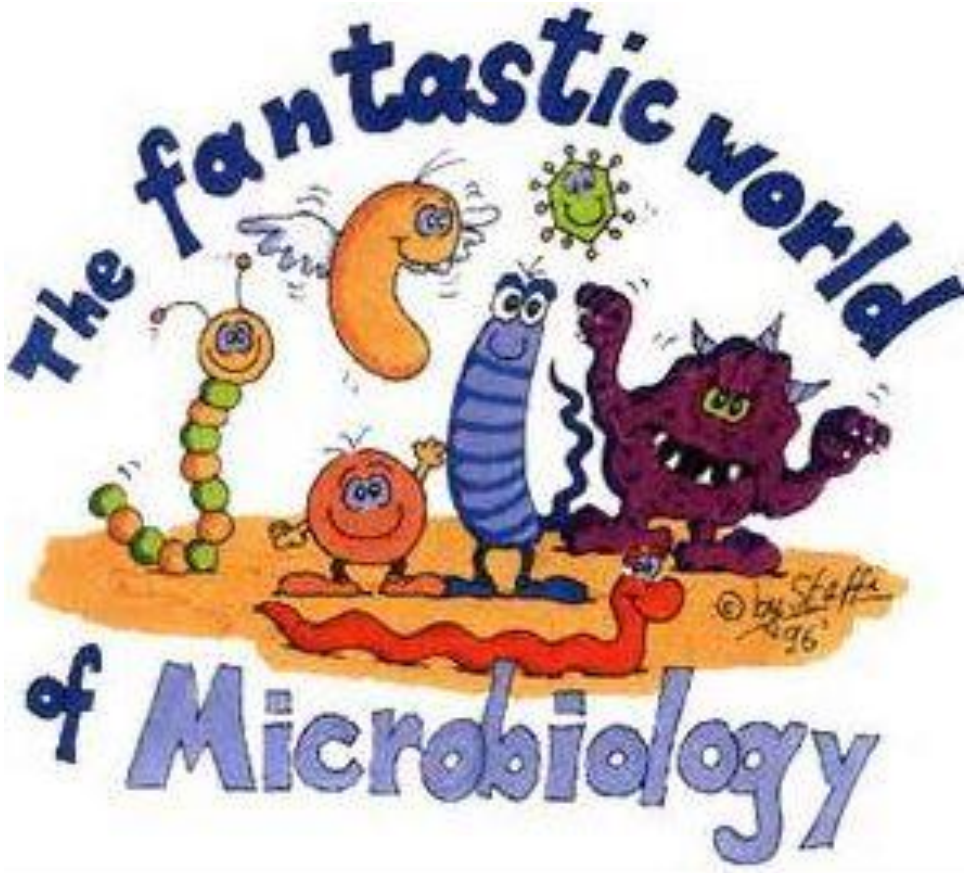
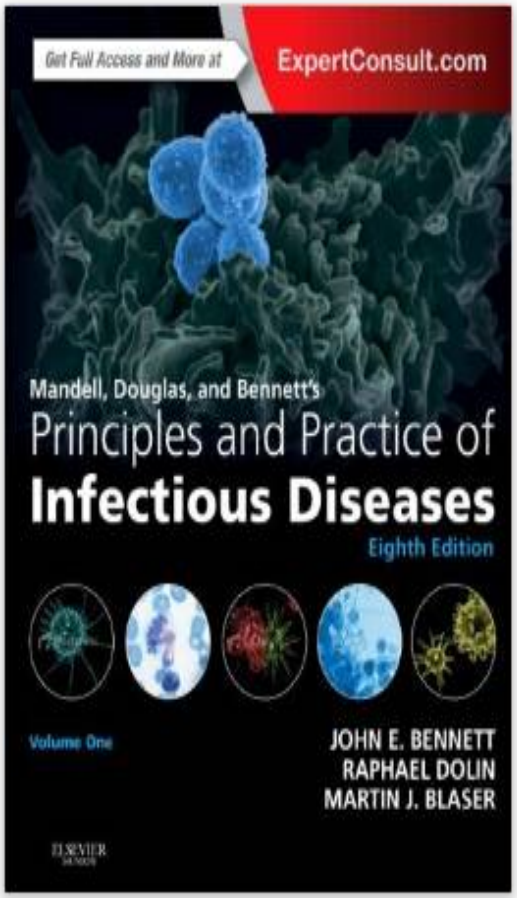
Infectious Diseases Specialist

- ….and what is it exactly that you do?


The fantastic world
of Microbiology



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by John E. Bennett MD (Author), Raphael Dolin MD (Author), Martin J. Blaser MD (Author)

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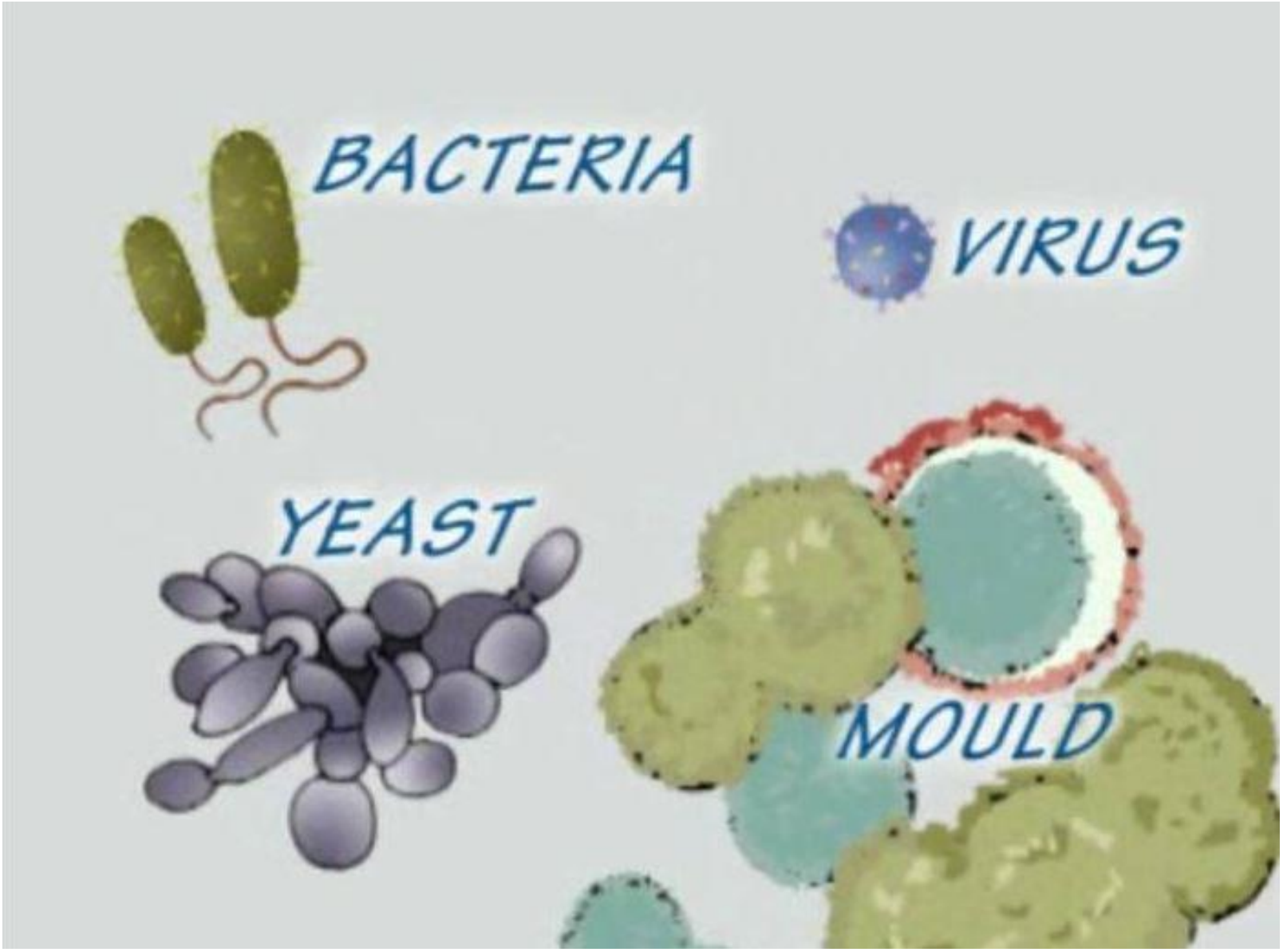
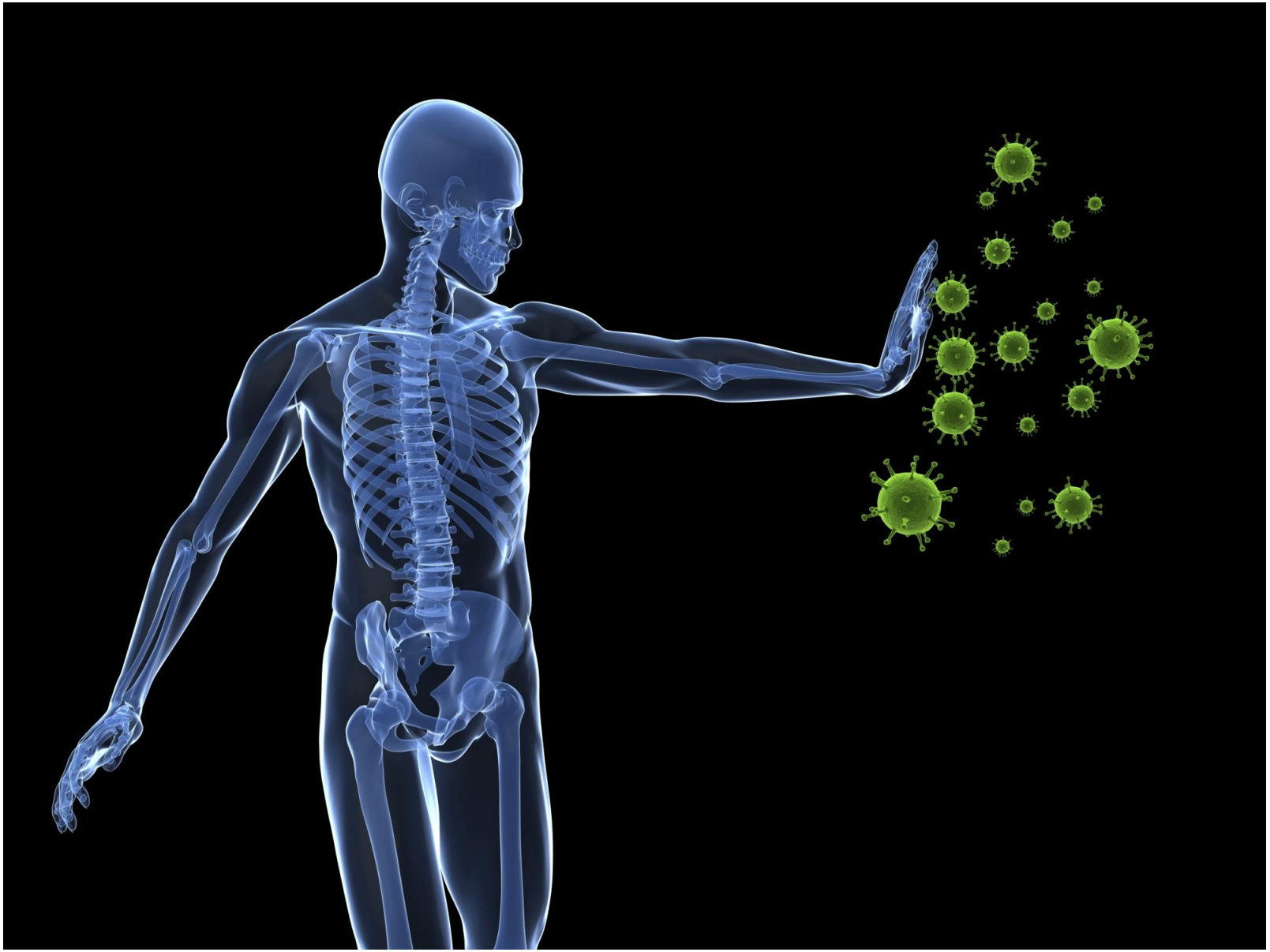
OH, MY GOD! THERE ARE BILLIONS OF THEM!
OF WHAT DOCTOR?! BILLIONS OF WHAT?!

Parasite-Host Relationship

SUPPORT BACTERIA!

it's the only culture some people have


BACTERIA
VIRUS
YEAST
MOULD

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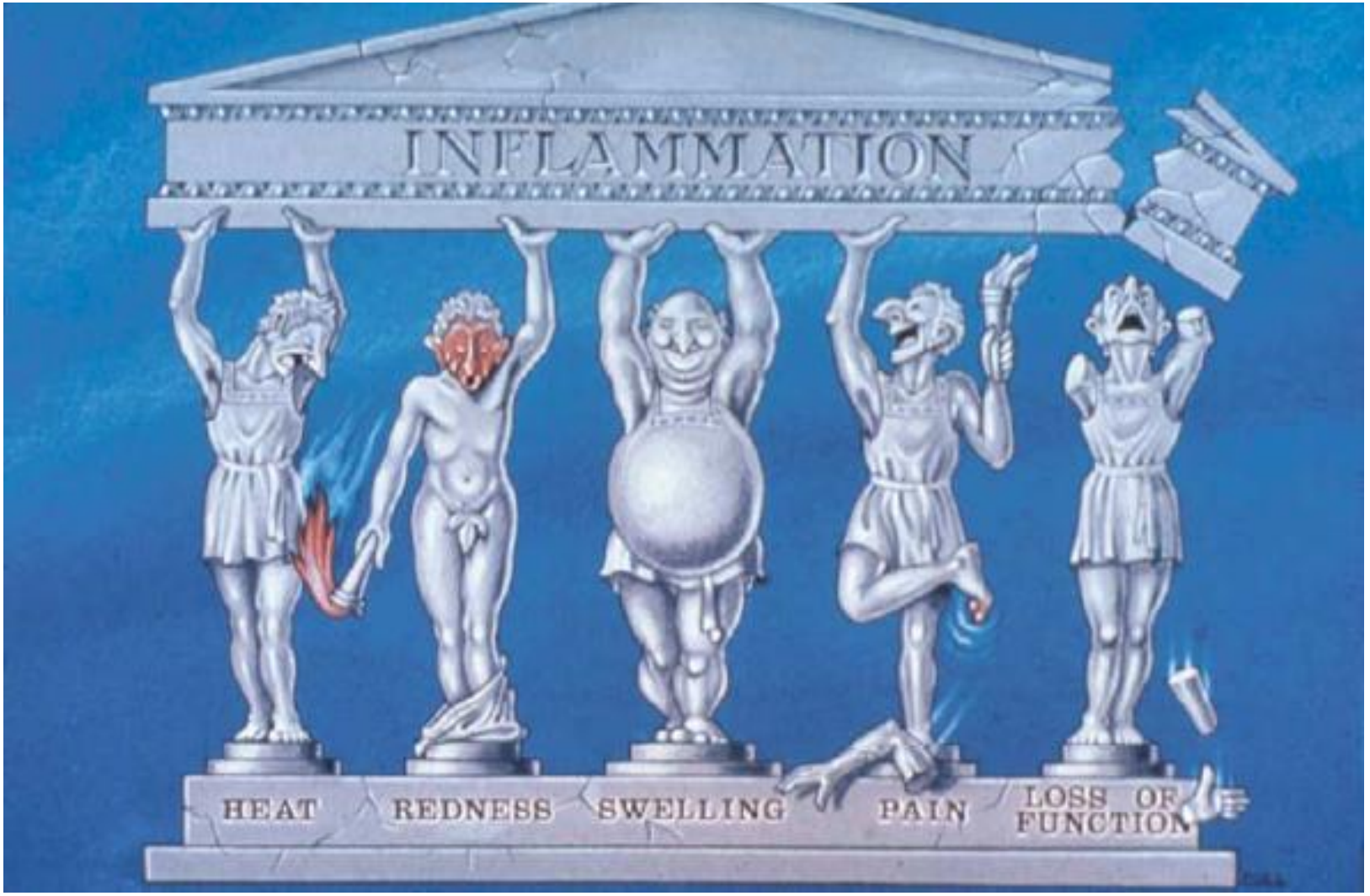
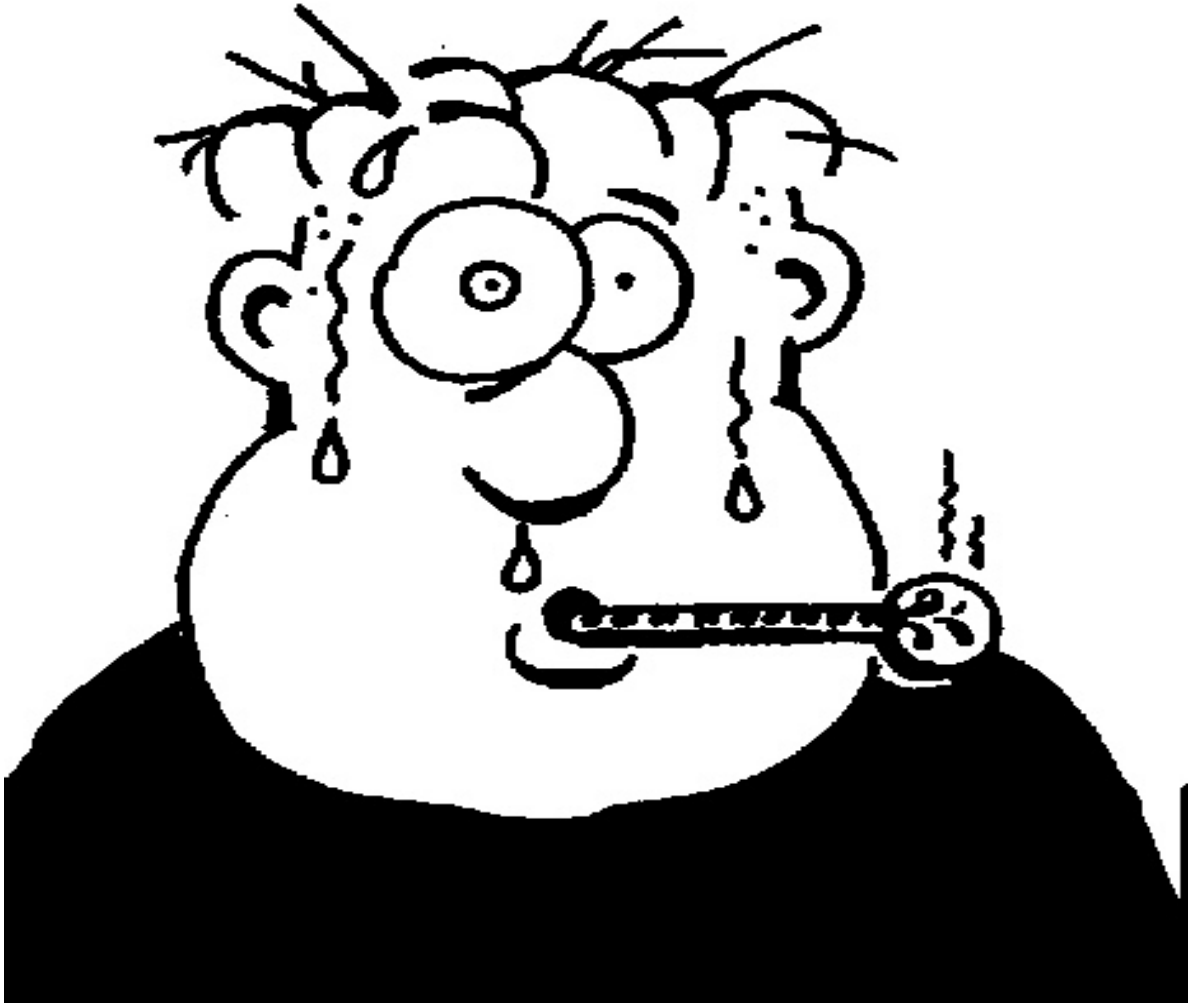
Otherwise harmless germs can be opportunists

Taking advantage of a weakened host condition

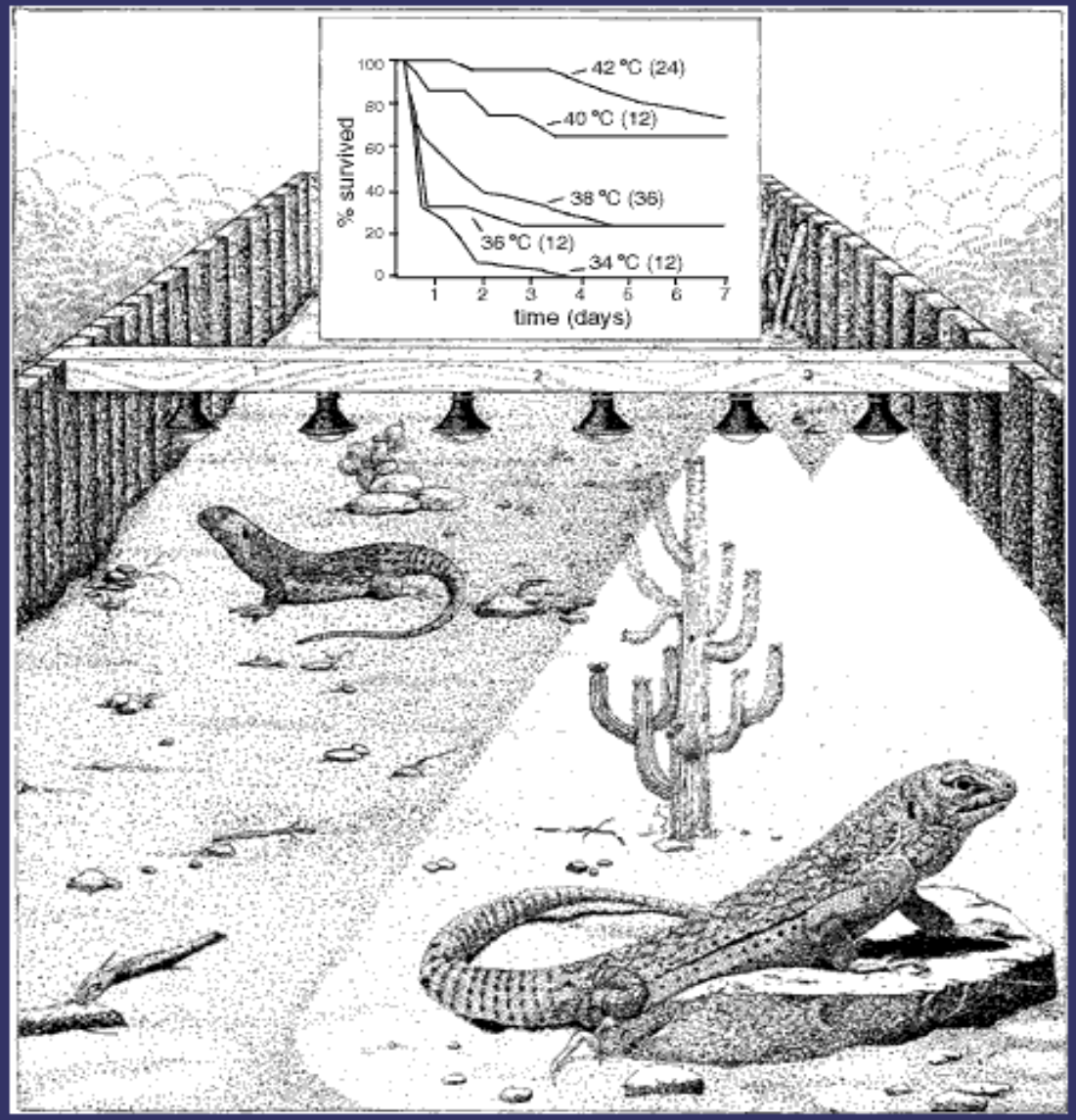

INFLAMMATION
HEAT
REDNESS
SWELLING
PAIN
LOSS OF FUNCTION



Why Fever?

Dipsosaurus dorsalis

Function of Fever

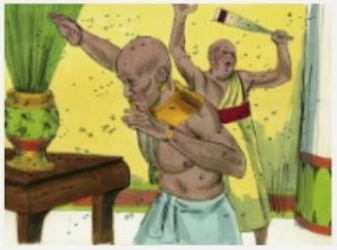


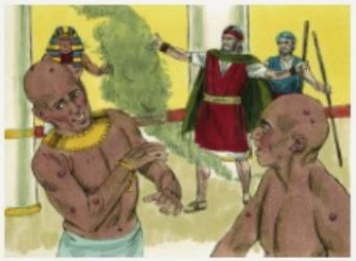
Courtesy of the American Museum of Natural History.

10 Plagues

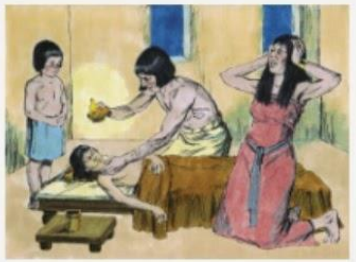
Exodus 7-12

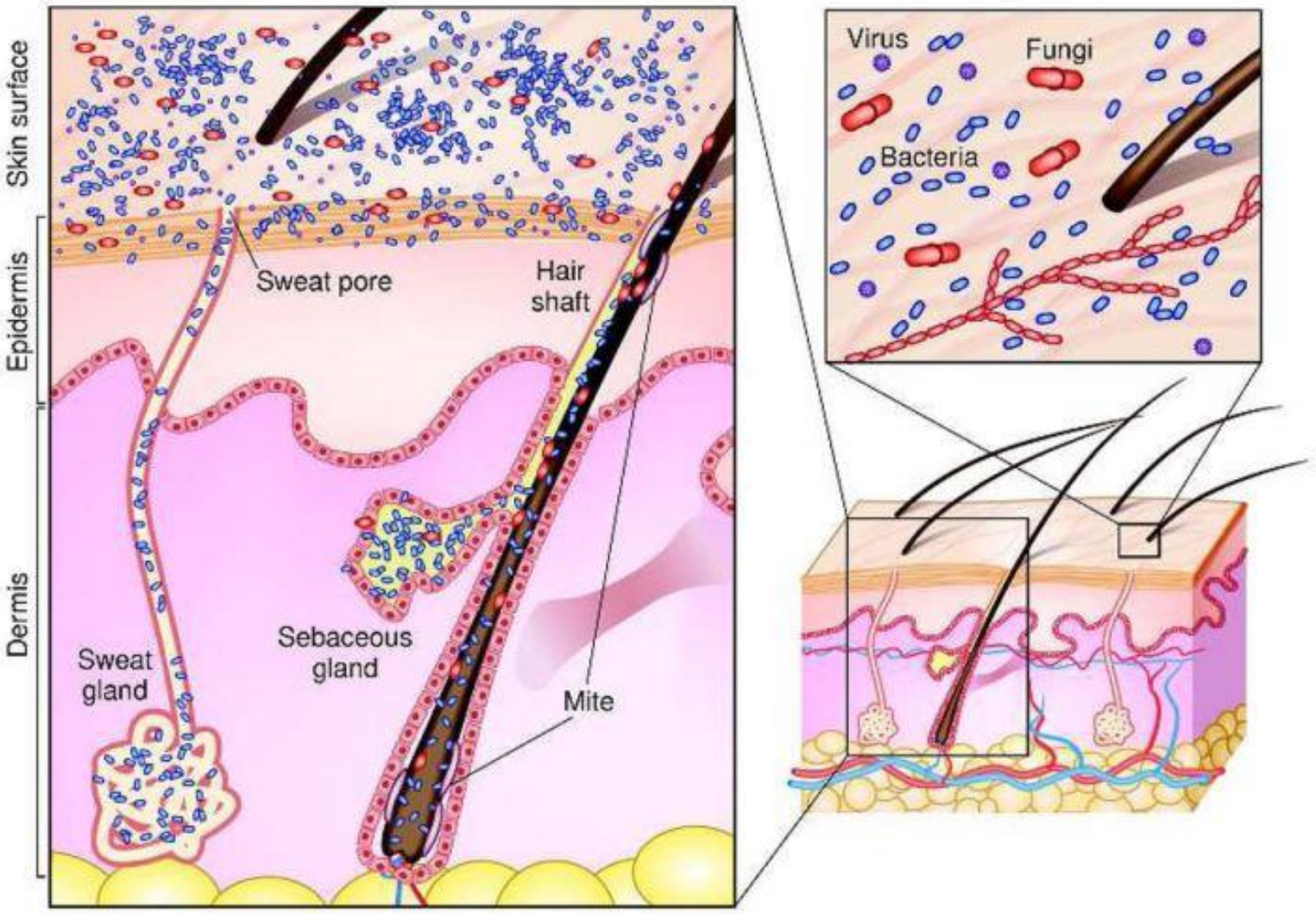
1. Water to blood
2. Frogs
3. Lice
4. Flies
5. Animals died from disease
6. Boils
7. Hail
8. Locusts
9. Darkness
10. Death of firstborn

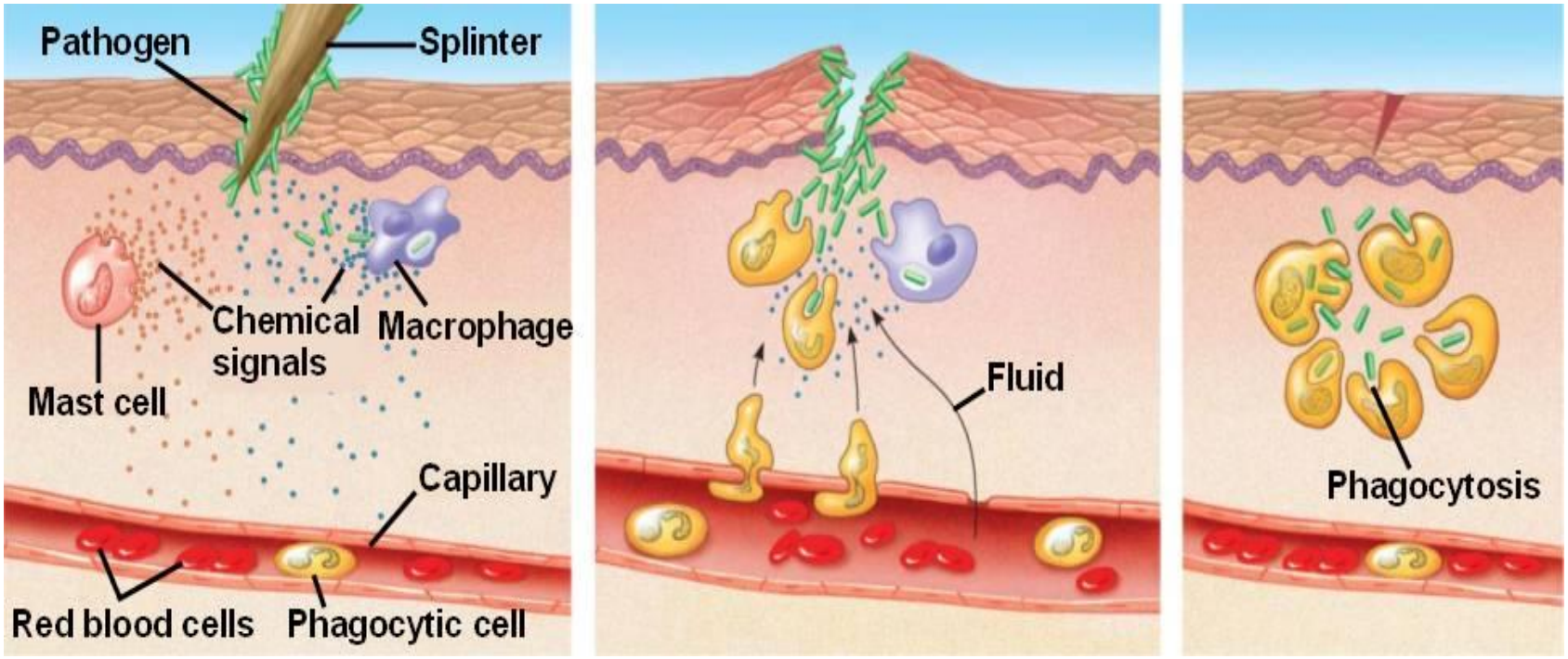





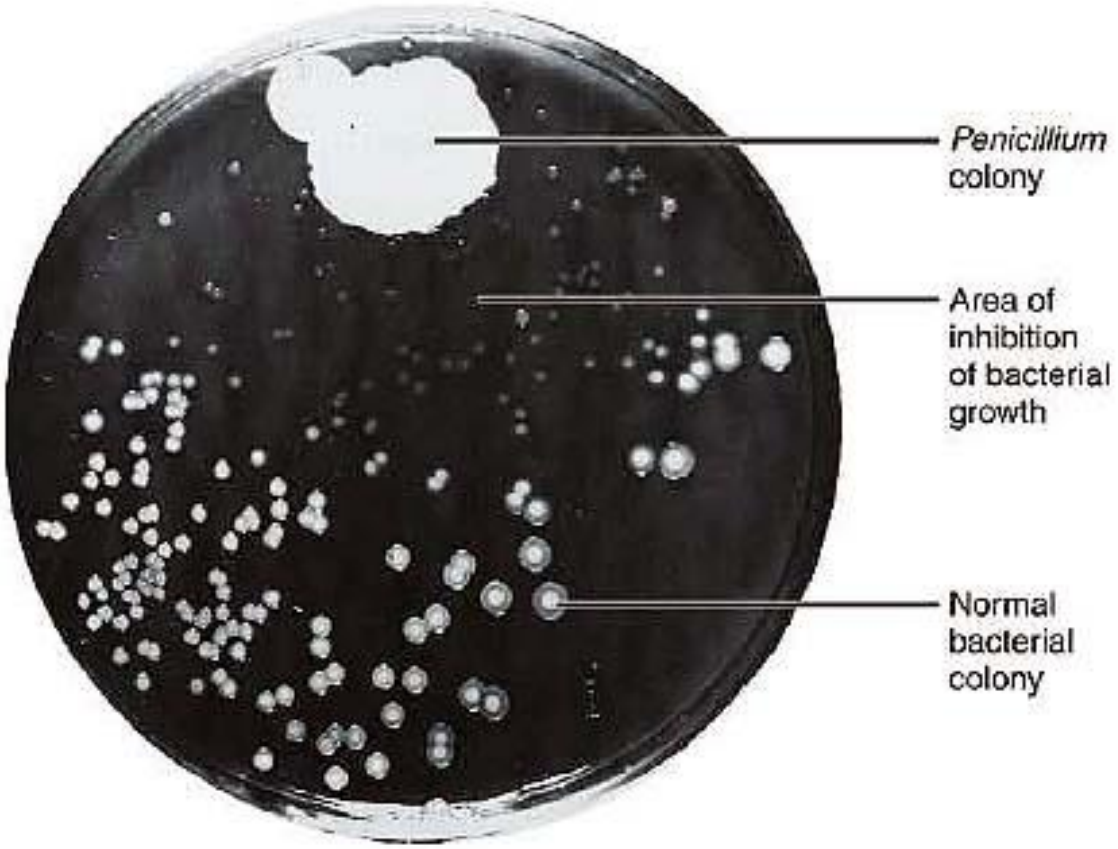



Skin surface
Epidermis
Dermis
Sweat pore
Hair shaft
Sebaceous gland
Sweat gland
Mite
Virus
Fungi
Bacteria


2 µm

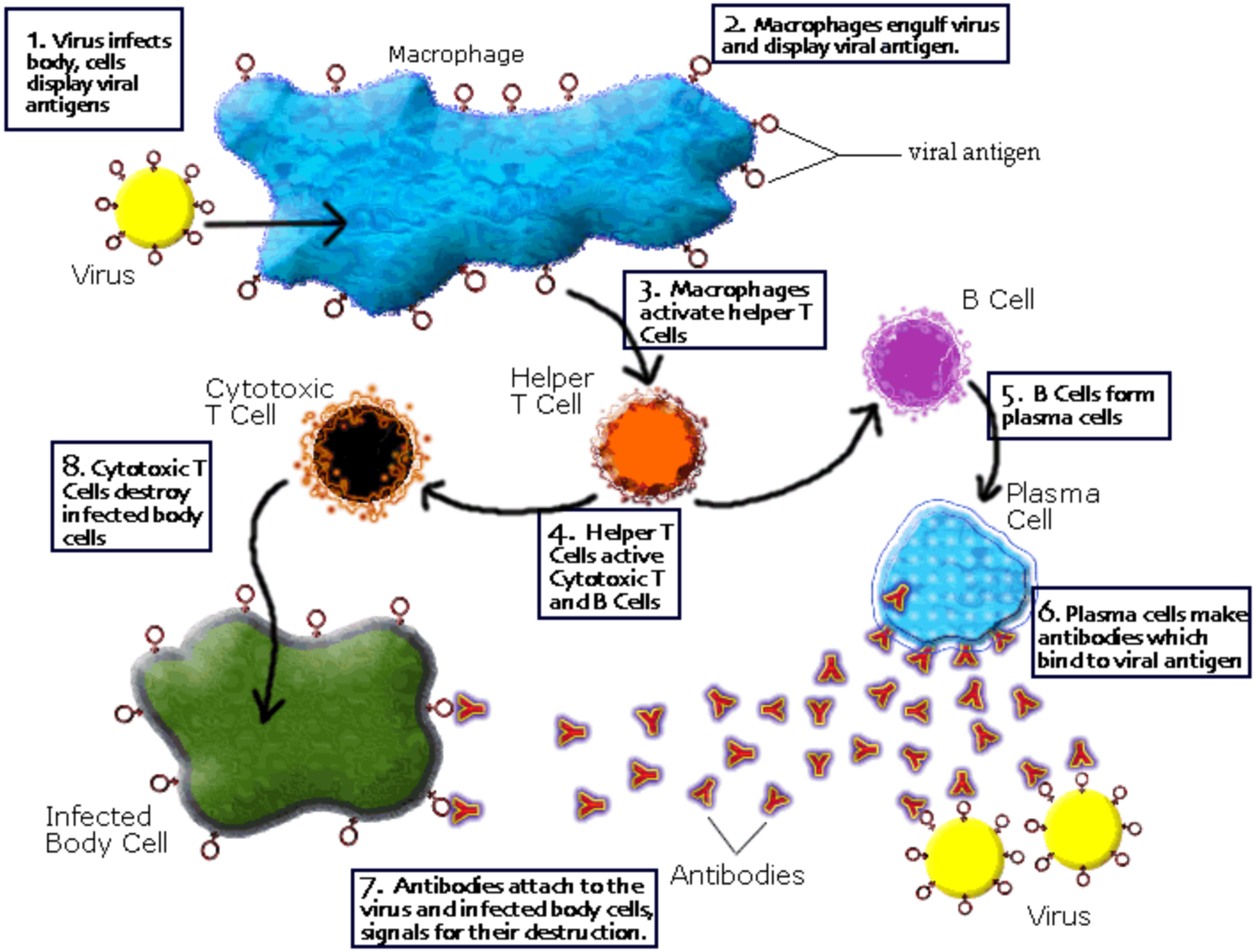

Pathogen
Splinter
Chemical signals
Macrophage
Mast cell
Capillary
Red blood cells
Phagocytic cell
Fluid
Phagocytosis

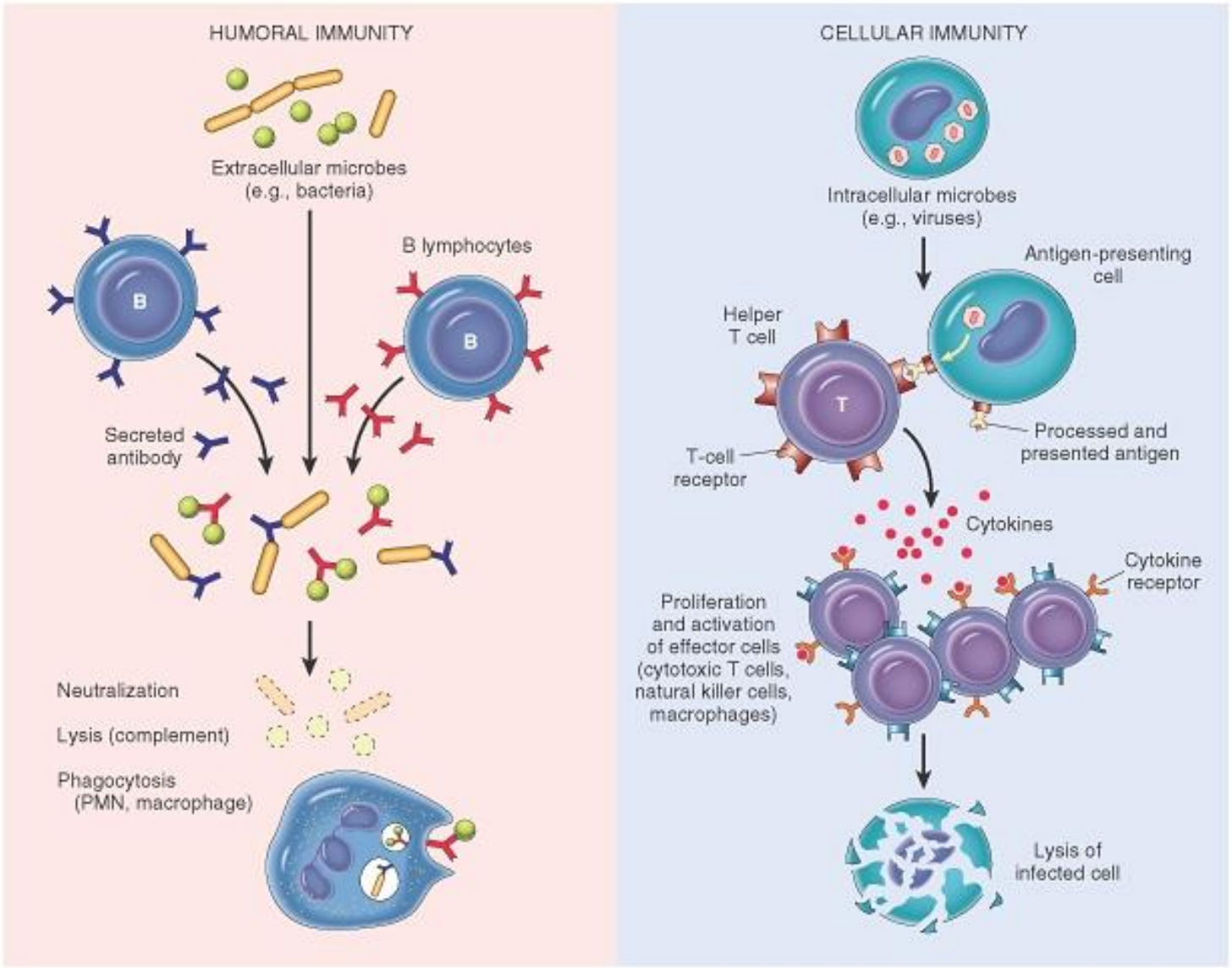

©
www.microbiologyinpictures.com
Hans N.
Staphylococcus aureus

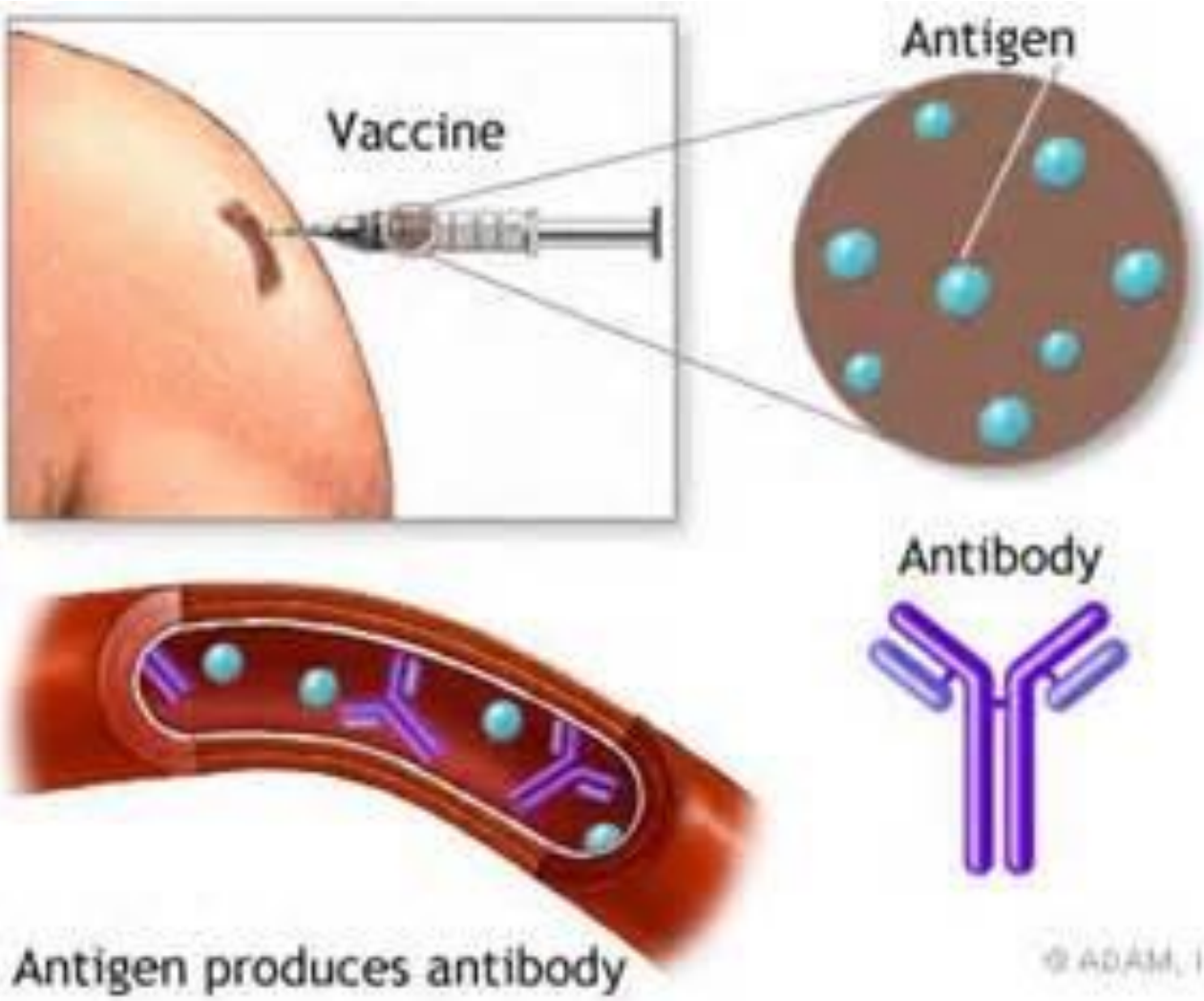

Penicillium colony
Area of inhibition of bacterial growth
Normal bacterial colony

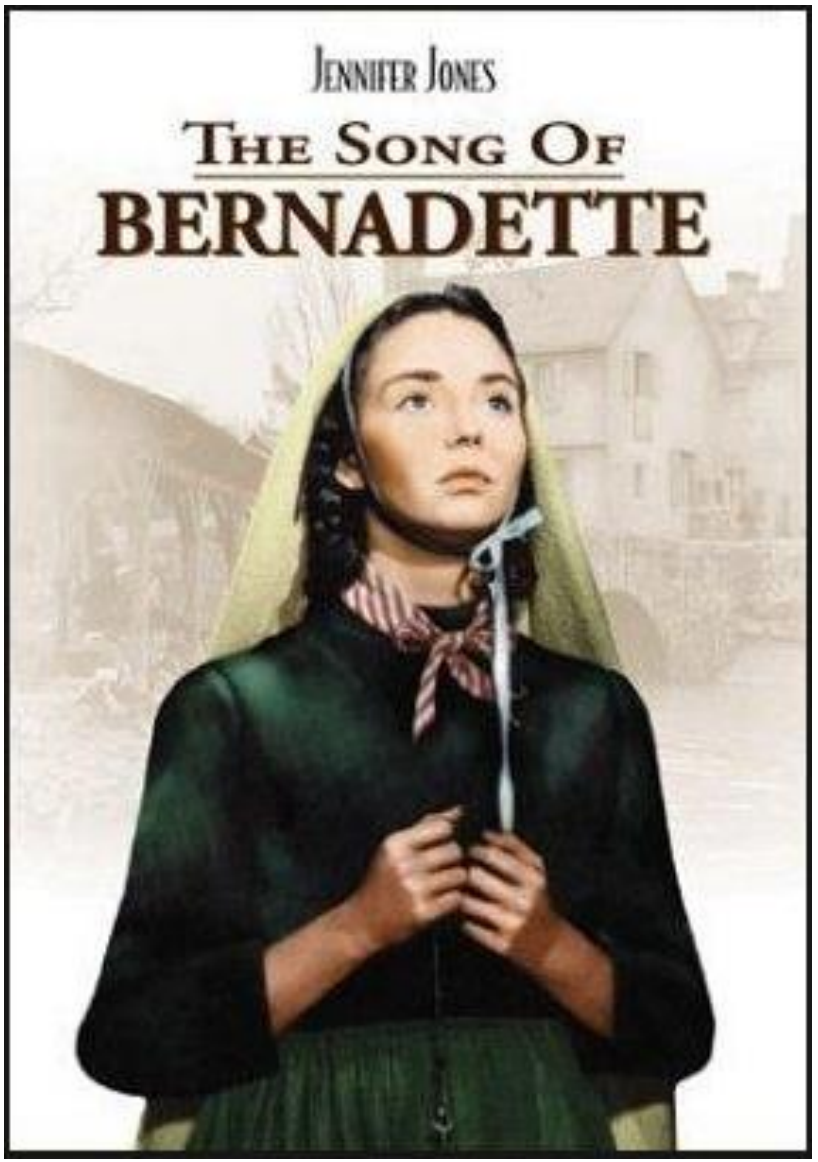

KILLS
99%
KILLS
99%

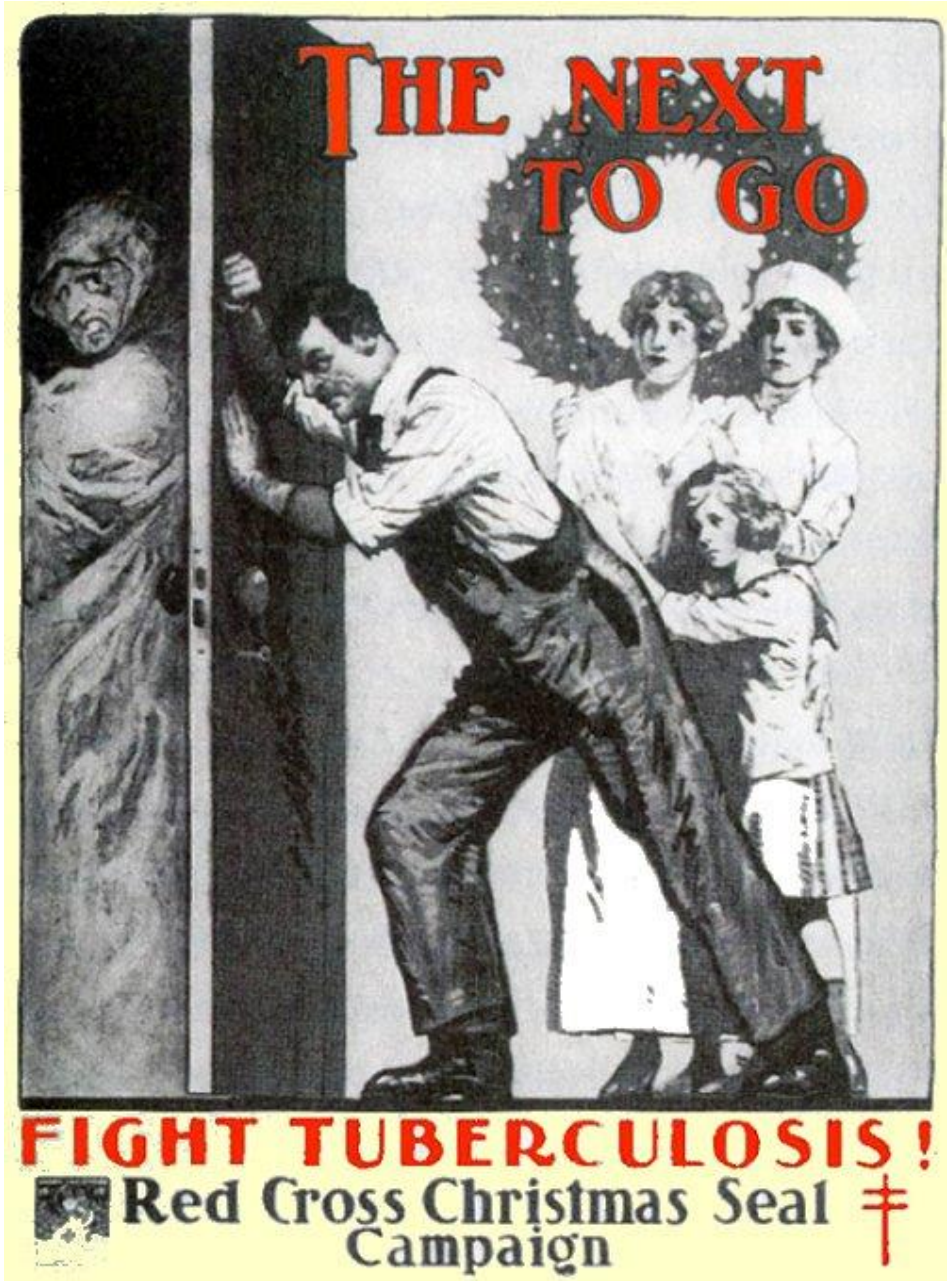

GREG CAN'T PLAY
MUMPS


1. Virus infects body, cells display viral antigens
Macrophage
2. Macrophages engulf virus and display viral antigen.
viral antigen
Virus
3. Macrophages activate helper T Cells
B Cell
Cytotoxic T Cell
Helper T Cell
5. B Cells form plasma cells
8. Cytotoxic T Cells destroy infected body cells
Plasma Cell
4. Helper T Cells active Cytotoxic T and B Cells
6. Plasma cells make antibodies which bind to viral antigen
Infected Body Cell
Antibodies
7. Antibodies attach to the virus and infected body cells, signals for their destruction.
Virus




Vaccine
Antigen
Antibody
Antigen produces antibody
© ADAM, Inc.


Jennifer Jones
The Song Of
BERNADETTE


THE NEXT TO GO
FIGHT TUBERCULOSIS!
Red Cross Christmas Seal Campaign

George Orwell
Died at 47 (1903-1950)

Louis Braille
Died at 43 (1809-1852)

Simón Bolívar
Died at 47 (1783-1830)

Doc Holliday
Died at 36 (1851-1887)

Frédéric Chopin
Died at 39 (1810-1849)

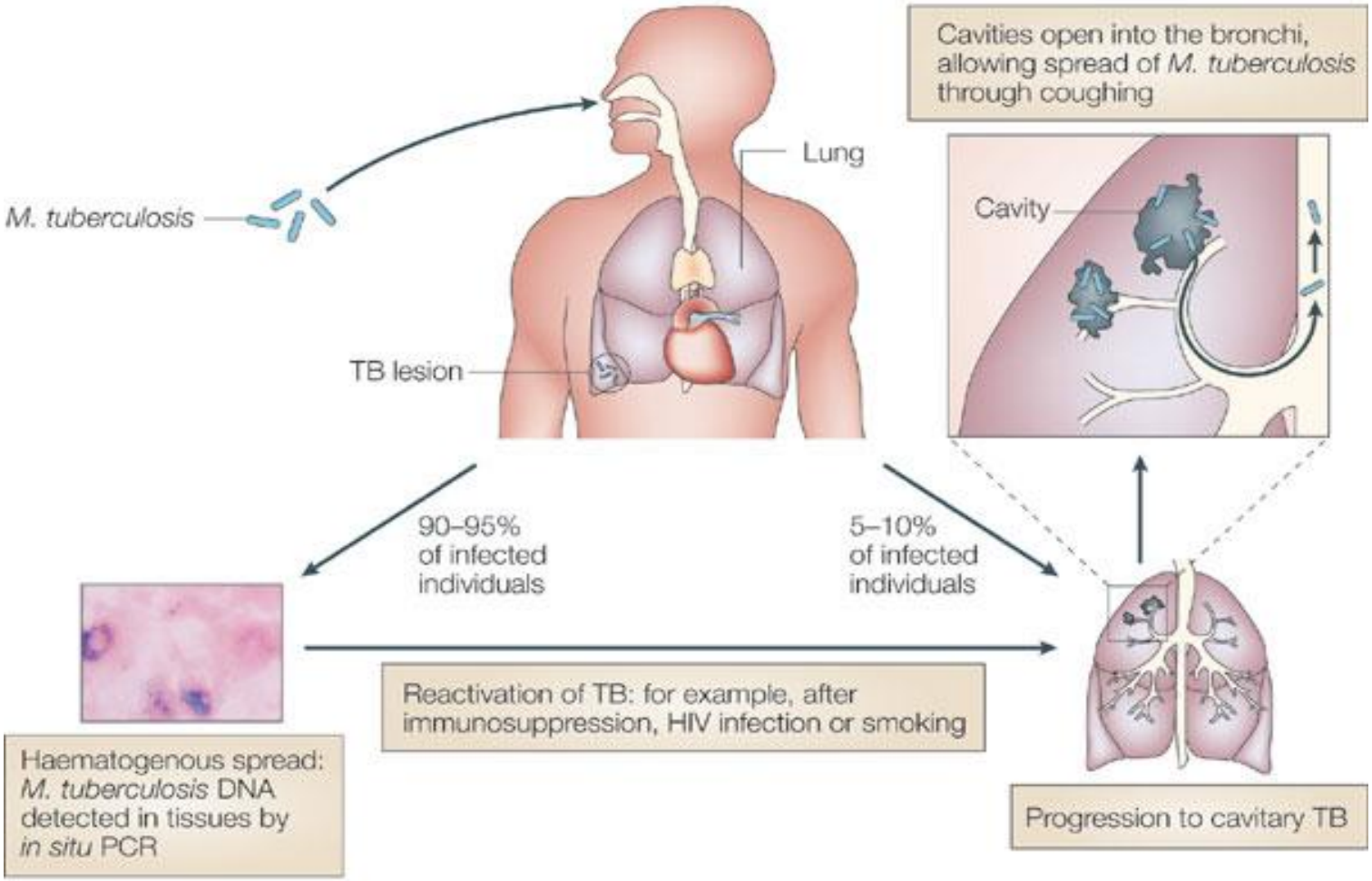
Vivien Leigh
Died at 54 (1913-1967)

Henry David Thoreau
Died at 45 (1817-1862)

John Keats
Died at 26 (1795-1821)

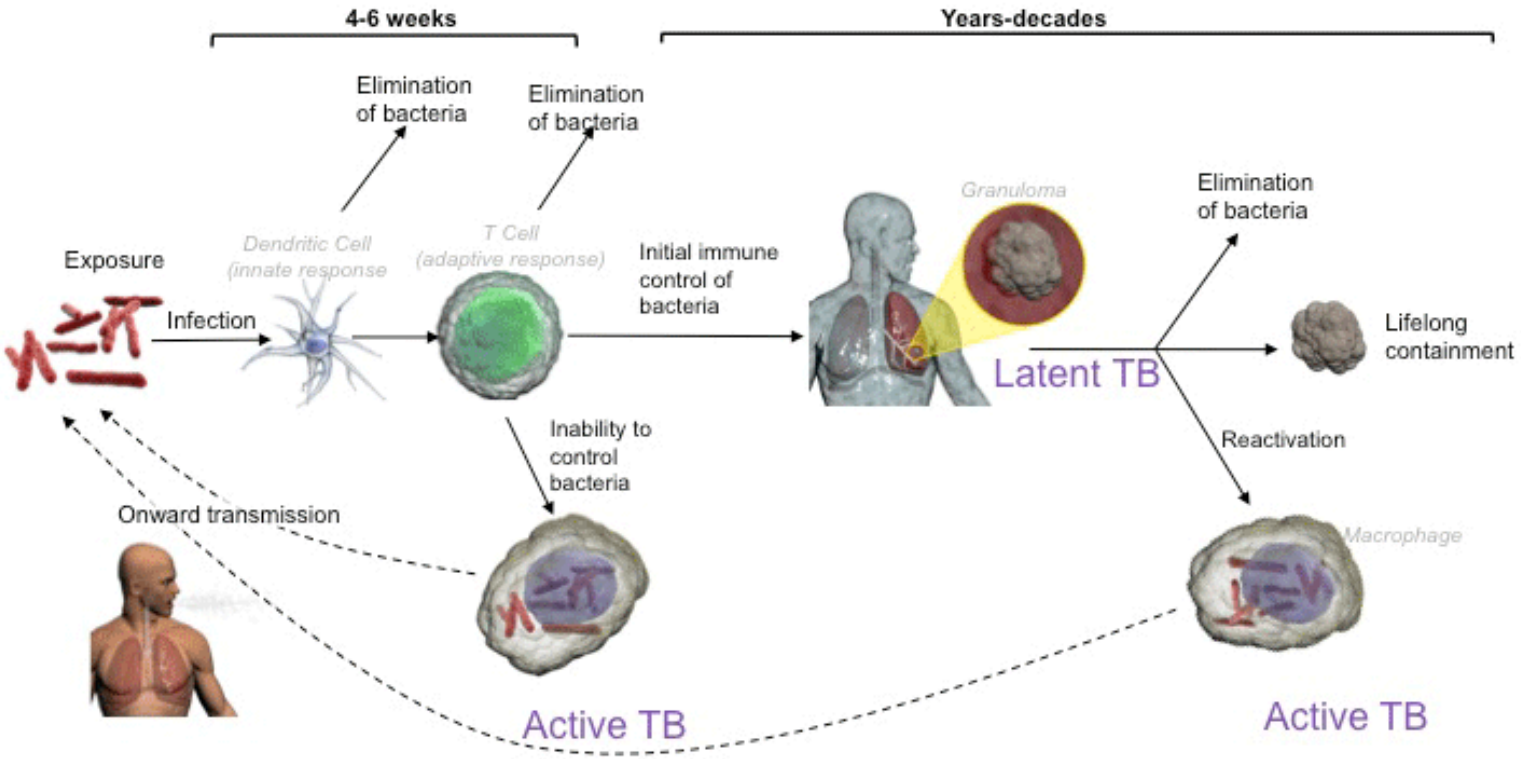
Anton Chekhov
Died at 44 (1860-1904)

Jane Austen
Died at 42 (1775-1817)

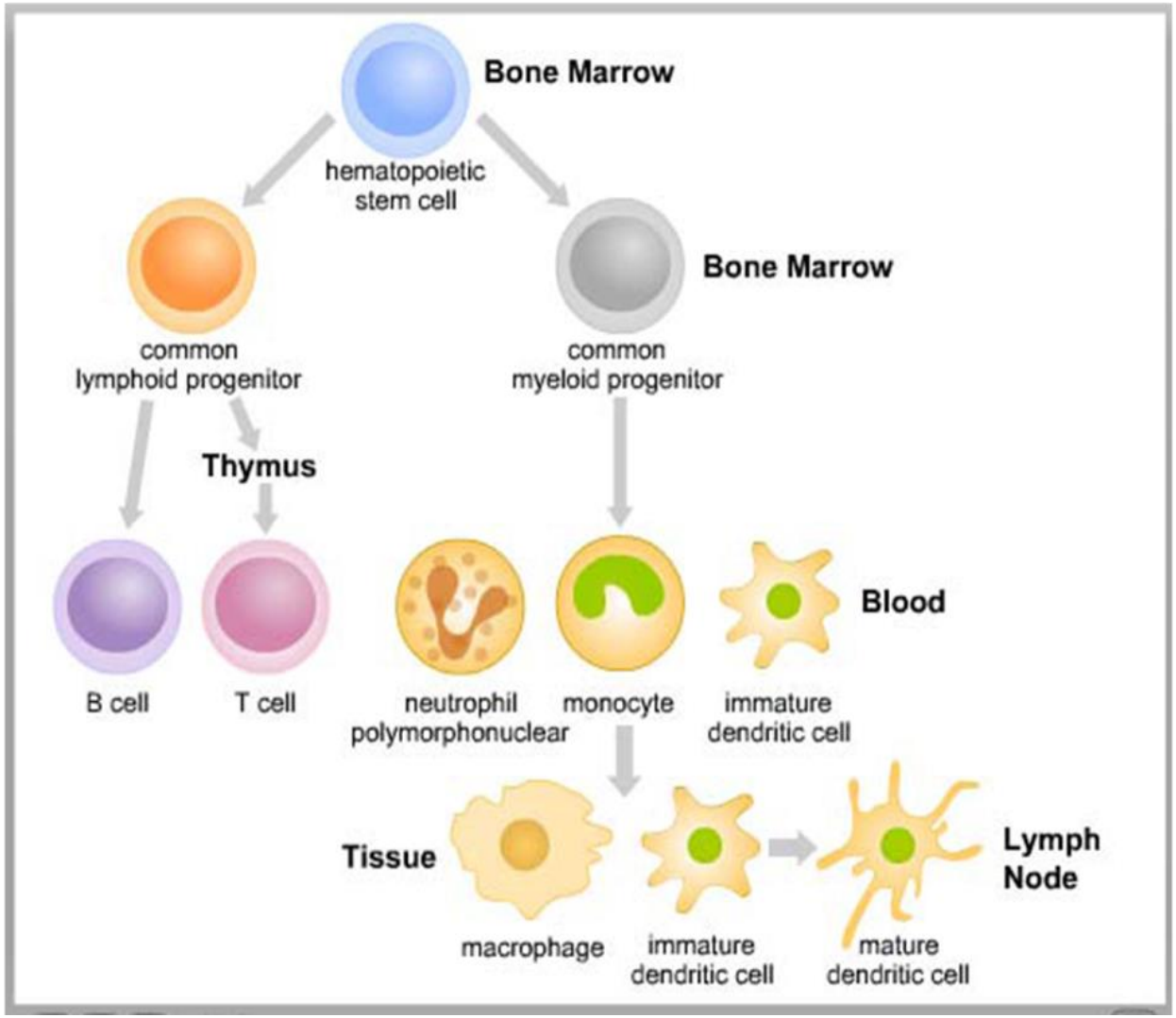


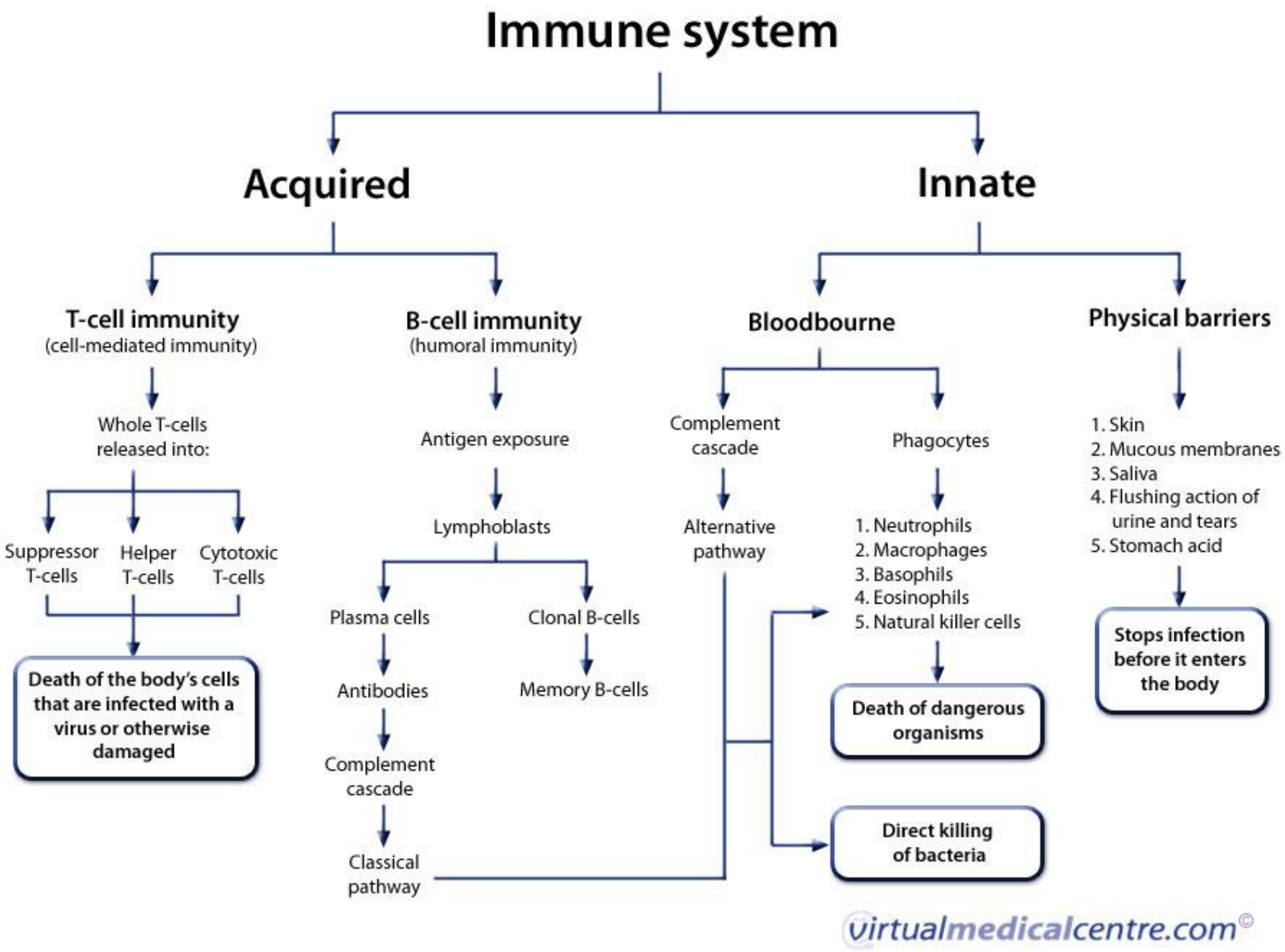
Nature Reviews | Immunology

Natural history of TB infection



White Blood Cell Lineages

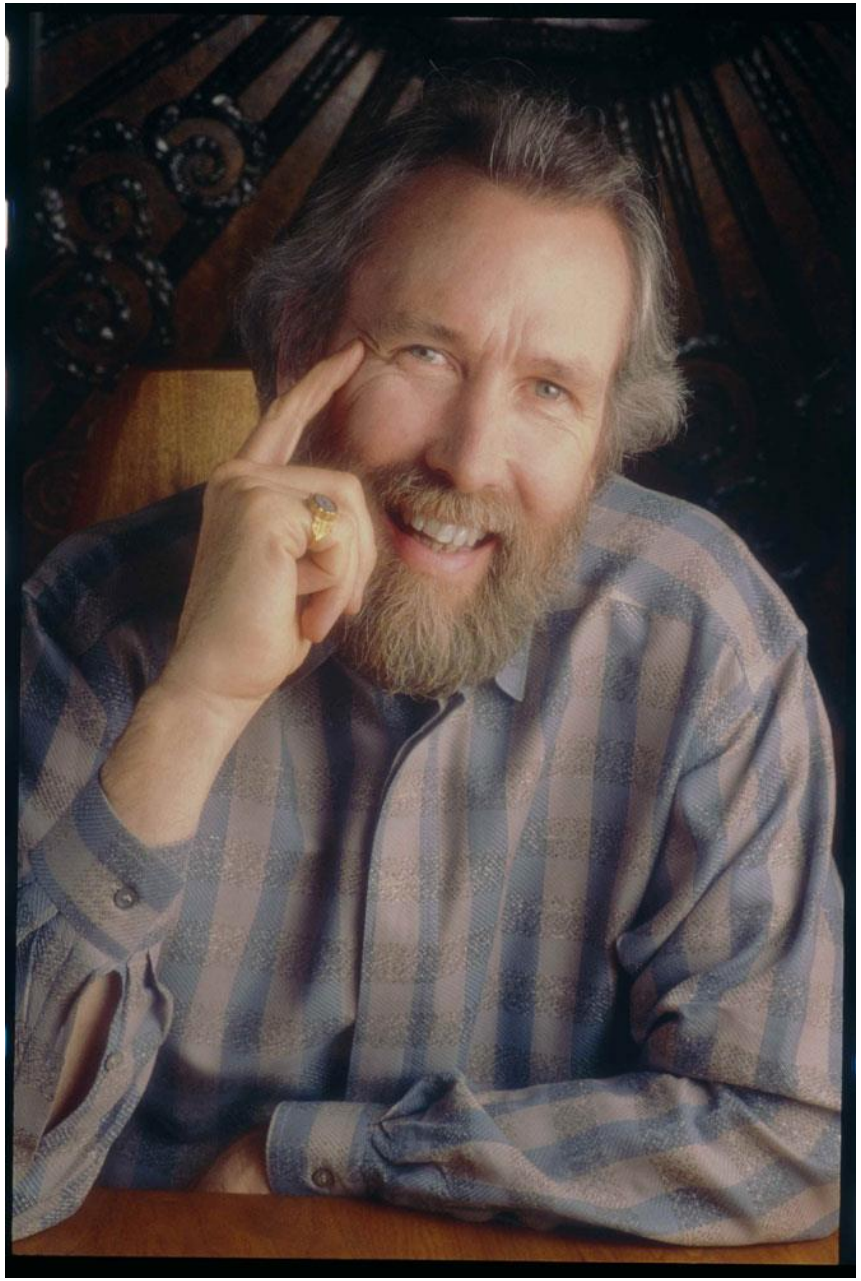


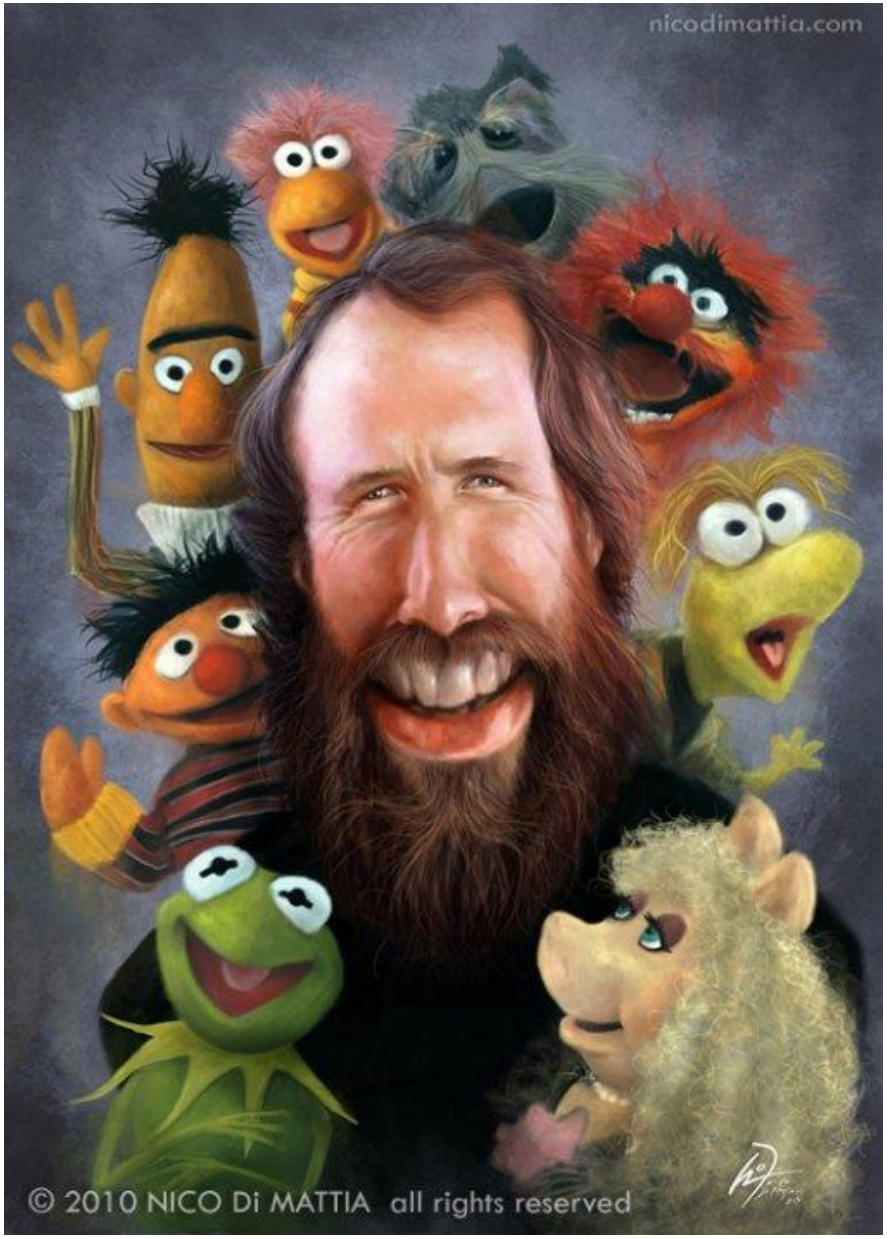


- inflammatory response to infection

Murphy's Law

"If anything can go wrong, it will"

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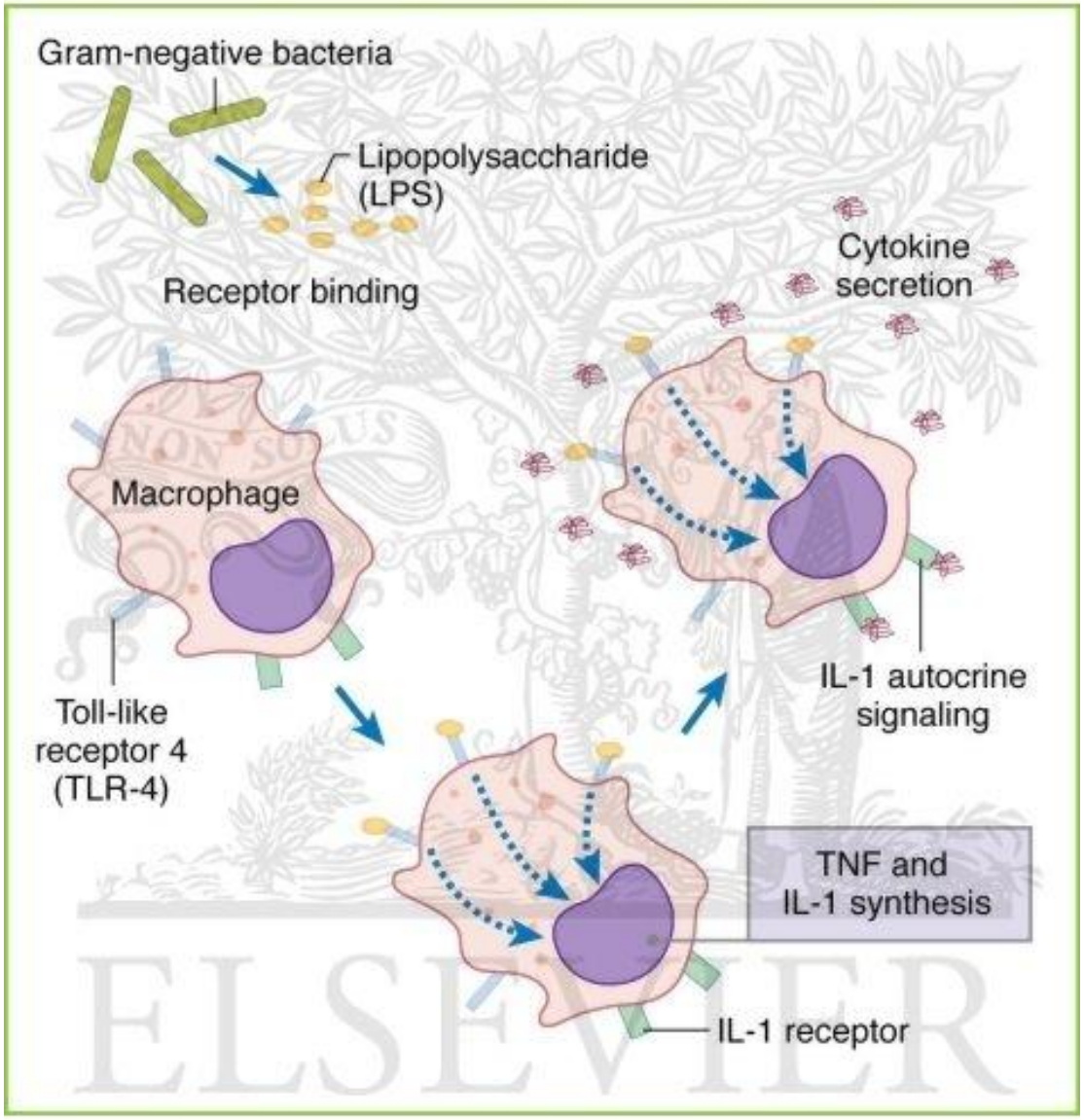
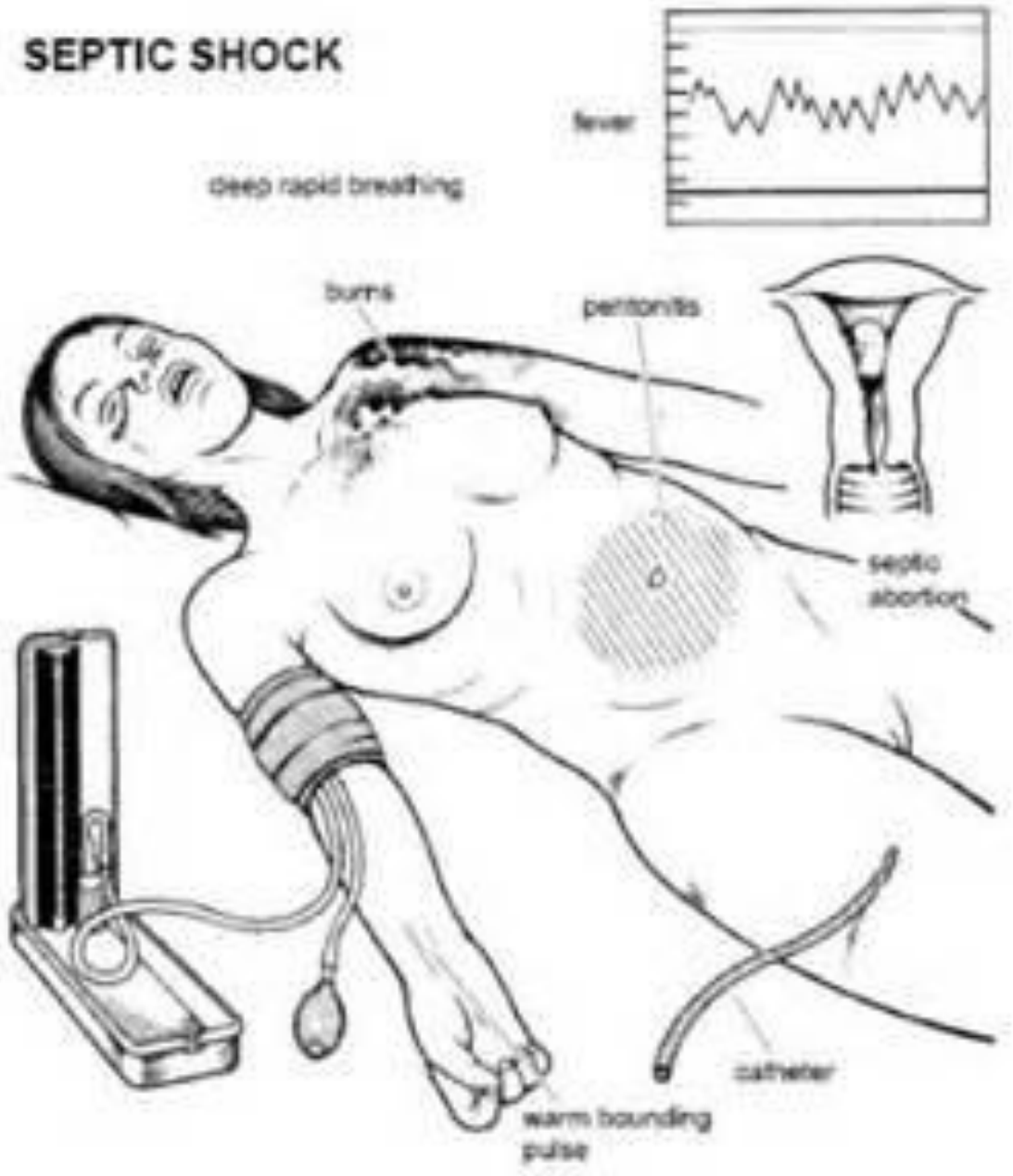


SEPTIC SHOCK



- inflammatory response to infection
- inflammatory response to infection overshoots _sepsis

The first time the allergy-prone person runs across an allergen such as ragweed,

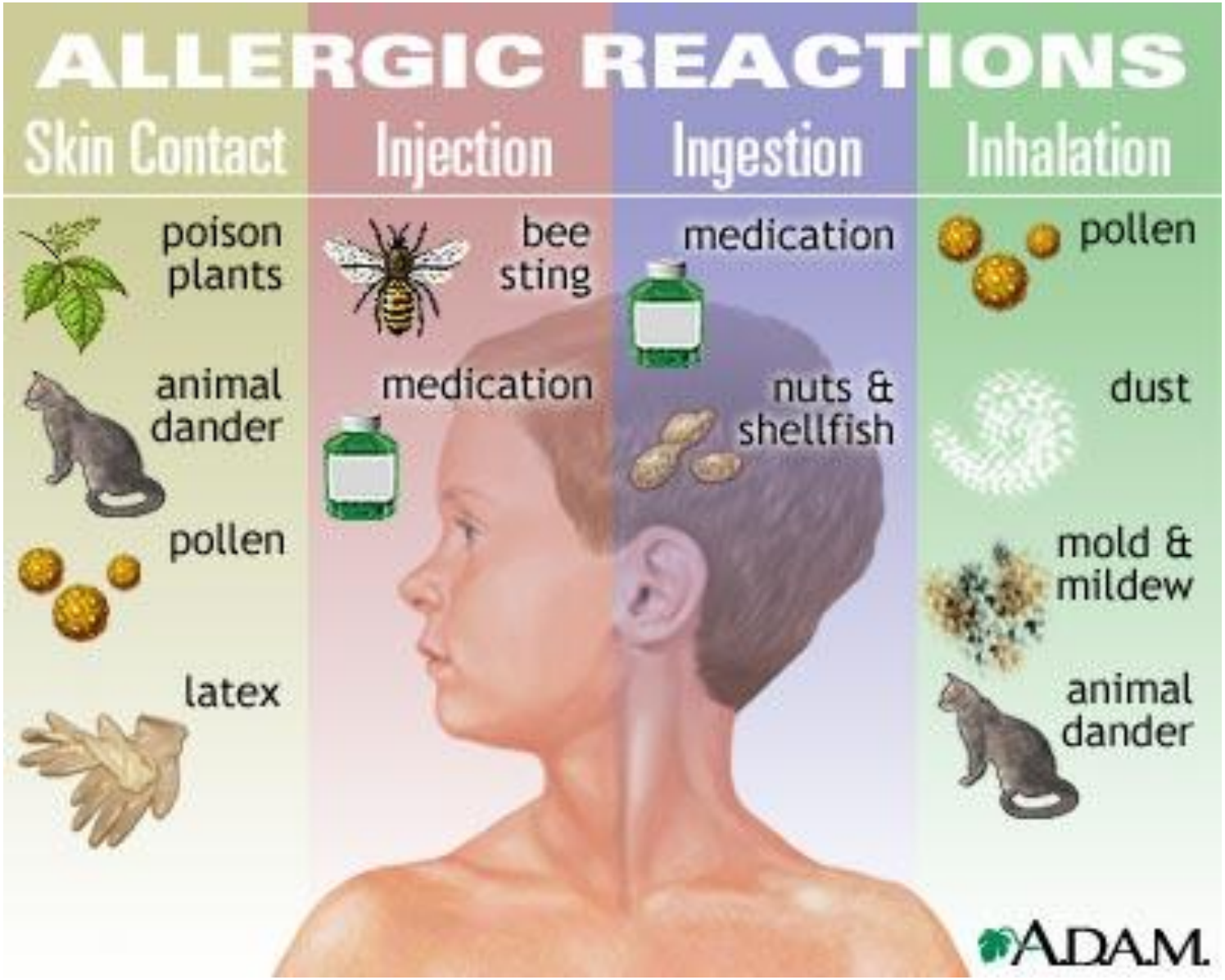
he or she makes large amounts of ragweed IgE antibody.

These IgE molecules attach themselves to mast cells.

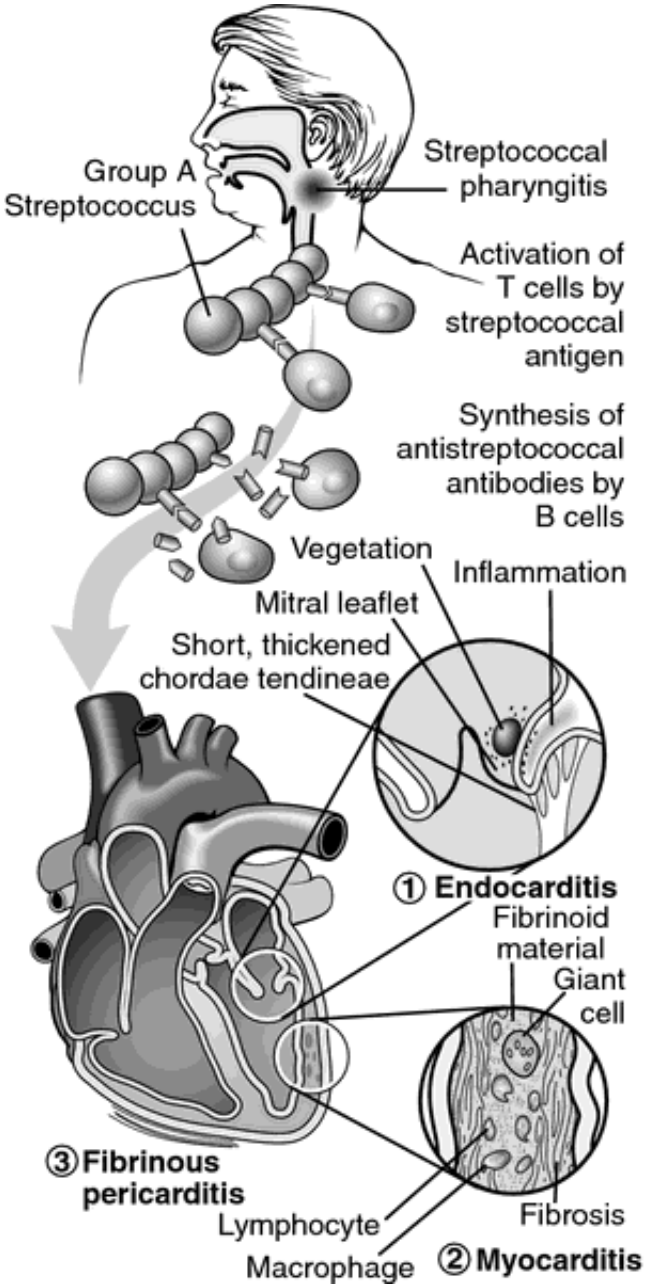
The second time that person has a brush with ragweed,

the IgE-primed mast cell will release its powerful chemicals,

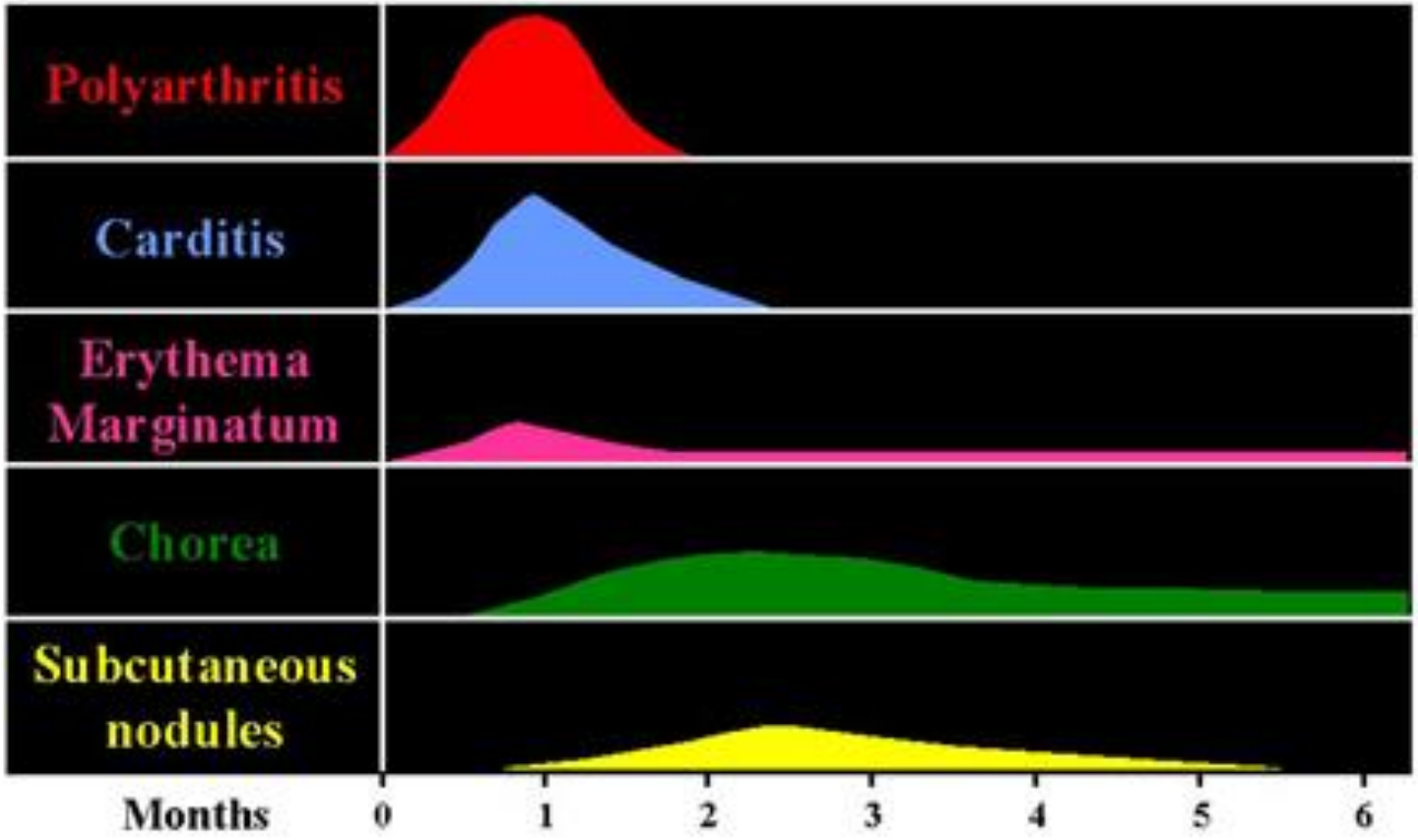
and the person will suffer the wheezing and/or sneezing, runny nose, watery eyes, and itching of allergy.

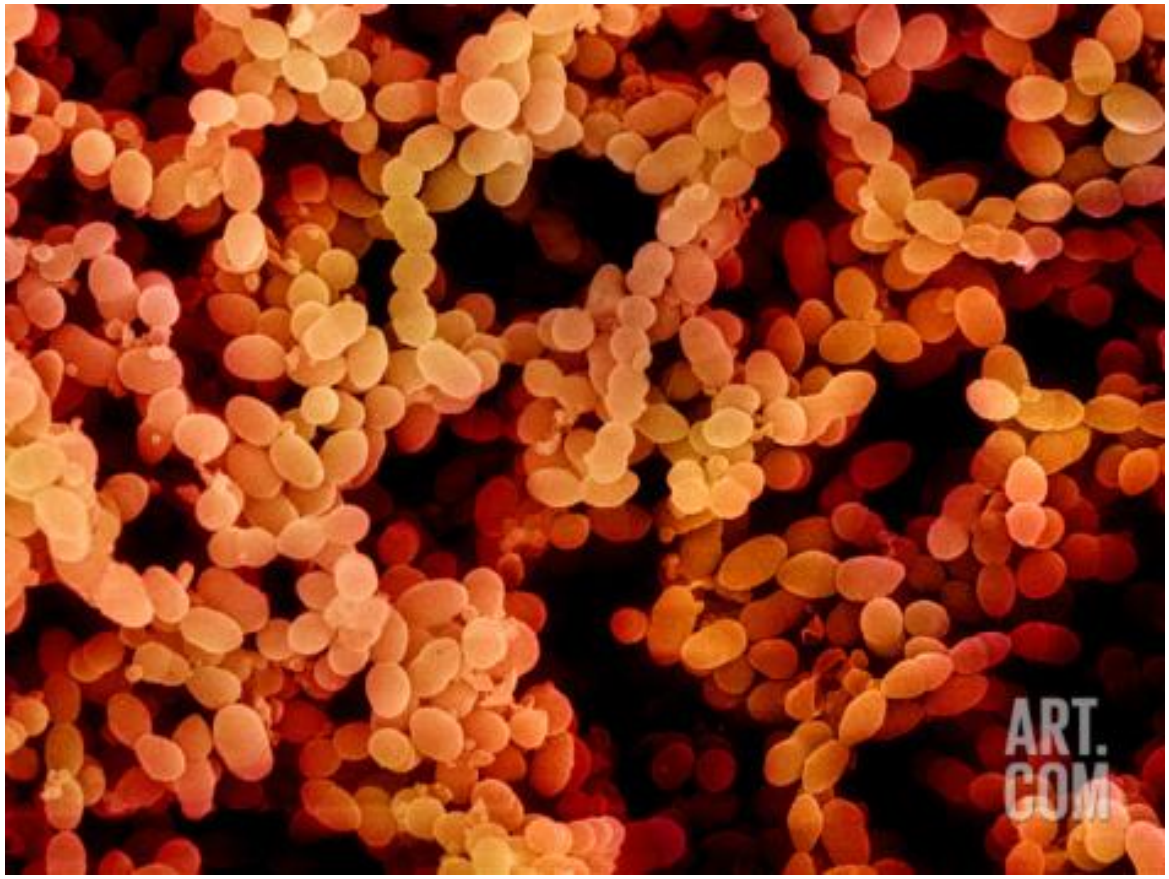

ALLERGIC REACTIONS
Skin Contact
Injection
Ingestion
Inhalation
poison plants
animal dander
pollen
latex
bee sting
medication
medication
nuts & shellfish
pollen
dust
mold & mildew
animal dander
A.D.A.M.

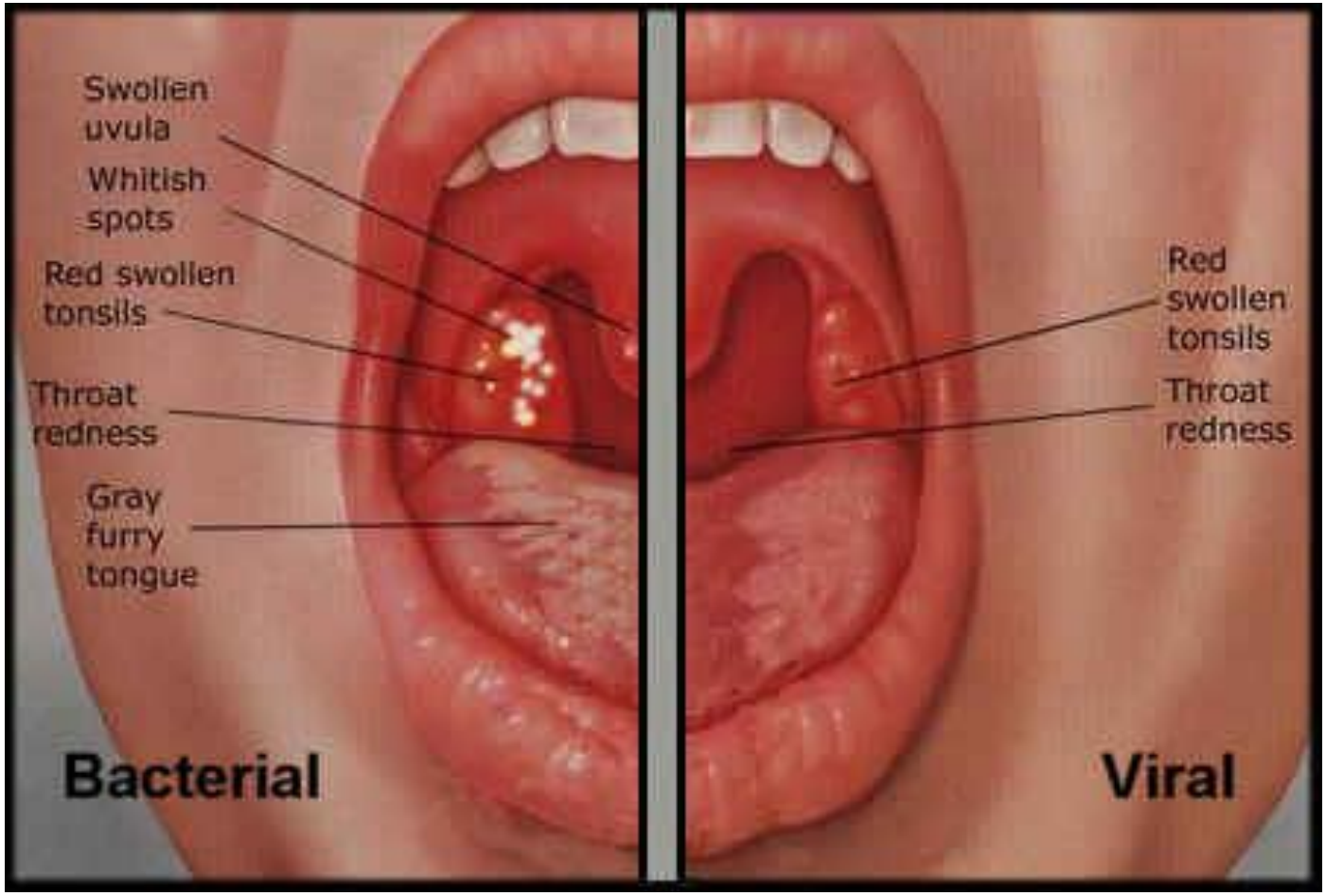
- inflammatory response to infection
- inflammatory response to infection overshoots _sepsis
- inflammatory response to a non-infection _ allergy

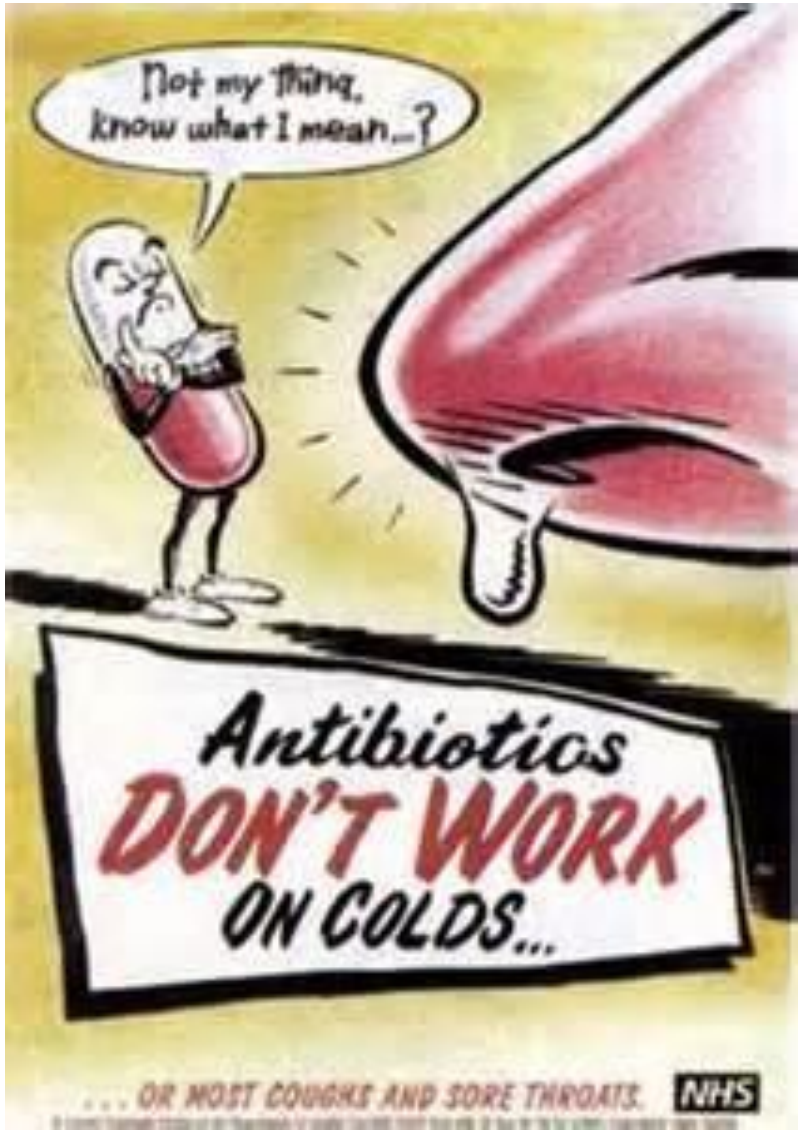

Group A
Streptococcus
Streptococcal
pharyngitis
Activation of
T cells by
streptococcal
antigen
Synthesis of
antistreptococcal
antibodies by
B cells
Vegetation
Inflammation
Mitral leaflet
Short, thickened
chordae tendineae
① Endocarditis
Fibrinoid
material
Giant
cell
③ Fibrinous
pericarditis
Lymphocyte
Macrophage
Fibrosis
② Myocarditis

Clinical Manifestations of Acute Rheumatic Fever




ART.
COM


Swollen uvula
Whitish spots
Red swollen tonsils
Throat redness
Gray furry tongue
Bacterial
Red swollen tonsils
Throat redness
Viral


Not my thing, know what I mean...?
Antibiotics
DON'T WORK
ON COLDS...
. . . OR MOST COUGHS AND SORE THROATS.
NHS

- inflammatory response to infection
- inflammatory response to infection overshoots _sepsis
- inflammatory response to a non-infectious entity _ allergy
- inflammatory response to infection cross-reacts _ rheumatic fever

David Vetter

1971-84

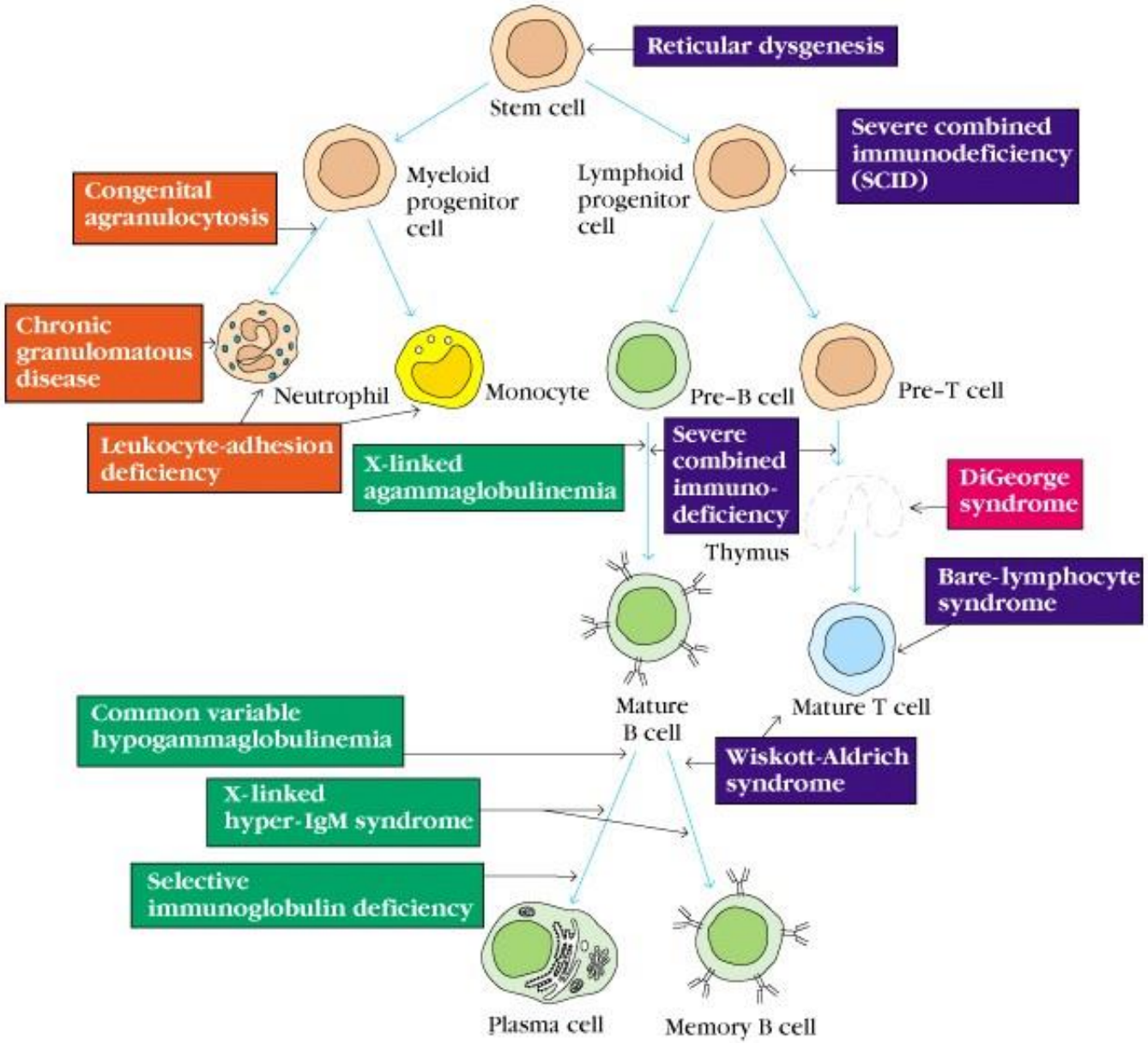
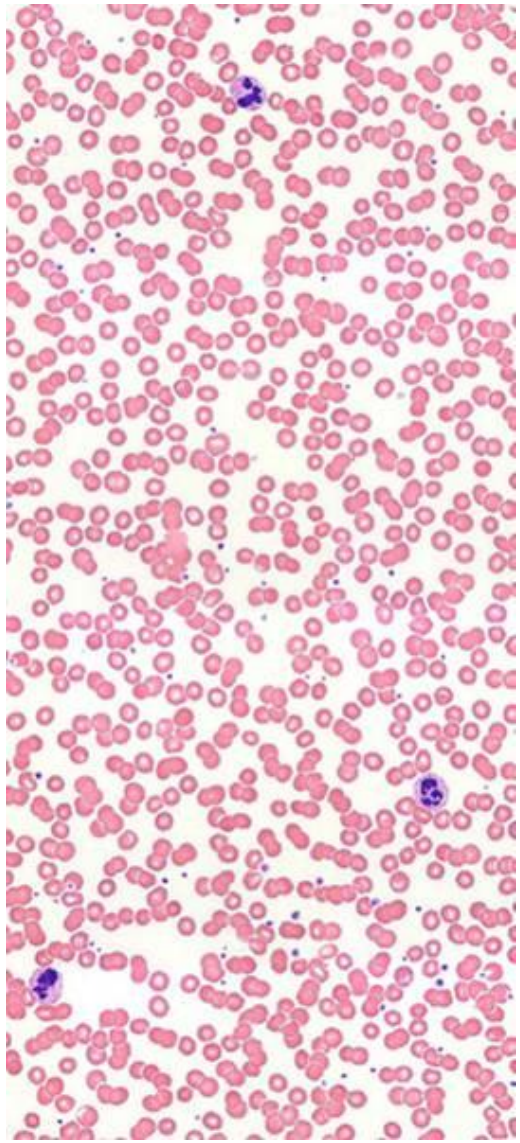

Reticular dysgenesis
Stem cell
Severe combined immunodeficiency (SCID)
Myeloid progenitor cell
Lymphoid progenitor cell
Congenital agranulocytosis
Chronic granulomatous disease
Neutrophil
Monocyte
Pre-B cell
Pre-T cell
Leukocyte-adhesion deficiency
X-linked agammaglobulinemia
Severe combined immuno-deficiency
DiGeorge syndrome
Thymus
Bare-lymphocyte syndrome
Mature B cell
Mature T cell
Common variable hypogammaglobulinemia
Wiskott-Aldrich syndrome
X-linked hyper-IgM syndrome
Selective immunoglobulin deficiency
Plasma cell
Memory B cell

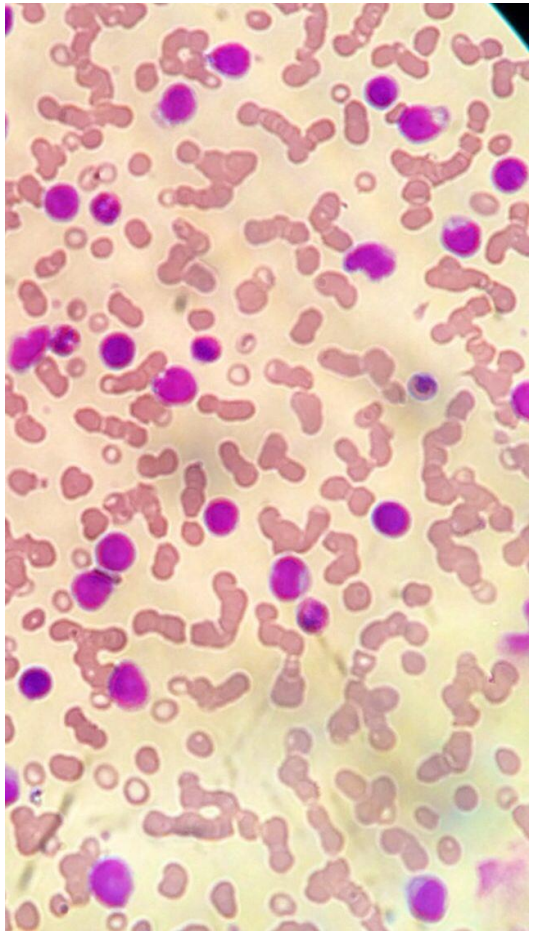
Table 4b: Microbiology of Infections

Site	Defect
Mycobacteria	T-cell deficiency N-K cell defect IL-12
Encapsulated organisms *(Streptococcus pneumoniae, Haemophilus influenzaa, Nisseria)*	B-cell or complement deficiency
Catalase-positive organisms *(Staph aureus, Klebsiella, Serratia)*	Neutrophil/phagocyte defects (CGD)
Viruses	
Herpes, varicella, CMV	T-cell deficiency Il-12/ NK cell defects
Enteroviruses (echovirus, Coxsackie)	B-cell deficiency
Fungi	
Candida	T-cell deficiency
Aspergillus	T-cell or phagocyte defects
Parasites	
Giardia lamblia	B-cell deficiency
Toxoplasma gondii	T-cell deficiency
Opportunistic infections	
Pneumocystis carinii	T-cell deficiency
Cryptosporidium	T-cell deficiency

- inflammatory response to infection
- inflammatory response to infection overshoots _sepsis
- inflammatory response to a non-infectious entity _ allergy
- inflammatory response to infection cross-reacts _ rheumatic fever
- inflammatory response absent _ primary immunodeficiency

Al McGuire 1928-2001





- inflammatory response to infection
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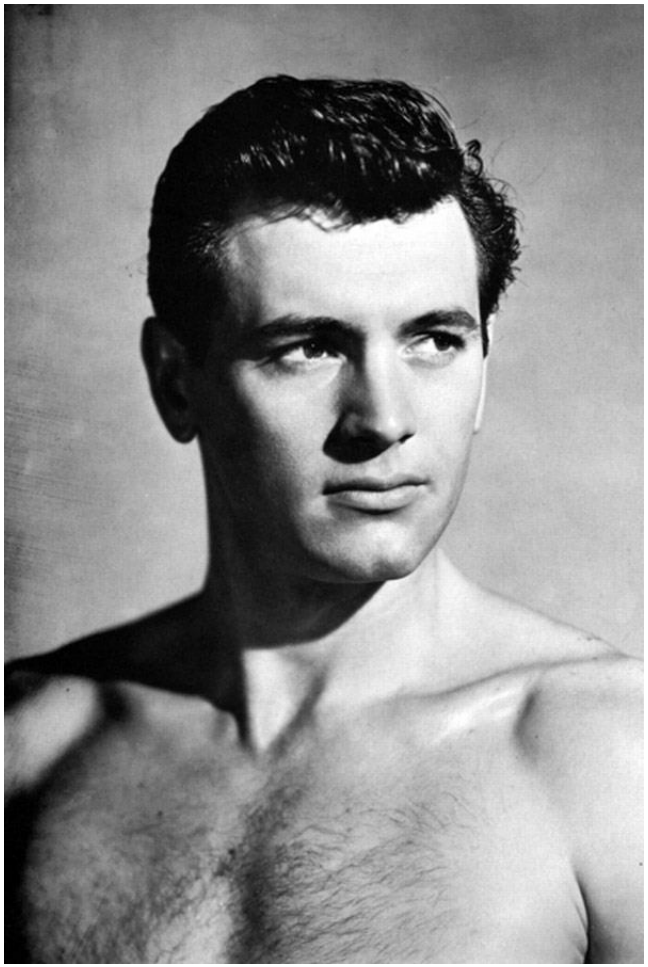
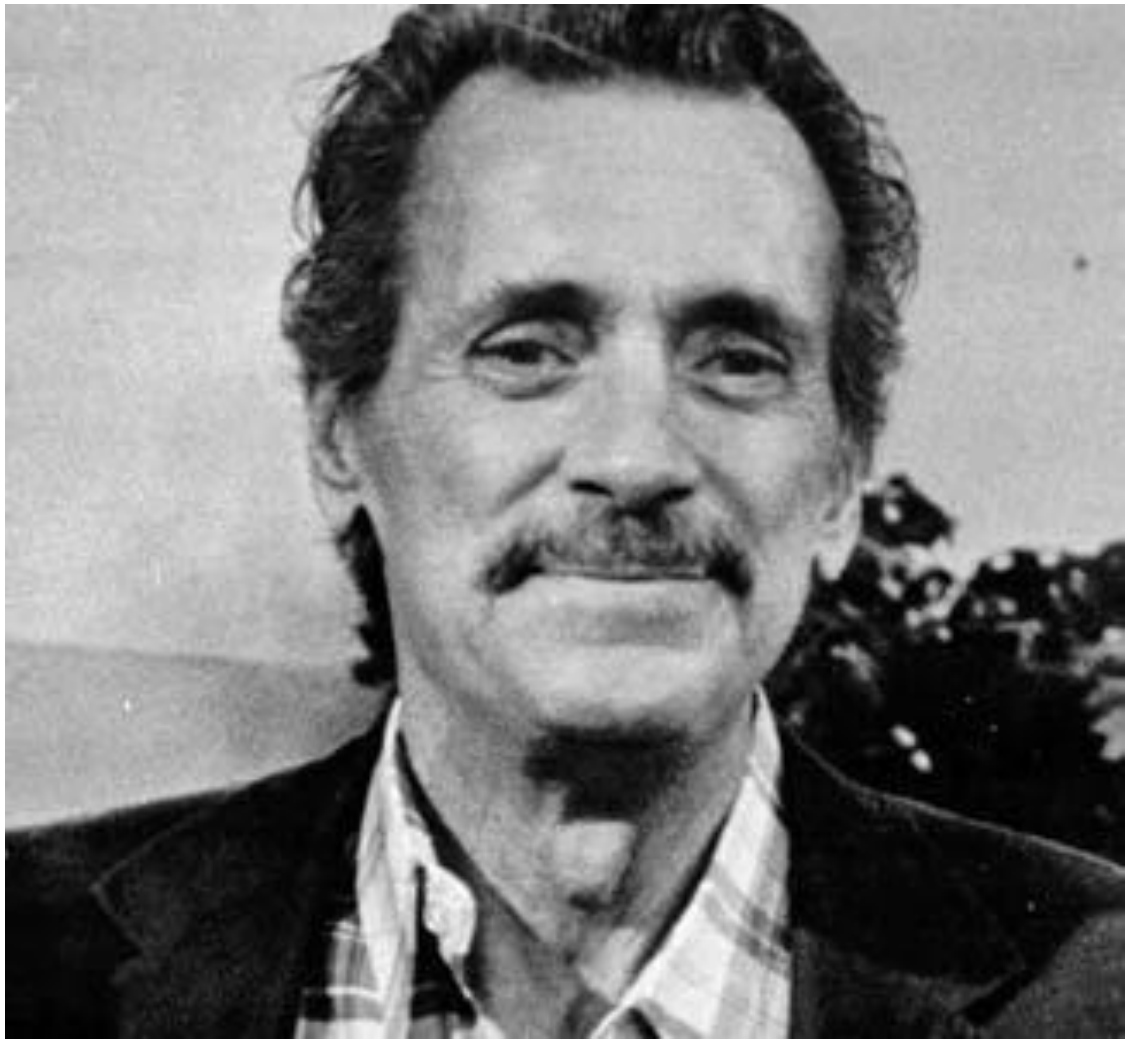
- inflammatory response absent _ primary immunodeficiency
- inflammatory response weakened by disease _ leukemia

Rock Hudson

1925-85

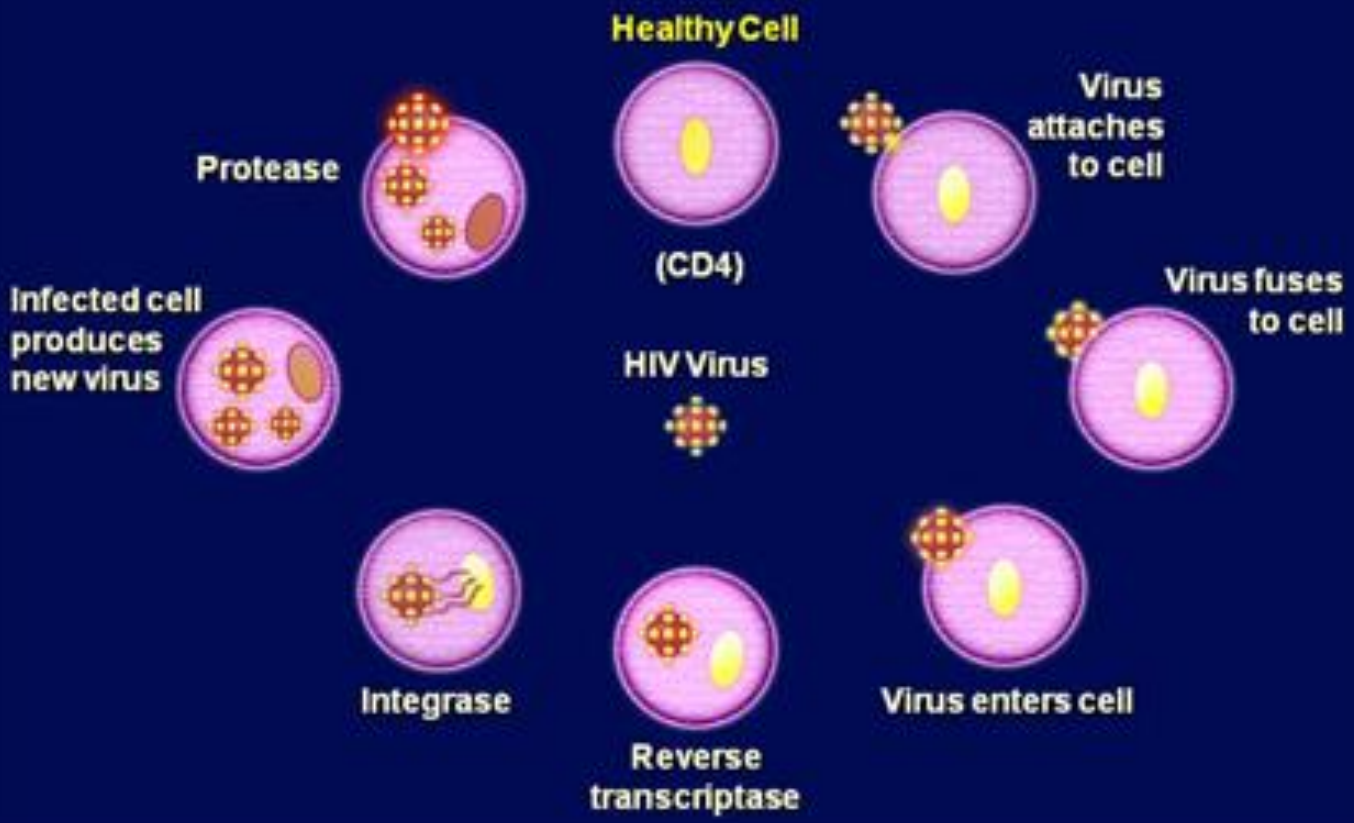




Opportunistic Diseases of AIDS

- *Candidiasis* of bronchi, trachea, esophagus, or lungs
- *Invasive cervical cancer*
- *Coccidioidomycosis*
- *Cryptococcosis*
- *Cryptosporidiosis*, chronic intestinal (greater than 1 month's duration)
- *Cytomegalovirus* disease (particularly CMV retinitis)
- *Encephalopathy*, HIV-related
- *Herpes simplex*: chronic ulcer(s) (greater than 1 month's duration); or bronchitis, pneumonitis, or esophagitis
- *Histoplasmosis*
- *Isosporiasis*, chronic intestinal (greater than 1 month's duration)
- *Kaposi's sarcomav*
- *Lymphoma*, multiple forms
- *Mycobacterium avium complex*
- *Tuberculosis*
- *Pneumocystis carinii pneumonia*
- *Pneumonia*, recurrent
- *Progressive multifocal leukoencephalopathy*
- *Salmonella septicemia*, recurrent
- *Toxoplasmosis* of brain
- *Wasting syndrome* due to HIV

Targets for HIV Meds

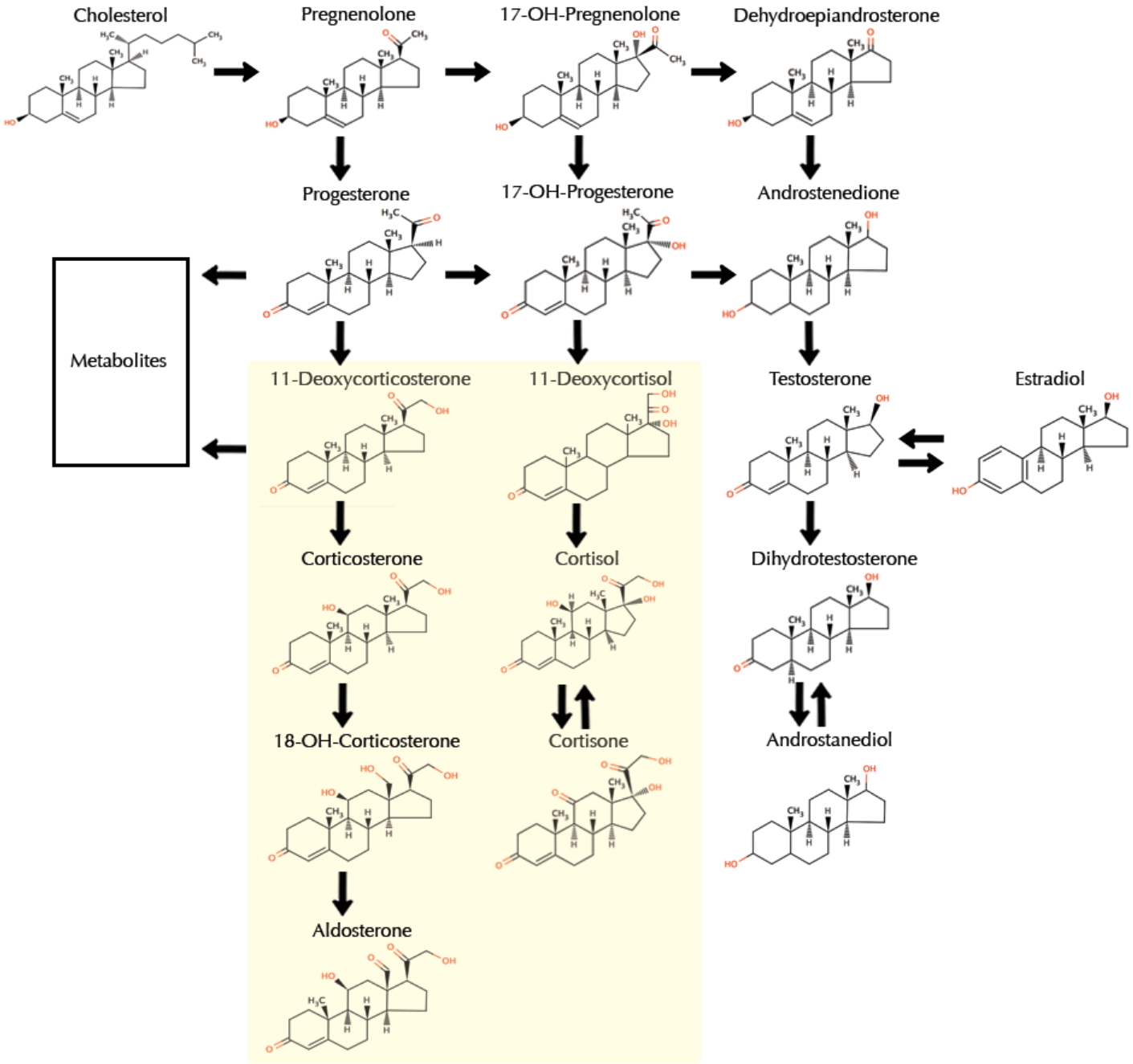


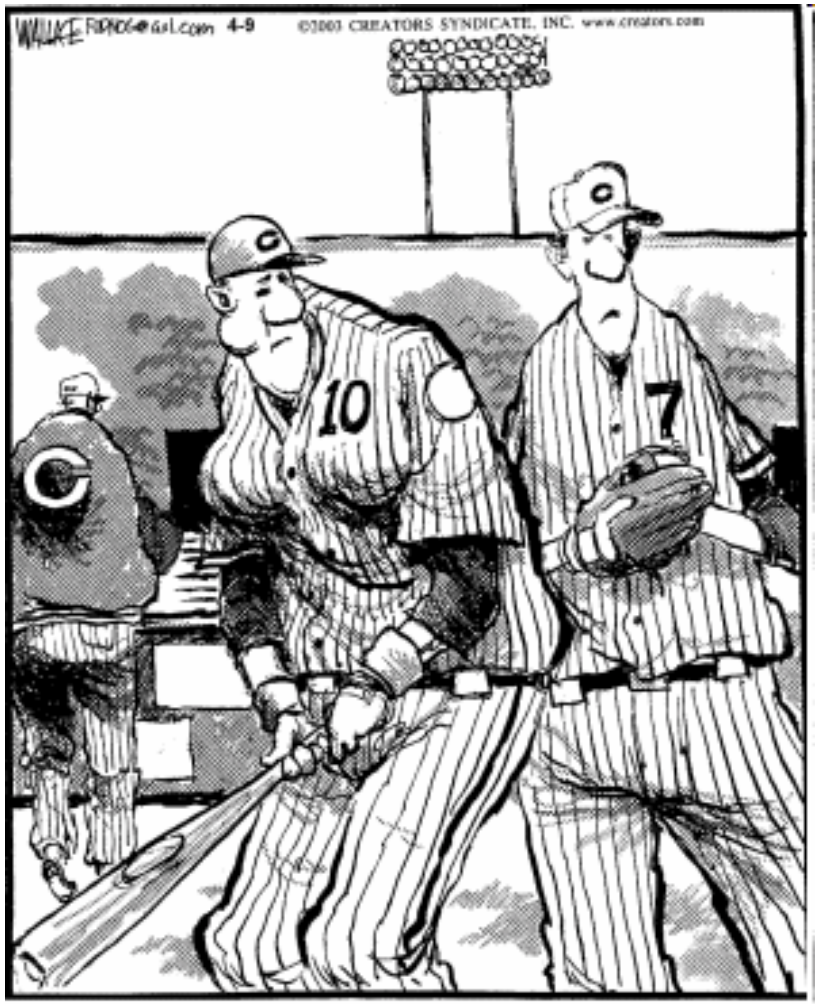
Doctors without Boundaries

- inflammatory response to infection
- inflammatory response to infection overshoots_sepsis
- inflammatory response to infection cross-reacts_ rheumatic fever
- inflammatory response to a non-infectious entity_allergy
- inflammatory response absent_primary immunodeficiency
- inflammatory response weakened by disease_leukemia
- inflammatory system attacked by an infection_HIV, AIDS

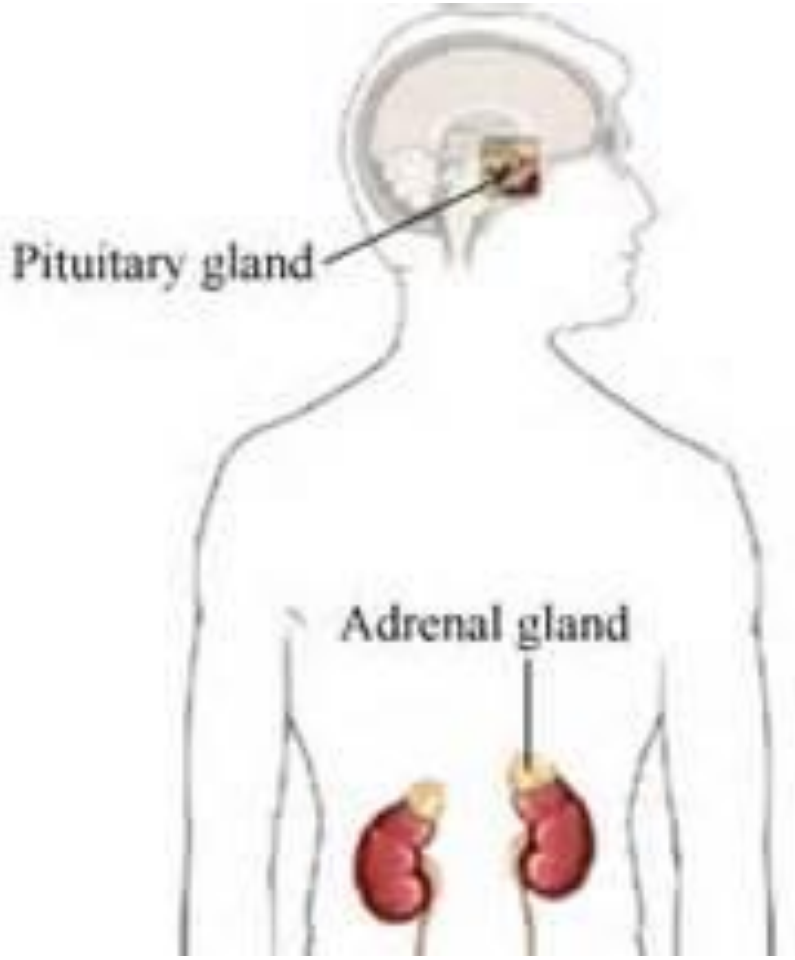
– Eleanor Roosevelt

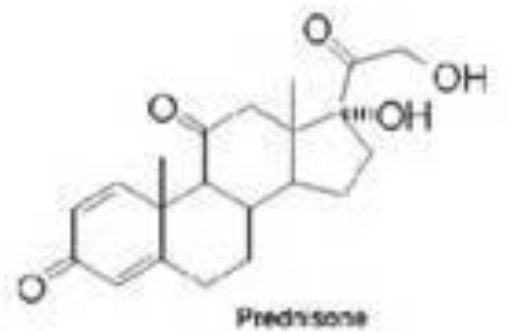
1884-1962


Cholesterol
Pregnenolone
17-OH-Pregnenolone
Dehydroepiandrosterone
Progesterone
17-OH-Progesterone
Androstenedione
Metabolites
11-Deoxycorticosterone
11-Deoxycortisol
Testosterone
Estradiol
Corticosterone
Cortisol
Dihydrotestosterone
18-OH-Corticosterone
Cortisone
Androstanediol
Aldosterone

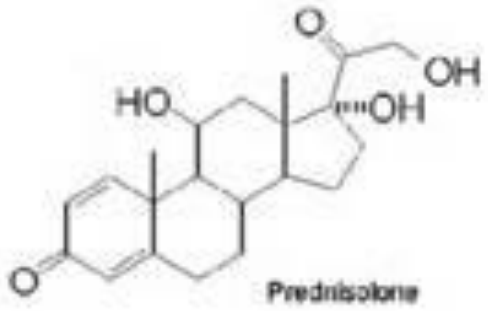


"Buck, are you sure that guy who gives you the steroids is giving you the right stuff?"


Pituitary gland
Adrenal gland



Prednisone



Prednisolone

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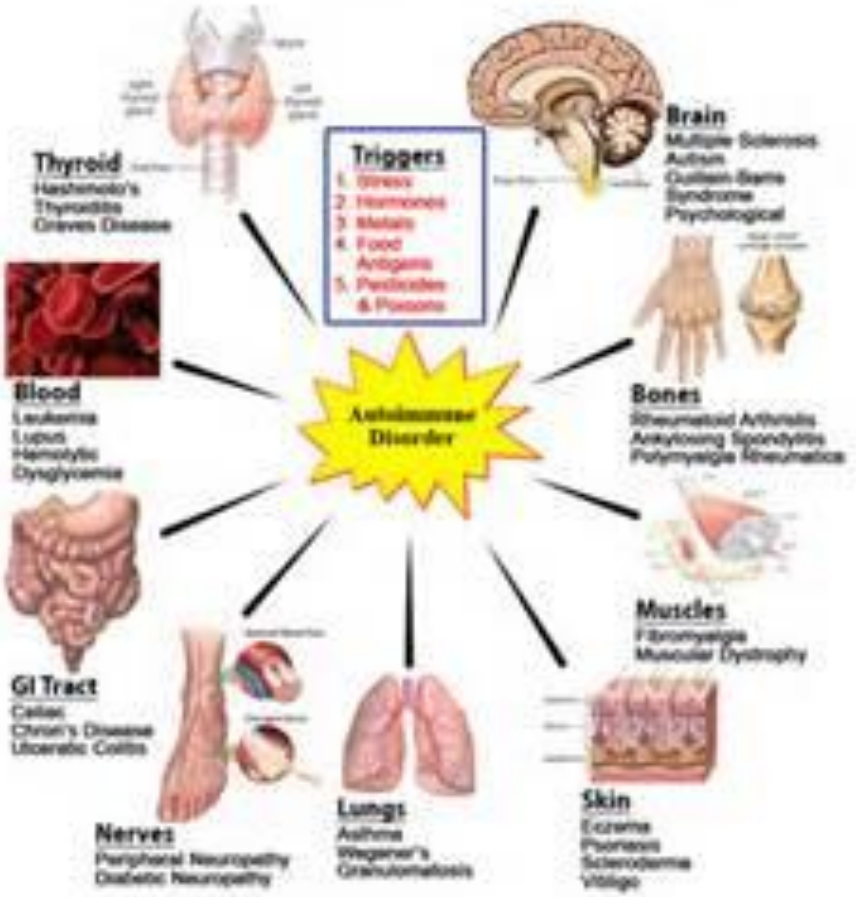
- inflammatory response weakened by disease _ leukemia
- inflammatory response weakened by infection _ AIDS
- inflammatory response weakened medically _ anti-inflammatories

Tissues of The Body Affected By Autoimmune Attack



The spectrum of autoimmune disease

Organ Specific Autoimmune Diseases

• Graves Disease	(Thyroid: TSHR Abs, TPO Abs)
• Hashimoto Thytreoiditis	(Thyroid: TPO Abs, Tg Abs)
• Diabetes Type I	(Pankreas: GAD II Abs, IA2 Abs, ICA)
• Goodpasture Syndrome	(Kidney: GBM Abs)
• Pernicious Anemia	(Stomach: Parietal Cell Abs)
• Primary Biliary Cirrhosis	(Liver, Bile: AMAbs)
• Myasthenia Gravis	(Muscles: AChR Abs)
• Dermato-/Polymyositis	(Skin / Muscles: Jo 1 Abs)
• Vasculitis	(Vessels: ANCA)
• Rheumatoid Arthritis	(Joints: CRP, RF, RA33 Abs, Sa Abs)
• MCTD	(RNP Abs)
• Scleroderma	(Scl 70 Abs, CENP Abs, PM/Scl Abs)
• SLE	(ANA, Cardiolipin Abs, Beta 2 GP I Abs)

Multi-systemic Autoimmune Diseases

Acute Disseminated Encephalomyelitis (ADEM)
Alopecia Areata
Addison's Disease
Ankylosing Spondylitis
Antiphospholipid Antibody Syndrome (APS)
Autoimmune Hemolytic Anemia
Autoimmune Hepatitis
Autoimmune Inner Ear Disease
Bullous Pemphigoid
Coeliac Disease
Chagas Disease
Crohn's Disease
Dermatomyositis
Endometriosis
Guillain-Barre Syndrome
Graves' disease
Goodpasture's Syndrome
Hashimoto's Disease
Hidradenitis Suppurativa
Interstitial Cystitis
IgA Nephropathy
Idiopathic Thrombocytopenic Purpura
Kawasaki Disease
Lupus Erythematosus
Morphea
Mixed Connective Tissue Disease
Myasthenia Gravis
Multiple Sclerosis (MS)
Narcolepsy (possibly)
Neuromyotonia
Opsoclonus Myoclonus Syndrome (OMS)
Psoriasis
Primary Biliary Cirrhosis
Pernicious Anemia
Polymyositis
Psoriatic Arthritis
Pemphigus Vulgaris
Rheumatoid Arthritis
Scleroderma
Stiff Person Syndrome
Sjögren's Syndrome
Schizophrenia
Temporal Arteritis
Ulcerative Colitis
Vasculitis
Vitiligo
Wegener's Granulomatosis

- Laurence Olivier
- 1907-1989

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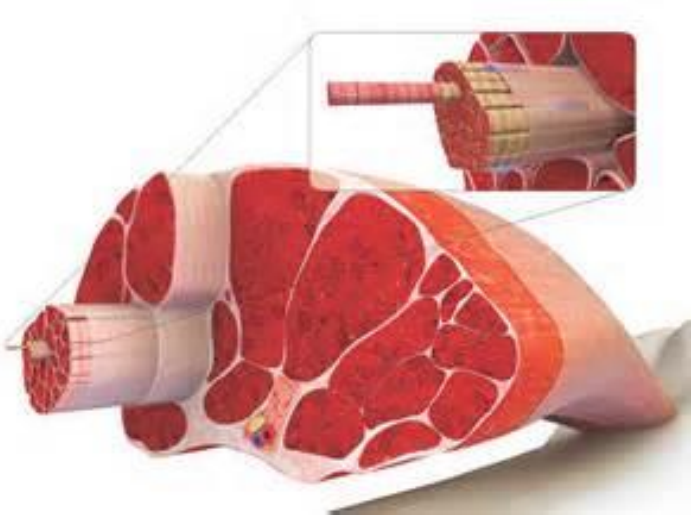
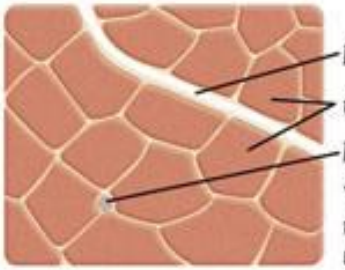
- inflammatory response weakened by disease _ leukemia
- inflammatory response weakened by infection _ AIDS
- inflammatory response weakened medically _ anti-inflammatories
- inflammatory response against self _ autoimmune disorders
- inflammatory response against self_muscle



Normal Muscle



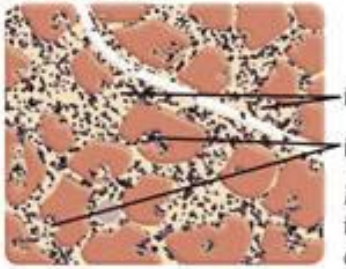
border of muscle bundle (fascicle)

normal muscle fibers

blood vessel

When normal muscle fibers are viewed under a microscope, they look like puzzle pieces that fit together neatly.

Polymyositis

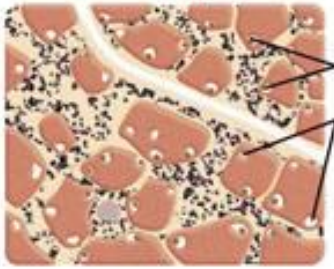


inflammatory cells

invasion of fibers by inflammatory cells

In polymyositis, inflammatory cells of the immune system invade previously healthy muscle cells, which become rounded and variable in size.

Inclusion-Body Myositis

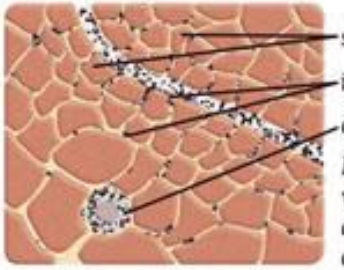


inclusion bodies

vacuoles

Inclusion-body myositis is characterized by muscle fibers that contain empty, bubble-like spaces (vacuoles) and clumps of cellular material (inclusion bodies). Inflammatory cells can be seen between the fibers.

Dermatomyositis



shrinkage (atrophy) of fibers near border of fascicle

inflammatory cells around fascicle and between fibers

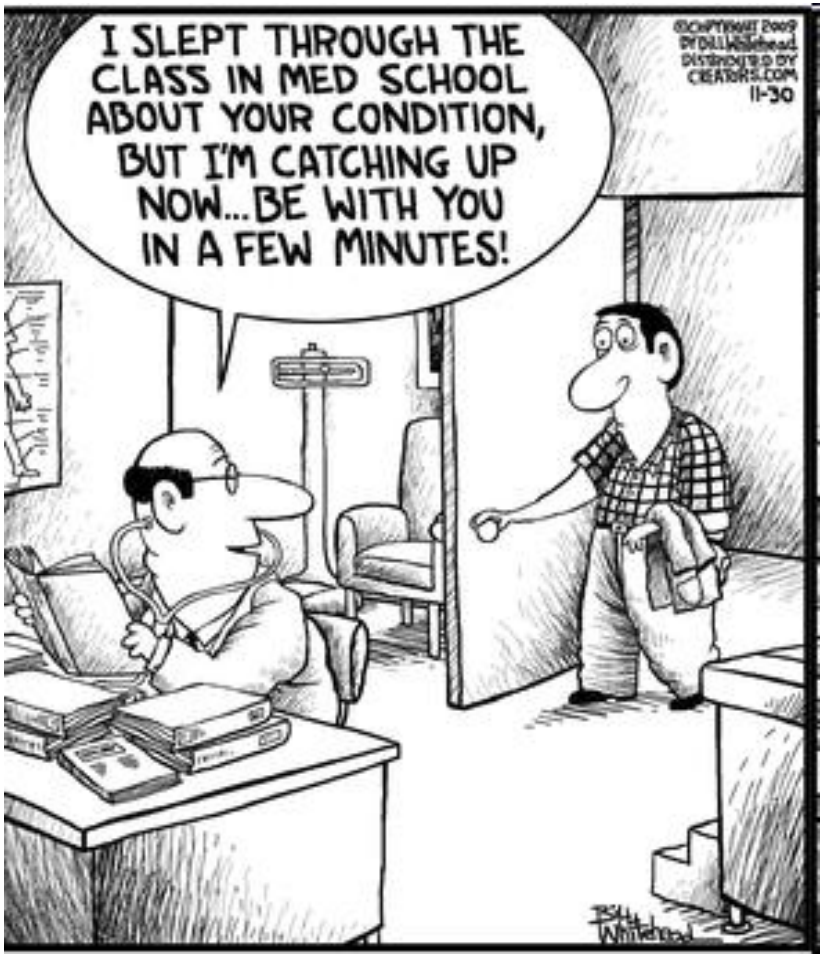
cuff of inflammatory cells around blood vessel

In DM, inflammatory cells are concentrated around blood vessels at the borders of the muscle fiber bundles (fascicles), and fibers in this region often shrink. Inflammatory cells can sometimes be seen forming a cuff around blood vessels.

Medication or treatment	How it works	Comments
corticosteroids prednisone tablets (Deltasone); intravenous methylprednisolone sodium succinate (Solu-Medrol)	Dampens inflammation and immune response by interfering with processing of antigens and with early triggering of T cell and B cell production and later proliferation of B cells and T cells. These cells are produced by the immune system in autoimmune diseases such as PM and DM.	Can be taken orally as prednisone and related compounds; also available for intravenous use. Many side effects with long-term, high-dose therapy, such as weight gain and redistribution of fat to face, abdomen and upper back; thinning of skin; susceptibility to infection; bone loss; muscle damage; cataracts; elevated pressures in eyes (glaucoma); psychological disturbances; high blood pressure; high blood sugar; growth slowing in children.
azathioprine (Imuran)	Interferes with proliferation of B cells and T cells.	Can suppress production of several types of blood cells, so cell counts must be monitored; increases risk of cancer.
methotrexate (Rheumatrex, Folex, Mexate)	Interferes with proliferation of B cells and T cells.	Can cause liver damage; used in higher doses to treat cancer.

Medication or treatment	How it works	Comments
cyclosporine (Neoral, Sandimmune)	Keeps T cells from stimulating production of more T cells and B cells ("upstream" of azathioprine and methotrexate action).	Doesn't affect production of cells other than T cells and B cells; can cause kidney damage, infection, high blood pressure, tremor and excessive hair growth.
cyclophosphamide (Cytoxan)	Interferes with proliferation and activity of B cells and T cells	Also used in cancer; toxic to many kinds of cells, including those of the blood and bladder; can cause sterility in both sexes.
mycophenolate mofetil (CellCept)	Interferes with proliferation of B cells and T cells.	Can cause diarrhea, vomiting, infection (particularly with cytomegalovirus); increases risk of cancer, especially lymphomas; causes depletion of certain blood cells.
tacrolimus (Prograf, old name FK506)	Keeps T cells from stimulating production of more T cells and B cells ("upstream" of azathioprine and methotrexate action).	Can damage kidneys; can cause headaches, tremors and sleep difficulties; diarrhea, nausea and vomiting; high blood pressure, high blood sugar and high blood levels of potassium; increases risk of infection and lymphomas. Drug breakdown interfered with by grapefruit juice; potential for kidney damage increased by some anti-inflammatory drugs.

Medication or treatment	How it works	Comments
hydroxychloroquine sulfate (Plaquenil)	Mechanism not understood; used in arthritis, lupus, malaria; can be used to reduce steroid dosage in myositis, particularly in children.	Can treat muscle symptoms and dermatomyositis rash; can cause damage to eyes' retinas or corneas; regular eye exams needed.
infusion of mixed immunoglobulins; IVIg (Gammar, Gammagard, Sandoglobulin others)	Has complex actions on immune system, such as providing antibodies against patient's own antibodies; interfering with immune system reaction to antibody-marked cells; interfering with blood-transported chemicals released by immune system; interfering with activation and maturation of T cells and B cells.	Doesn't affect production of cells other than T cells and B cells; can cause kidney damage, infection, high blood pressure, tremor and excessive hair growth.
plasmapheresis	Removes antibodies and proteins made by the immune system from the blood and returns "cleansed" blood to patient.	Very rarely used in myositis since 1992 study showed it was no more effective than placebo; some think it's useful when combined with immunosuppressant drugs.


I SLEPT THROUGH THE CLASS IN MED SCHOOL ABOUT YOUR CONDITION, BUT I'M CATCHING UP NOW... BE WITH YOU IN A FEW MINUTES!
DISTRIBUTED BY CREATORS.COM
11-30

"You're just going to feel a little pinch, then a horrific burning pain, your eyes will roll back into your head, you will drool uncontrollably..."