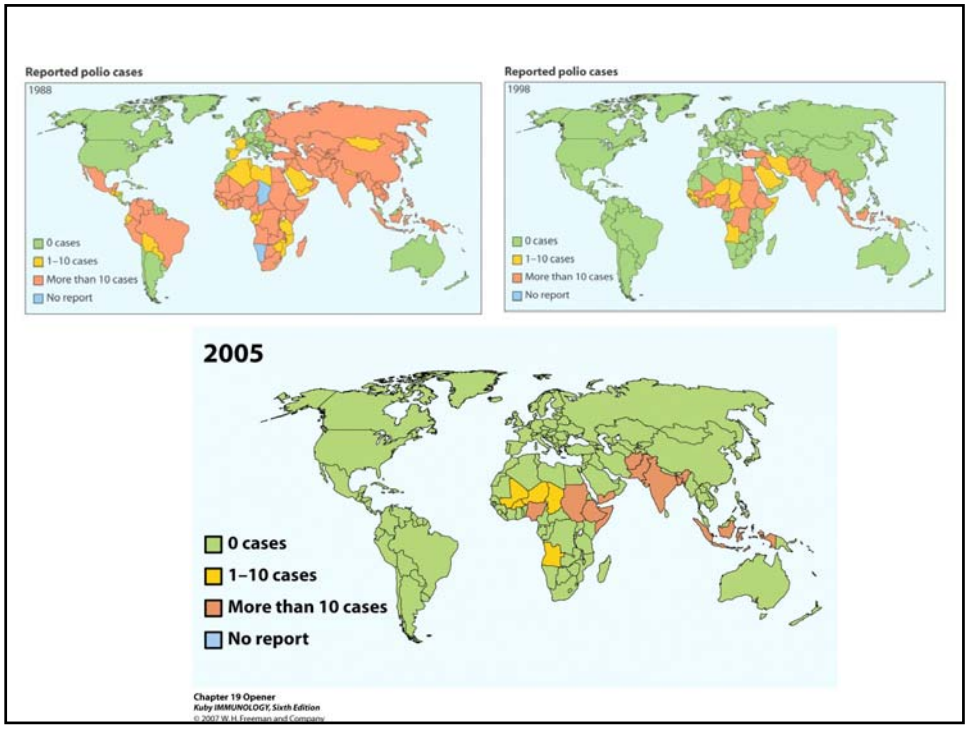
疫苗 (Vaccine) 及 疫苗接種(Vaccination)

History

- 種人痘 (Variegation):
  In contact with smallpox at skin (<18th century)
- 種牛痘 (Variolation):
  Inoculation of smallpox into skin (19th century)
- 疫苗接種 (Vaccination):
  Inoculation of cowpox into skin (20th century)

Louis Pasteur
1885

Wood engraving of Louis Pasteur watching Joseph Meister receive the rabies vaccine.



免疫預防注射計畫

現代化國家保護國民健康所必需

發揮群體免疫效果，遏阻傳染病的發生

預防醫學專家建議接種年齡如下：

B 型肝炎：出生時及 1 歲左右

DPT：2、4、6、18 個月大及 5歲左右

小兒麻痺：2、4、6 個月大及 5歲左右

水痘皰疹：１ 歲及 12 歲時

MMR：１ 歲及 5 歲時

台灣預防接種的歷史及未來展望

1948 引進白喉類毒素

1951 開始接種卡介苗1965；全面推行嬰兒施打BCG
盛行率：5.15% in 1957 → 0.65% in 1993 → 6.91/100,00 in 2000

1954 開始使用破傷風百日咳混合疫苗(DTP)
⇒ 2186 cases (1957) → no case (1989)

1958 引進注射式沙克疫苗(IPV)

1963 引進口服沙賓疫苗(OPV)
⇒ 760 cases in 1958 → 根除 (2000)

1967 研發日本腦炎疫苗

1968 全面施打JE。目前每一位兒童均接受四劑的接種

1978 針對初生滿九個月及15個月幼兒，全面推行各接種一劑麻疹疫苗

1984 推行肝炎疫苗接種

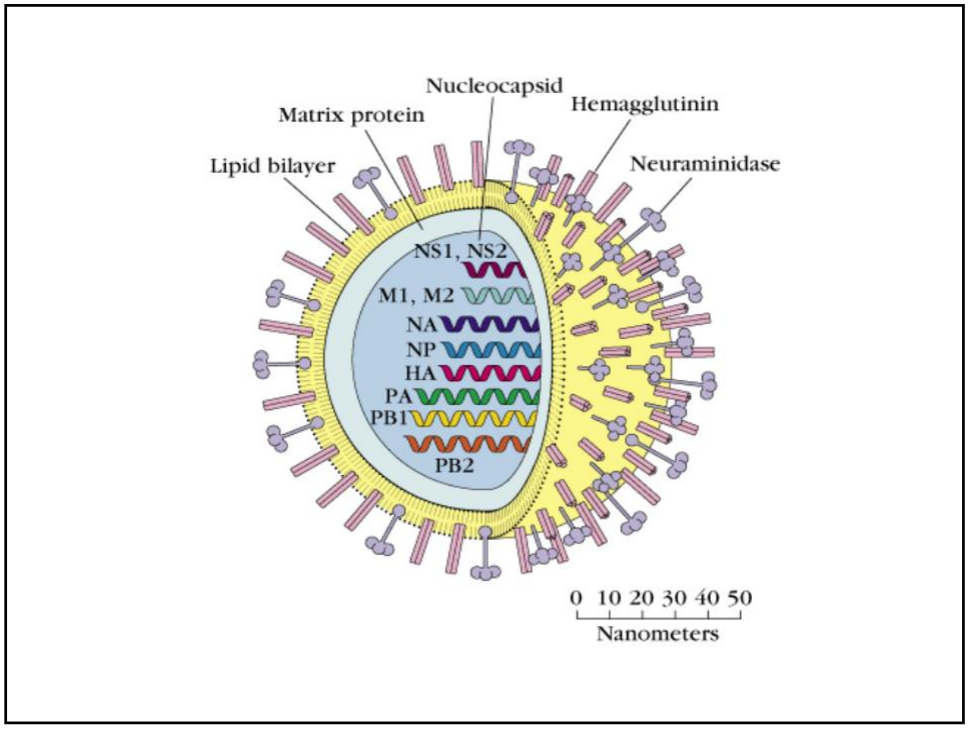
1992 開始實施「根除三麻一封計畫」，滿15個月幼兒改施打一劑麻疹、腮腺炎、德國麻疹混合疫苗（MMR）

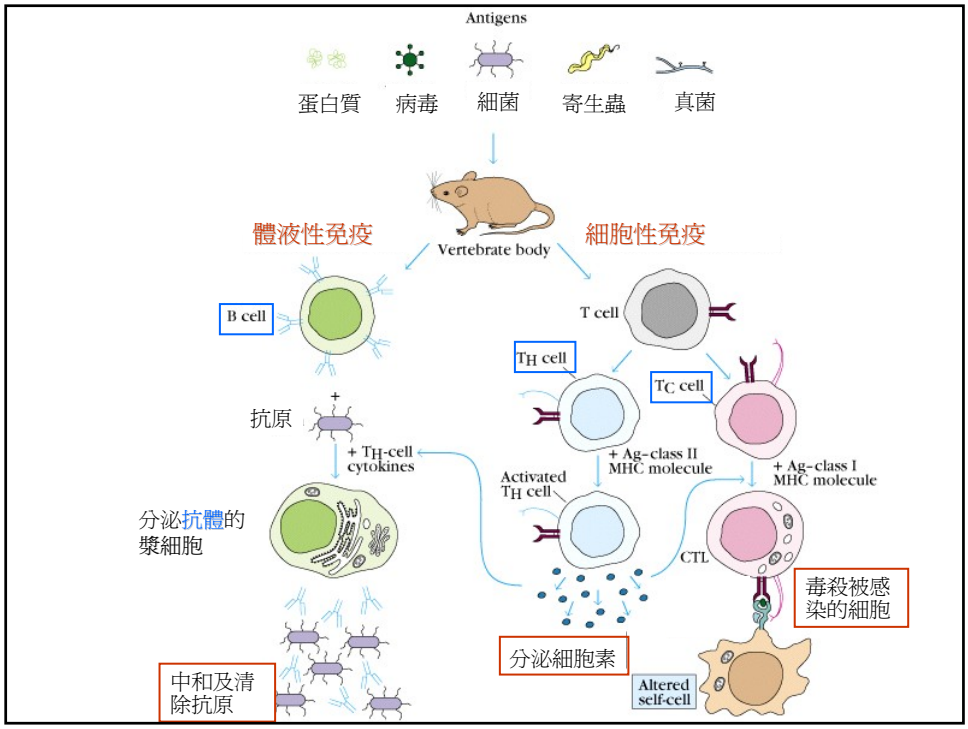
1998 推動「關切老人健康、加強老人福利」政策，針對65歲以上高危險群老人接種流感疫苗

疫苗接種(Vaccination)

Herd immunity (群體免疫力)

Results when most of a population is immune to a disease


Nucleocapsid
Matrix protein
Hemagglutinin
Lipid bilayer
Neuraminidase
NS1, NS2
M1, M2
NA
NP
HA
PA
PB1
PB2
0 10 20 30 40 50
Nanometers


Antigens
蛋白質
病毒
細菌
寄生蟲
真菌
Vertebrate body
體液性免疫
細胞性免疫
B cell
T cell
TH cell
TC cell
抗原
+ TH-cell cytokines
+ Ag-class II MHC molecule
+ Ag-class I MHC molecule
Activated TH cell
CTL
分泌抗體的漿細胞
毒殺被感染的細胞
分泌細胞素
中和及清除抗原
Altered self-cell

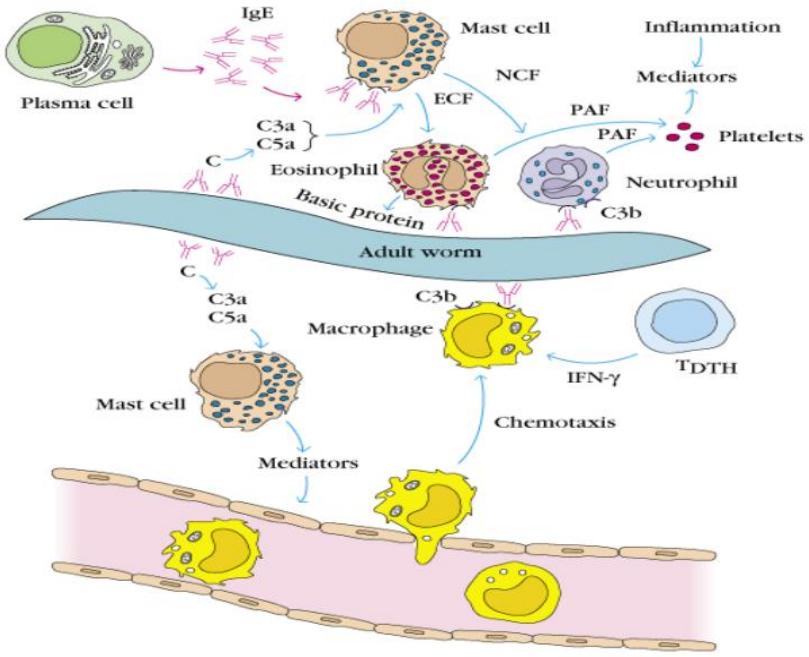


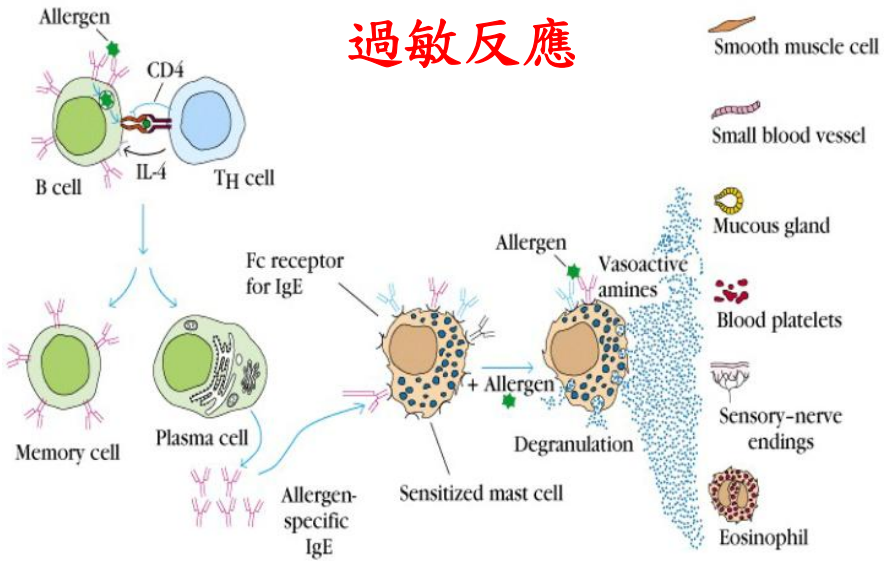
TABLE 18-2 Some influenza A strains and their hemagglutinin (H) and neuraminidase (N) subtype

Species	Virus strain designation	Antigenic subtype
Human	A/Puerto Rico/8/34	H0N1
	A/Fort Monmouth/1/47	H1N1
	A/Singapore/1/57	H2N2
	A/Hong Kong/1/68	H3N2
	A/USSR/80/77	H1N1
	A/Brazil/11/78	H1N1
	A/Bangkok/1/79	H3N2
	A/Taiwan/1/86	H1N1
	A/Shanghai/16/89	H3N2
	A/Johannesburg/33/95	H3N2
	A/Wuhan/359/95	H3N2
	A/Texas/36/95	H1N1
	A/Hong Kong/156/97	H5N1
Swine	A/Sw/Iowa/15/30	H1N1
	A/Sw/Taiwan/70	H3N2
Horse (equine)	A/Eq/Prague/1/56	H7N7
	A/Eq/Miami/1/63	H3N8*
Bird	A/Fowl/Dutch/27	H7N7
	A/Tern/South America/61	H5N3
	A/Turkey/Ontario/68	H8N4
	A/Chicken/Hong Kong/258/97	H5N1†

*H3N8 has recently been shown to cause flu-like illness in dogs; the species shift occurred with no reassortment of genes.
†As of 2006, a dangerous new H5N1 avian strain has infected approximately 175 humans with 50% mortality.

Table 18-2
Kuby IMMUNOLOGY, Sixth Edition

過敏反應



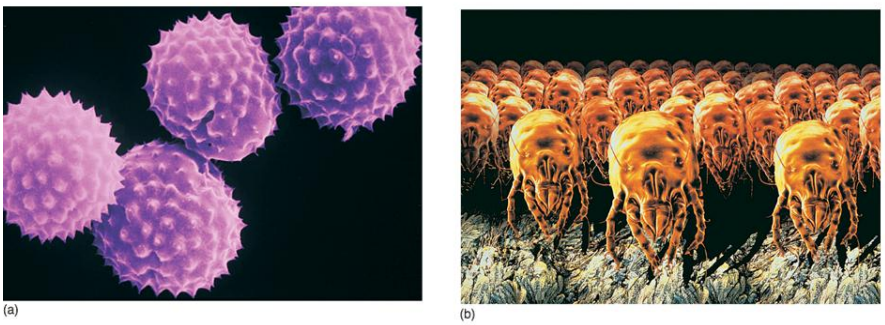
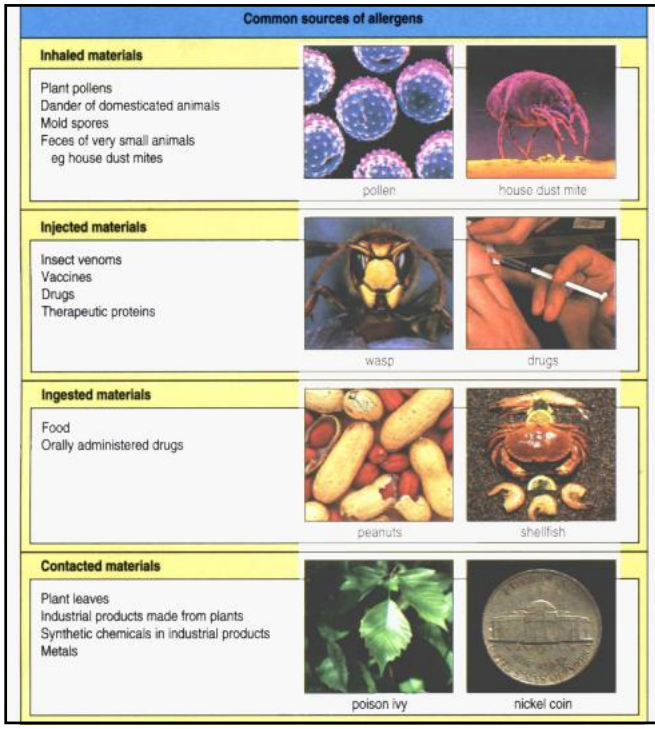


圖 15.28 常見的過敏原。(a)豚草花粉（可引起乾草熱）的電子顯微掃描圖。(b)家塵中塵蟎（粉塵蟎(Dermatophagoides farinae)）的電子顯微掃描圖；由塵蟎所產生的排泄物顆粒常會引起慢性過敏性鼻炎和氣喘。



吸入

打入

食入

接觸

Figure 10.1 Some substances that are a common cause of hypersensitivity reactions.

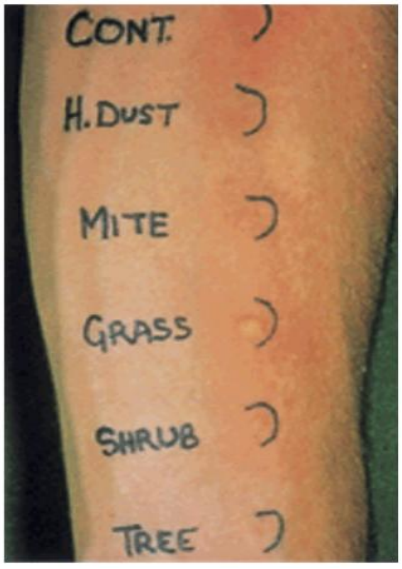


TABLE 16-1 COMMON ALLERGENS ASSOCIATED WITH TYPE I HYPERSENSITIVITY

Proteins
- Foreign serum
- Vaccines

Plant pollens
- Rye grass
- Ragweed
- Timothy grass
- Birch trees

Drugs
- Penicillin
- Sulfonamides
- Local anesthetics
- Salicylates

Foods
- Nuts
- Seafood
- Eggs
- Peas, beans
- Milk

Insect products
- Bee venom
- Wasp venom
- Ant venom
- Cockroach calyx
- Dust mites

Mold spores

Animal hair and dander

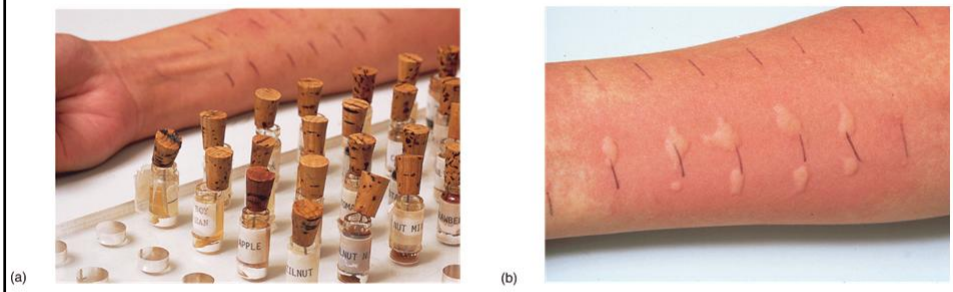
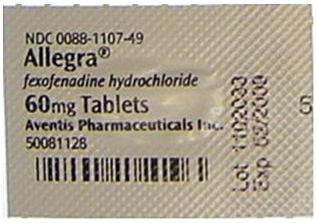


圖 15.27 過敏性皮膚試驗。(a)當注入抗原於敏感個體皮膚時，(b)幾分鐘內便會產生典型的發紅及疹塊反應。



抗組織胺

抗組織胺

抗組織胺

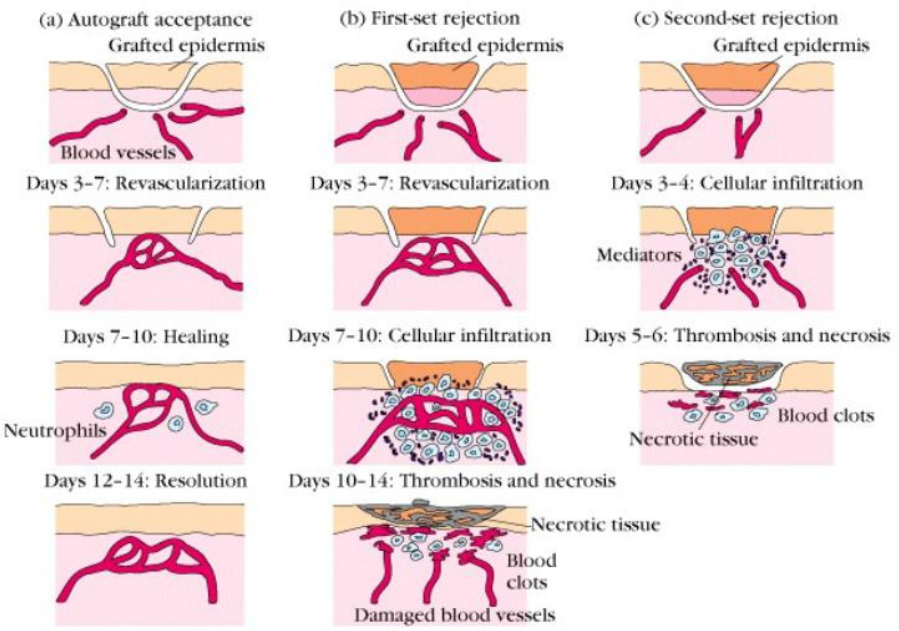
Benadryl

Autoimmune Disorders

表 15.10 自體免疫疾病的一些例子

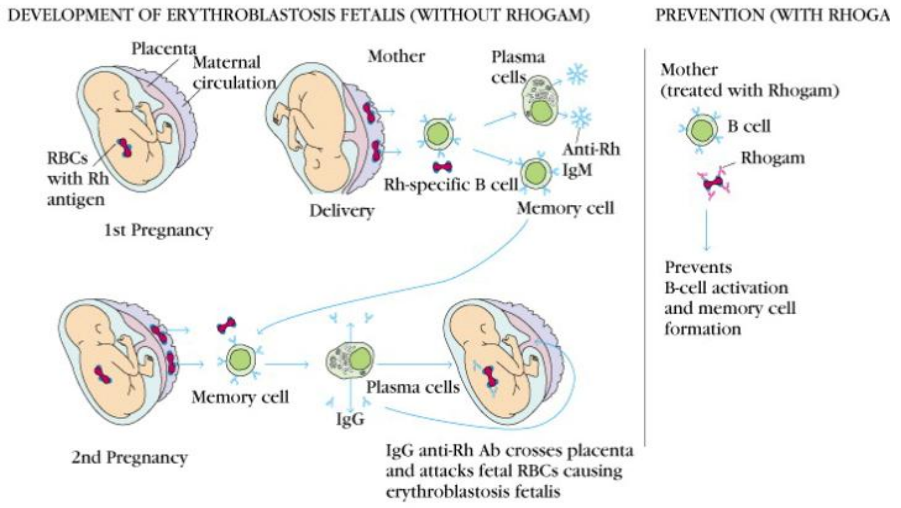
疾 病	抗 原
接種後及感染後腦脊髓炎	髓鞘質，交叉反應作用
精子生成不能 (Aspermatogenesis)	精子
交感性眼炎	葡萄膜(Uvea)
橋本氏甲狀腺炎	甲狀腺球蛋白
葛瑞夫茲氏病（凸眼性甲狀腺腫）	TSH 接受器蛋白
自體免疫溶血性疾病	紅血球表面之 I 、 Rh 或其他抗原
血小板缺乏性紫癜症	半抗原－血小板或吸附半抗原的抗原複合體
重症肌無力	乙醯膽鹼接受器
風濕熱	鏈球菌，與心臟瓣膜交叉反應作用
腎絲球腎炎	鏈球菌，與腎臟交叉反應作用
類風濕性關節炎	IgG
全身性紅斑性狼瘡	DNA 、核蛋白、 RNA 等
第一型糖尿病	胰臟小島中的 β 細胞
多發性硬化症	髓鞘的成份

X-ray of hands with arthritis



ABO血型系統與RH血型系統

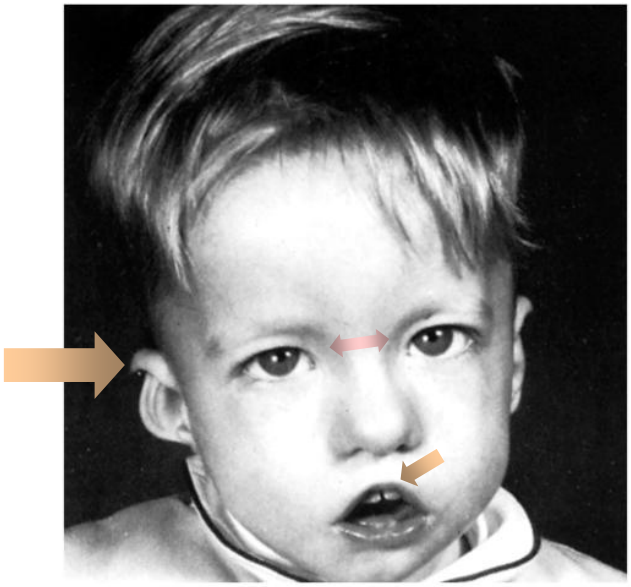
血型系統	ABO	RH
主要血型抗原	A抗原 B抗原	D抗原
抗 體	IgM, 自然產生 不經抗原刺激	IgG, 不自然產生 必經抗原刺激
造成RBC凝集溶血之情形	AB型間互相輸血 AB型輸給O型者	Rh (-)多次接受Rh(+)的血液 有Rh(+)胎兒的Rh (-)經產婦



免疫不全症
Deficient immune responses

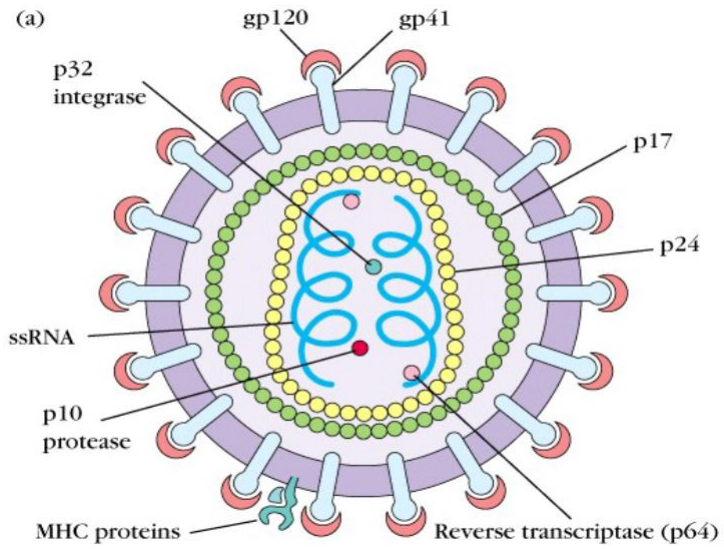
免疫不全可分為primary及secondary immunodeficiencies，前者起因於基因或是免疫系統發育時的缺陷，後者又稱acquired immunodeficiencies，病人因曝露於多樣化的下而導致免疫的缺失，目前最受重視的是AIDS

狄喬治症(DiGeorge syndrome)患者

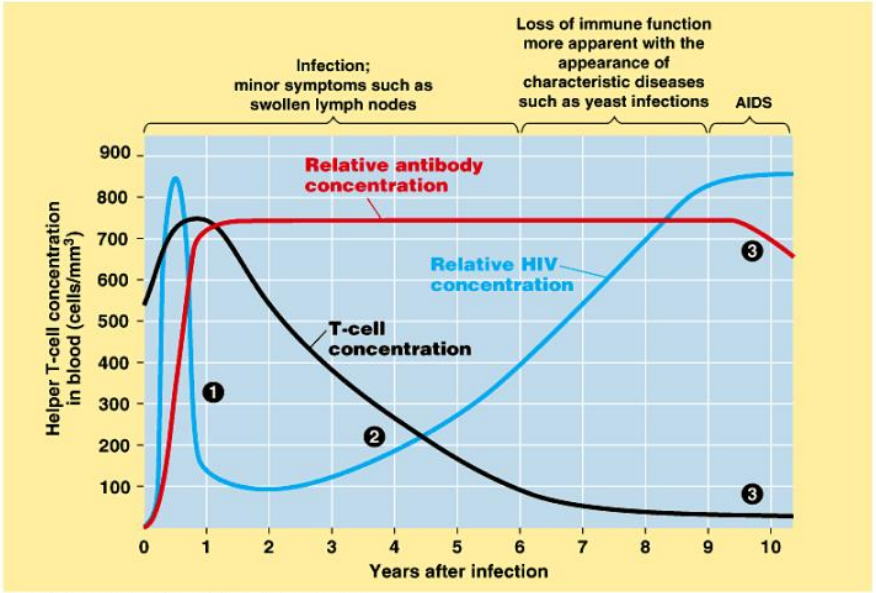


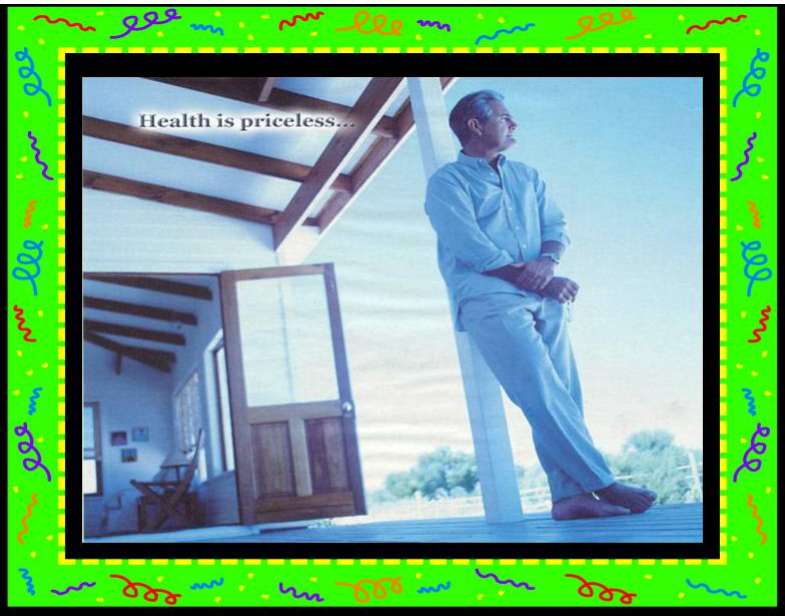
Acquired immunodeficiency syndrome

Acquired immunodeficiency syndrome (AIDS) is a severe immune system disorder caused by infection with the human immunodeficiency virus (HIV). Individuals with AIDS are highly susceptible to opportunistic diseases, infections, and cancers that take advantage of a deficient immune system. Mortality rate approaches 100%. HIV probably evolved from another virus in central Africa and may have gone unrecognized for many years.

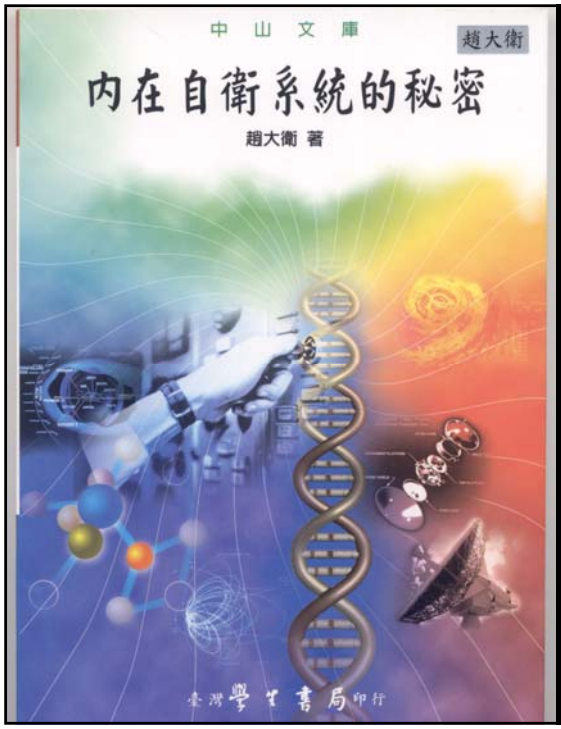


The stages of HIV infection





生過病就知道健康是無價的



打開了一本屬於
高中生的免疫學