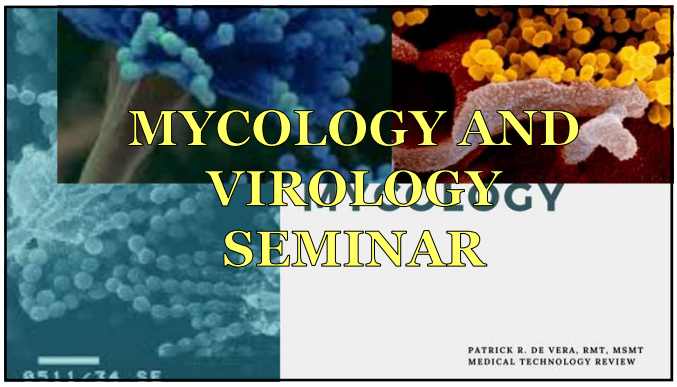
MYCOLOGY AND
VIROLOGY
SEMINAR
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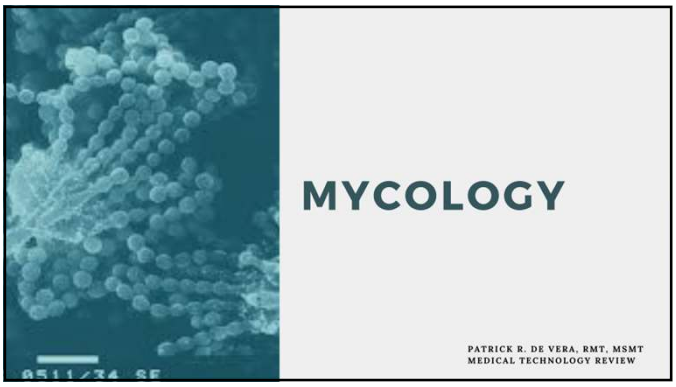
1


MYCOLOGY
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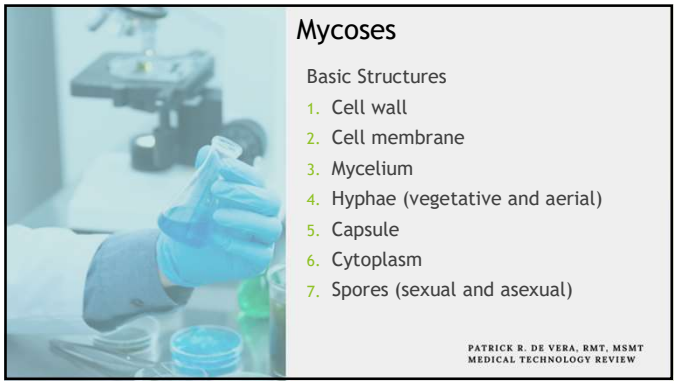
2


Mycoses
Basic Structures
1. Cell wall
2. Cell membrane
3. Mycelium
4. Hyphae (vegetative and aerial)
5. Capsule
6. Cytoplasm
7. Spores (sexual and asexual)
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3


LABORATORY DIAGNOSIS

4

MICROSCOPIC

1. 10% KOH preparation
2. Calcofluor white
3. India Ink
4. Giemsa or Wright Stain
5. Gram stain
6. Histologic
7. Wood's Lamp
8. Lactophenol Cotton Blue

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USE OF CULTURE MEDIA

1. SDA
2. Mycosel/BHI/SABHI/IMA
3. Potato Dextrose Agar
4. Rice Medium
5. Corn meal Tween 80 Agar
6. Staib's Niger Seed Agar
7. Czapek's Medium
8. Brain Heart Infusion Agar
9. Casein medium
10. Urea agar
11. Cotton Seed Agar
12. Dermatophyte Test Medium
13. 1% Glucose Corn Agar

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IDENTIFICATION OF YEAST

1. Germ tube test
2. Cornmeal Agar
3. Biochemical test
4. CHROMagar
5. Polymerase Chain Reaction
6. MALDI-TOF
7. Serology (ExoantigenTest)
8. CHO Assimilation test

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Categories of Medically Important Fungi

1. Superficial
2. Cutaneous
3. Subcutaneous
4. Opportunistic
5. Systemic

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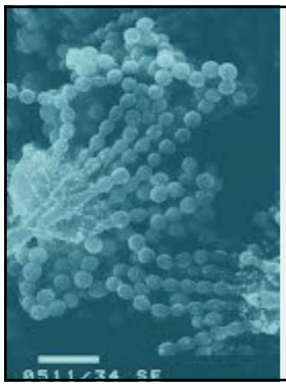

MYCOLOGY

SUPERFICIAL MYCOSES

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- Non-invasive
- No immune response from the host
- MOT: person to person contact, fomites

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Malassezia furfur

- Causes ptyriasis or tinea versicolor
- Hypopigmented macules
- KOH: budding yeast cells and hypae
- ID : "spaghetti and meatballs" (PAS)
  - *needs lipids - (+) SDA with olive oil

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PIEDRA AGENTS

Piedraia hortai

- black piedra, black nodule on hair shaft
- ID: black nodule on hair shaft composed of spore sacs and spores

Trichosporon beigelii

- white piedra, creme-colored nodules on hair shaft
- ID: white nodule on hair shaft composed of mycelia that fragment into arthrospores

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Exophiala werneckii

- Tinea nigra
- Brownish spot, black macules
- Dematiacious: Moist, shiny black and yeast-like colonies
- ID: black, 2-celled oval yeast in skin scrapings

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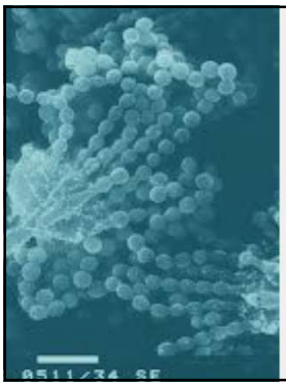

MYCOLOGY
CUTANEOUS MYCOSES

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- Dermatophytes/dermatomycoses – Keratinophilic
- "Tinea" – Latin word for Ringworm
- Macroconidia and Microconidia – LPCB
  - Trichophyton – skin, hair & nail
  - Microsporum – skin & hair only
  - Epidermophyton - skin & nails only

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Types of tinea or ringworm

1. **Tinea capitis** - ringworm lesion of scalp
2. **Tinea corporis** - ringworm lesion of arms, trunk or legs
3. **Tinea manus** - ringworm lesion of the hand
4. **Tinea cruris** - ringworm lesion of groin or "jock's itch"
5. **Tinea pedis** - ringworm lesion of foot
6. **Tinea unguium** -ringworm lesion of nails

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Ectothrix – dermatophyte infection confined in the hair shaft surface

Caused by: *M.gypseum*, *M.canis* or *T.verrucosum*

Endothrix - dermatophyte infection of hair shaft and internalize the hair cell

Caused by: *T.tonsurans* or *T. violaceum*

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Laboratory Diagnosis

- 10% KOH (skin, hair and nails) – hyaline, septate hyphae
- Culture on SDA or Mycosel – RM temperature
- Wood's lamp (UVL): (+) fluorescence
- Treatment:
  - Topical anti-fungal creams – Miconazole
  - Oral – Grizeofulvin, Ketoconazole

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Trichophyton sp.

- ***Trichophyton rubrum*** -tear-drop shaped microconidia, fluffy white with red colored reverse
- ***Trichophyton mentagrophytes*** - grape – like microconidia

	Hair Perforation Test	Red pigment	Urease
T.rubrum	-	+	-
T.mentagrophytes	+ V SHAPE	-	+

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- ***Trichophyton tonsurans*** – Balloon-shaped microconidia, #1 tinea capitis agent, black dot tinea capitis
- ***Trichophyton schoenleinii*** - causes "Favus", Favic chandelier hyphae, no macro or microconidia
- ***Trichophyton verrucosum*** - Clavate/Pyriform microconidia and rat tail/ String bean shaped macroconidia. *Thiamine and Inositol

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Trichophyton species
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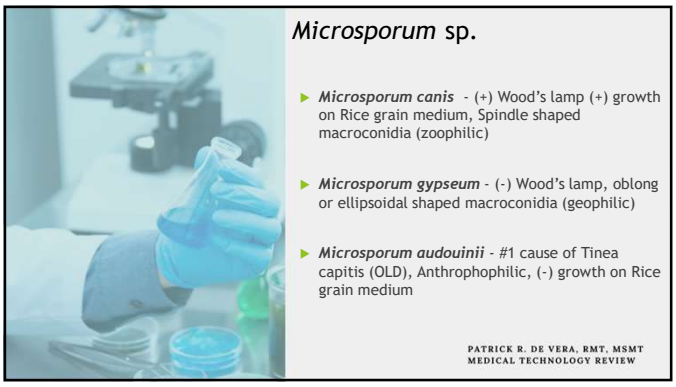
Microsporum sp.
Microsporum canis - (+) Wood's lamp (+) growth on Rice grain medium, Spindle shaped macroconidia (zoophilic)
Microsporum gypseum - (-) Wood's lamp, oblong or ellipsoidal shaped macroconidia (geophilic)
Microsporum audouinii - #1 cause of Tinea capitis (OLD), Anthrophophilic, (-) growth on Rice grain medium
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HARDY DIAGNOSTICS
Microsporum species
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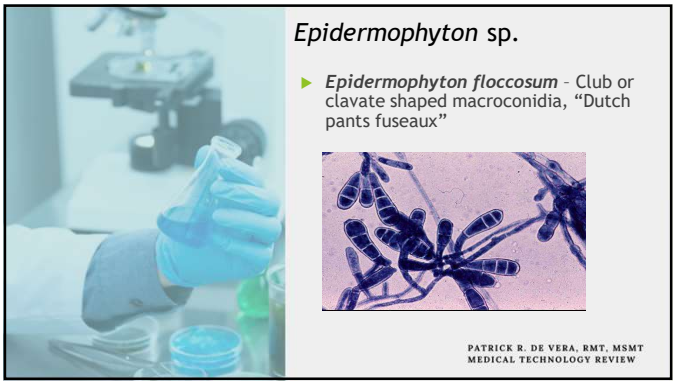
Epidermophyton sp.
Epidermophyton floccosum – Club or clavate shaped macroconidia, "Dutch pants fuseaux"
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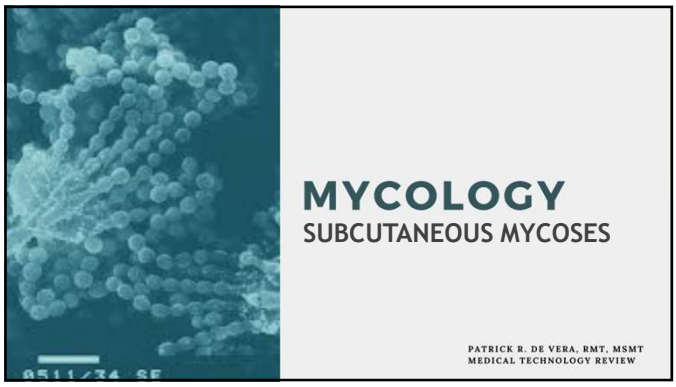
MYCOLOGY
SUBCUTANEOUS MYCOSES
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Habitat: Soil
MOT: Prick or skin trauma
SPX: Biopsy
Histological stains: granules (PAS or H&E)
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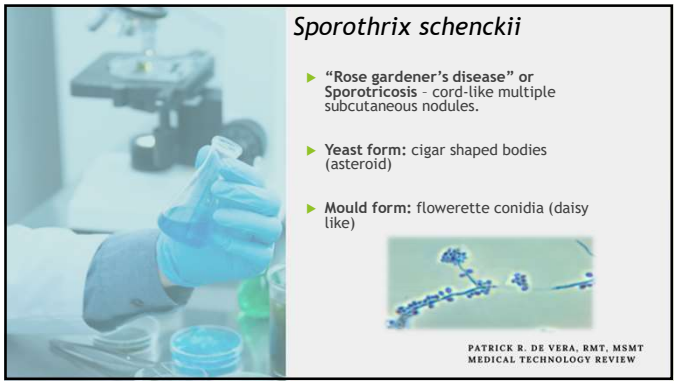
Sporothrix schenckii
"Rose gardener's disease" or Sporotricosis - cord-like multiple subcutaneous nodules.
Yeast form: cigar shaped bodies (asteroid)
Mould form: flowerette conidia (daisy like)
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Mycetoma Agents or Madura foot
causes Madura mycosis
Causative agents:
Pseudallescheria boydii - common cause, (+) Cleistothecia with ascospore.
Others: Madurella sp. and Leptosphaeria sp.
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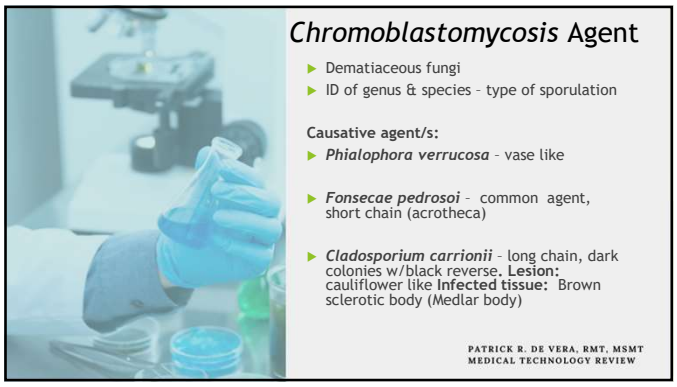
Chromoblastomycosis Agent
Dematiaceous fungi
ID of genus & species – type of sporulation
Causative agent/s:
Phialophora verrucosa – vase like
Fonsecae pedrosoi – common agent, short chain (acrotheca)
Cladosporium carrionii – long chain, dark colonies w/black reverse. **Lesion:** cauliflower like **Infected tissue:** Brown sclerotic body (Medlar body)
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Chromoblastomycosis **Agent**
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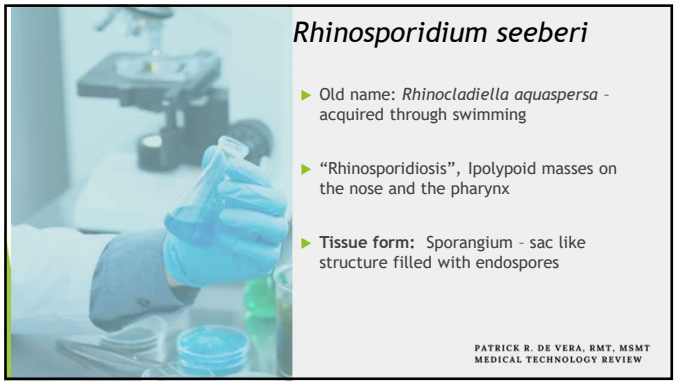
Rhinosporidium seeberi
Old name: *Rhinocladiella aquaspersa* – acquired through swimming
"Rhinosporidiosis", Ipolypoid masses on the nose and the pharynx
Tissue form: Sporangium – sac like structure filled with endospores
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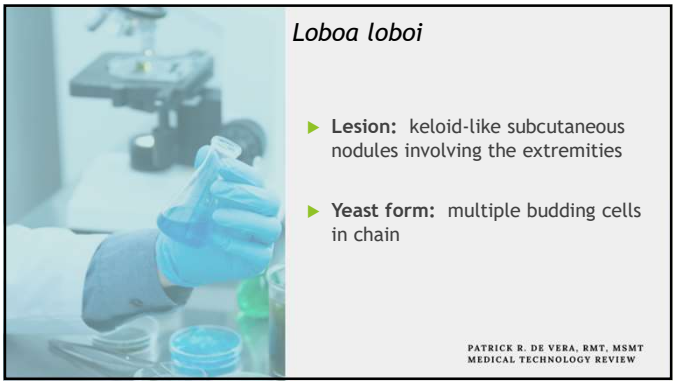
Loboa loboi
Lesion: keloid-like subcutaneous nodules involving the extremities
Yeast form: multiple budding cells in chain
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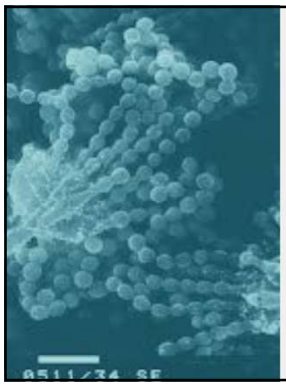

MYCOLOGY
OPPORTUNISTIC MYCOSES

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- Part of the normal flora
- Immunocompromised patients are at risk (DM, AIDS, malnutrition and chemotherapy)
- Prolong use of broad spectrum antibiotics
- Among pregnant women

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Candida albicans

- Normal flora: skin and mucous membrane (GI)
- Produce yeast and hyphae in vivo
- Sucrose (+), feathering in EMB
- Germ tube (+): Chlamydospore, Blastoconidia, Pseudohyphae, True hyphae

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Candida albicans

Disease: *"Oral thrush"* , Moniliasis, Diaper Rash

- Candidiasis - cutaneous
- Oropharyngeal - oral thrush, white spots
- Esophagitis, Cheilitis, Onchomycosis
- Vulvovaginitis
- Invasive: CNS and blood

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HARDY DIAGNOSTICS
Candida albicans
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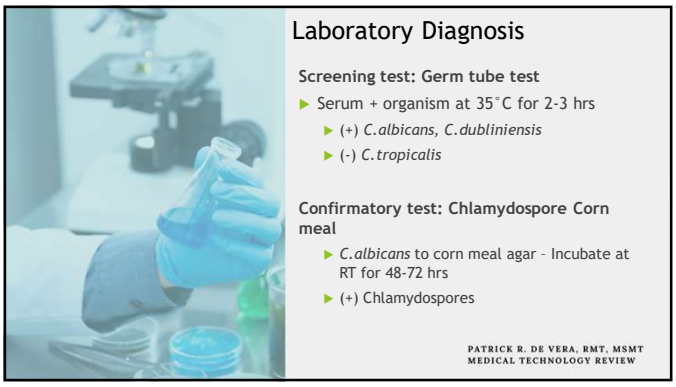
Laboratory Diagnosis
Screening test: Germ tube test
Serum + organism at 35°C for 2-3 hrs
(+) *C.albicans, C.dubliniensis*
(-) *C.tropicalis*
Confirmatory test: Chlamydospore Corn meal
C.albicans to corn meal agar – Incubate at RT for 48-72 hrs
(+) Chlamydospores
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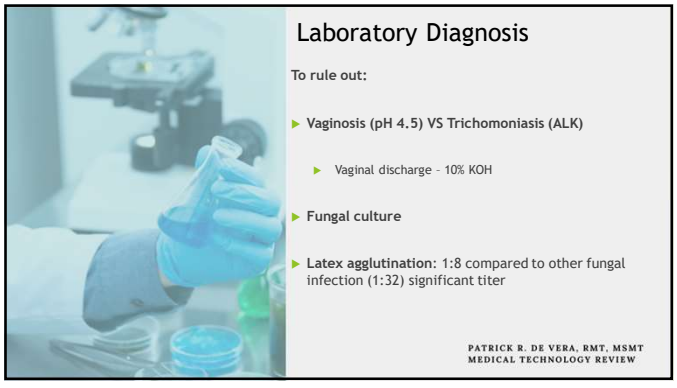
Laboratory Diagnosis
To rule out:
Vaginosis (pH 4.5) VS Trichomoniasis (ALK)
Vaginal discharge – 10% KOH
Fungal culture
Latex agglutination: 1:8 compared to other fungal infection (1:32) significant titer
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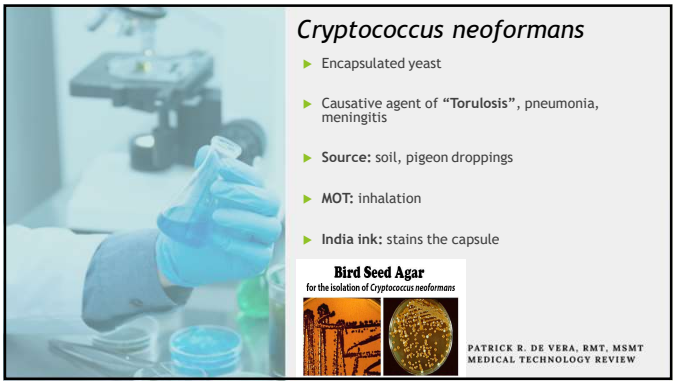
Cryptococcus neoformans
Encapsulated yeast
Causative agent of **"Torulosis"**, pneumonia, meningitis
Source: soil, pigeon droppings
MOT: inhalation
India ink: stains the capsule
Bird Seed Agar
for the isolation of *Cryptococcus neoformans*
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Cryptococcus neoformans

Latex agglutination: capsular Ag

- **(+)** Urease, Phenol oxidase - black, Inositol
- **(-)** Nitrate
- **(+) Bird seed/Niger seed agar** - yeast like mucoid, cream to brown color

Culture on SDA w/out cycloheximide

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Aspergillus sp.

- ***Aspergillus fumigatus*** - fungus ball, aspergilloma, allergy, otomycosis (bread mold) **"Farmer's Lung disease"**
- ***Aspergillus flavus*** -aflatoxin (toxicoses)
- **Aspergisllus niger** - brown to black spore

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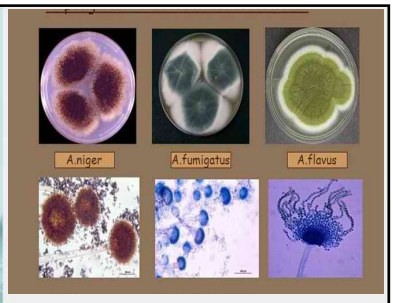

Aspergillus sp.

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Zygomycosis/Mucormycosis sp.

- **Causative agents:** Rhizopus, Mucor or Absidia (Zygomycetes)
- **MOT:** inhalation of conidia
- **Yeast form:** non- sepatate hyphae

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Pneumocystis jirovecii

- **Old name:** *Pneumocystis carinii*
- Protozoan??? Trophozoite -> precyst-> cyst forms, no Ergosterol
  - **#1 cause of pneumonia in AIDS (PCP)**
  - **#1 opportunistic infection in AIDS**
  - No growth on fungal media
  - No hyphae or spore
- **SPX :** Bronchoalveolar lavage (BAL)

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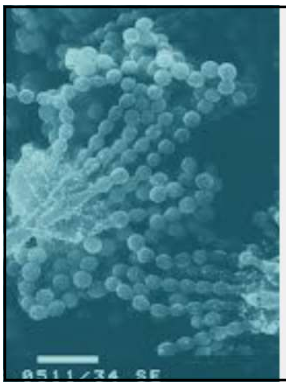

MYCOLOGY
SYSTEMIC MYCOSES

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- Dimorphic
  - **Mould form:** Infectious, cannot be cultured
  - **Yeast form:** Diagnostic, can be cultured
- **MOT:** inhalation
- **BSL III**
- **SPX:** sputum

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Exoantigen Test

-immunodiffusion test

1. A antigen - *B. dermatitidis*
2. 1, 2 & 3 antigen - *P. brasiliensis*
3. H and M antigen - *H. capsulatum*
4. HS, HL and F antigen - *C. immitis*

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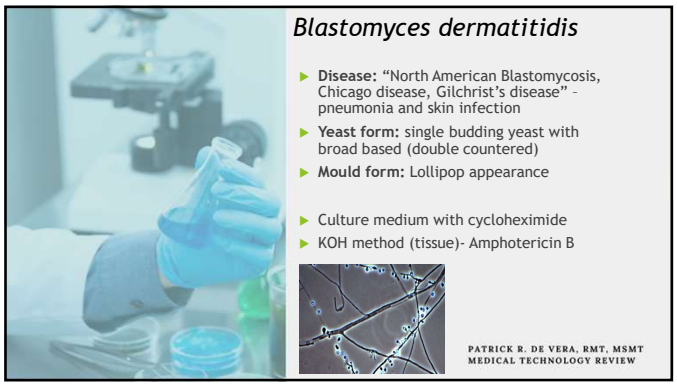
Blastomyces dermatitidis
Disease: "North American Blastomycosis, Chicago disease, Gilchrist's disease" - pneumonia and skin infection
Yeast form: single budding yeast with broad based (double countered)
Mould form: Lollipop appearance
Culture medium with cycloheximide
KOH method (tissue)- Amphotericin B
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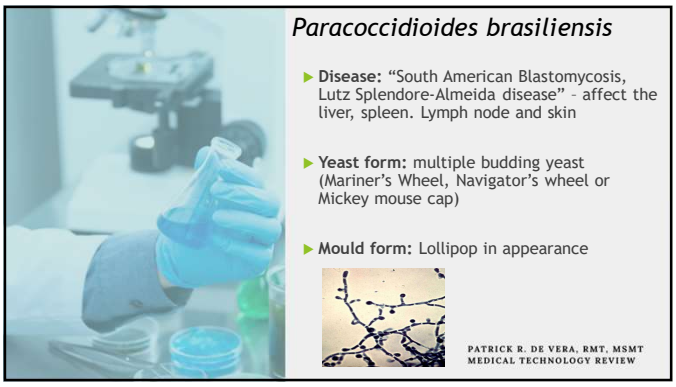
Paracoccidioides brasiliensis
Disease: "South American Blastomycosis, Lutz Splendore-Almeida disease" - affect the liver, spleen. Lymph node and skin
Yeast form: multiple budding yeast (Mariner's Wheel, Navigator's wheel or Mickey mouse cap)
Mould form: Lollipop in appearance
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MEDICAL TECHNOLOGY REVIEW

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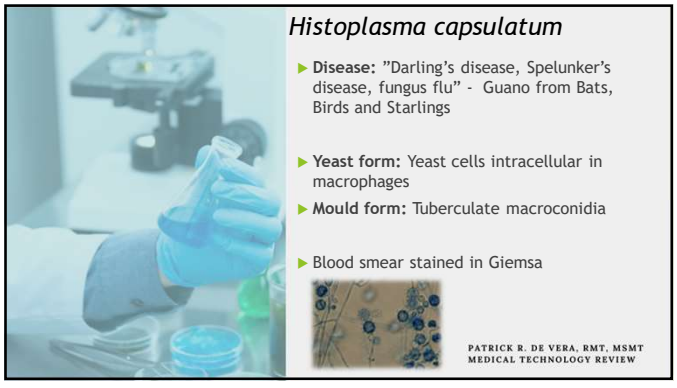
Histoplasma capsulatum
Disease: "Darling's disease, Spelunker's disease, fungus flu" - Guano from Bats, Birds and Starlings
Yeast form: Yeast cells intracellular in macrophages
Mould form: Tuberculate macroconidia
Blood smear stained in Giemsa
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MEDICAL TECHNOLOGY REVIEW

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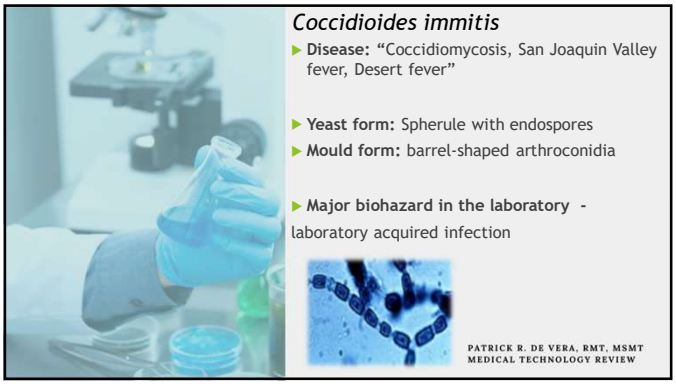
Coccidioides immitis
Disease: "Coccidiomycosis, San Joaquin Valley fever, Desert fever"
Yeast form: Spherule with endospores
Mould form: barrel-shaped arthroconidia
Major biohazard in the laboratory - laboratory acquired infection
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Laboratory Diagnosis

- **Culture:** SDA at RT(25°C) or BHIA + blood - 37°C
- **Direct examination of Clinical Specimens:**
  - Histoplasmosis - Wright's or Giemsa stain
  - Blastomycoses, Paracoccidioides and Coccidioides 10% KOH, PAS or H&E

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RECALL QUESTIONS

Hair Perforation test is indicated to identify this organism:
A. Epidermophyton floccosum
B. Malassezia furfur
C. Trichophyton mentagrophytes
D. Microsporum gypseum

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55

SAMPLE QUESTIONS

Of the following, the morphologic structure which identifies Candida albicans and distinguishes it from other Candida spp is the:

A. Hyphae
B. Blastospore
C. Pseudohyphae
D. Chlamydospore

56

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57

SAMPLE QUESTIONS

Pathogenic fungi isolated from sputum are usually the etiologic agent of:

A. Superficial mycoses
B. Cutaneous mycoses
C. Subcutaneous mycoses
D. Systemic mycoses

58

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59

SAMPLE QUESTIONS

Slide culture technique is useful to:

A. Initiate growth from clinical specimen
B. Save media
C. Study colonial morphology
D. Separate fungi from bacterial contaminants

60

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61

SAMPLE QUESTIONS

A potentially pathogenic yeast that is a normal flora in the oropharyngeal cavity and may produce a thrush is:

A. Rhizopus cryzae
B. Aspergillus fumigatus
C. Candida albicans
D. Cryptococcus neoformans

62

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63

SAMPLE QUESTIONS

The dermatophytes are differentiated primarily by the morphology of:

A. conidiospores
B. macroconidia
C. hyphae
D. sterigmata

64

SAMPLE QUESTIONS

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65

SAMPLE QUESTIONS

A direct microscopic examination of an exudate from the lung reveals large spherules with endospores. The thick walled spherules should alert the technologist to the possibility of:

A.Candidiasis
B. Blastomycosis
C. Coccidioidomycosis
D. Cryptococcosis

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SAMPLE QUESTIONS

Incubation period in germ tube test

A. 1-2 hours
B. 2-3 hours
C. 3-4 hours
D. 4-5 hours

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SAMPLE QUESTIONS

Incubation period in germ tube test

A. 1-2 hours
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D. 4-5 hours

69

SAMPLE QUESTIONS

The functions of 10% potassium hydroxide in the direct examination of skin, hair and nail scrapings is to:

A. clear and dissolve debris
B. preserve fungal elements
C. avoid contaminating bacteria
D. fix preparation for subsequent staining

70

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71

SAMPLE QUESTIONS

Infections that involve the outermost layer of the skin are due to the following EXCEPT:

A. Blastomyces dermatitidis
B. Trichosporon beigelii
C. Piedriae hortae
D. Malassezia furfur

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SAMPLE QUESTIONS

Candida species can be seen in the gram stained smear as:

A. pleomorphic short rods
B. round gram negative budding cells
C. gram positive cocci in pair
d. gram positive, oval cells with or without buds and pseudomycelia

74

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SAMPLE QUESTIONS (

Fungus that give a positive acid fast stain is:

A. Candida
B. Cryptococcus
C. Trichophyton
D. Nocardia

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SAMPLE QUESTIONS

Which group of mold can be ruled out when septate hyphae are observed in a culture?

A. Dematiaceous
B. Zygomycetes
C. Dermatophytes
D. Penicillium

78

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79

SAMPLE QUESTIONS

Broad coenocytic hyphae found in tissue would be most typical of infection with:

A. Aspergillus
B. Blastomyces
C. Microsporum
D. Rhizopus

80

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81

SAMPLE QUESTIONS

A yeast like fungus was isolated from sputum. No hyphae were produced in morphology agar. It was negative for nitrate assimilation and positive for inositol assimilation and produced urease at 37'. These findings are typical of:

A. Candida krusei
B. Cryptococcus terreus
C. Cryptococcus neoformans
D. Trichosporon beigelii

82

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83

SAMPLE QUESTIONS

CHO assimilation tests are used for the identification of yeast isolates by inoculating media

A. Free of carbohydrates
B. Free of niger seed agar
C. Containing yeast extract
D. Containing carbohydrates

84

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85

SAMPLE QUESTIONS

Of the following yeast, which produces arthrospore?

A. Rhodotorula
B. Cryptococcus
C. Geotrichum
D. Candida

86

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87

SAMPLE QUESTIONS

What is the first step to be performed in the identification of an unknown yeast isolate?

A. Gram stain smear
B. India ink test
C. Catalase test
D. Germ tube test

88

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89

SAMPLE QUESTIONS

Dimorphic molds are found in infected tissue in which form?

A. mold phase
B. Yeast phase
C. Encapsulated
D. latent

90

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91

SAMPLE QUESTIONS

A branching, gram positive acid fast organism isolated from a bronchial washing on a 63 year old woman receiving chemotherapy. The organism does NOT hydrolyze casein, tyrosine or xanthine. The most likely ID is:

A. Actinomadura madurae
B. Nocardia brasiliensis
C. Streptomyces somaliensis
D. Nocardia asteroides

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SAMPLE QUESTIONS

In processing clinical specimens and fungal isolates, laboratory workers may contract systemic fungal infections through:

A. Ingestion
B. Skin contact
C. Insect vector
D. Inhalation

94

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95

SAMPLE QUESTIONS

Test to differentiate groups of fungi

A. india ink
B. KOH wet mount
C. iodine
D. methyl red

96

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97

SAMPLE QUESTIONS

Which of the following is NOT an antifungal drug?

A. fungizone
B. mycostatin
C. nizoral
D. chloramphenicol

98

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99

SAMPLE QUESTIONS

It is the most important geophilic fungus that causes ringworm in man

A. Trichophyton rubrum
B. Microsporum canis
C. Microsporum gypseum
D. Microsporum audouinii

100

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101

SAMPLE QUESTIONS

A presumptive identification of Candida albicans can be made by checking the ability of the organism to produce ____ in serum. Using Cornmeal agar plus Tween 80, Candida albicans can be identified by its ability to produce _____.

A. capsule, chlamydospores
B. Blastospores, germ tubes
C. Pseudohyphae, sporangia
D. Germ tubes, chlamydospores

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103

SAMPLE QUESTIONS

What is the most common fungus seen in sputum bronchial washings, ears and biopsy materials?

A. Aspergillus
B. Trichosporum
C. Penicillium
D. None of the above

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SAMPLE QUESTIONS

The vegetative bodies of fungus which appear as long filaments is known as

A. hyphae
B. yeast
C. blastospores
D. conidium

106

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SAMPLE QUESTIONS

Most mycotic infection begin in the:

A. bones
B. heart
C. lungs
D. kidney

108

SAMPLE QUESTIONS

Most mycotic infection begin in the:

A. bones
B. heart
C. lungs
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109

SAMPLE QUESTIONS

Structure resembling intestinal protozoa

A. yeast
B. macrophages
C. pollen grains
D. all of the above

110

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Structure resembling intestinal protozoa

A. yeast
B. macrophages
C. pollen grains
D. all of the above

111

SAMPLE QUESTIONS

If 1% glucose is added to cornmeal agar, Trichophytn rubrum can be differentiated from the Trichophyton mentagrophytes by the production of:

A. Hyphae
B. Ascospores
C. Pigment
D. Sporangia

112

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113

SAMPLE QUESTIONS

Spores growing on the outside of the hair shaft

a. endothrix
b. ectothrix
c. exothrix
d. intrathrix

114

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a. endothrix
b. ectothrix
c. exothrix
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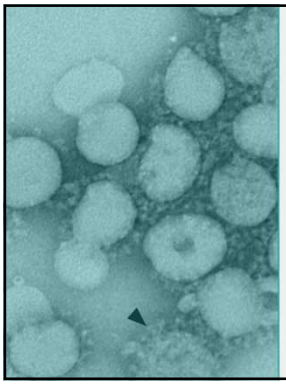
115



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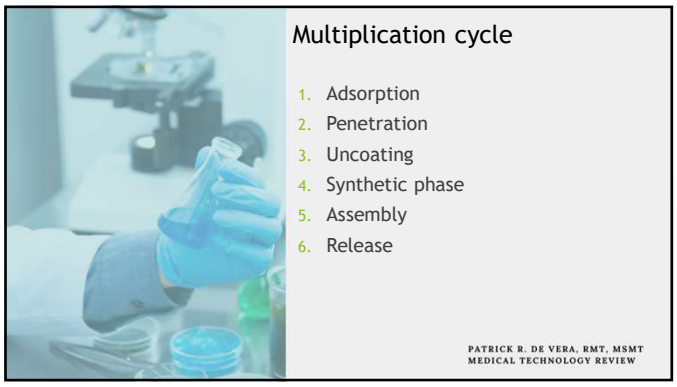

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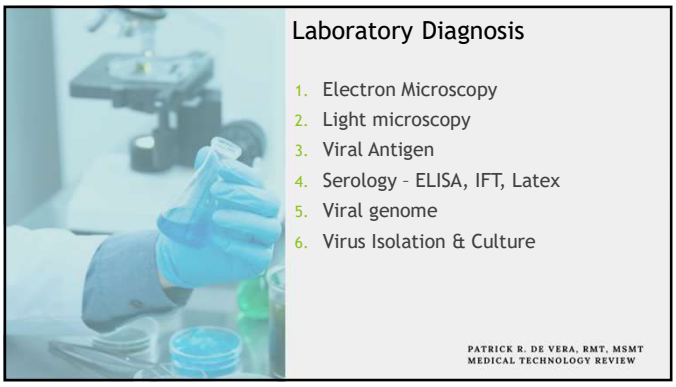

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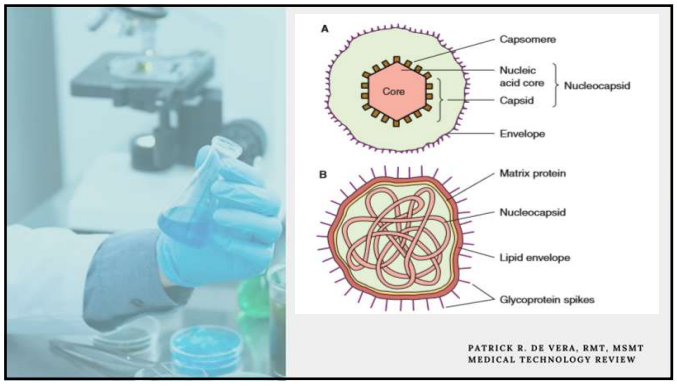

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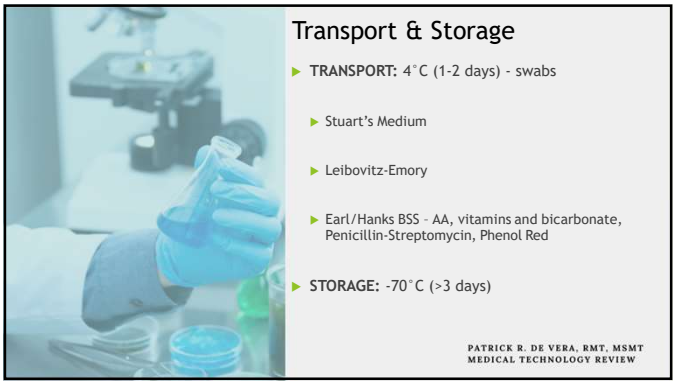

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Types of Cell Culture

1. **Primary cell** – passed only once e.g. PMKC
2. **Semi-continuous** – passed 50x, e.g. HDF
3. **Continuous** – malignant, passed indefinitely e.g. MDCK, Hep-2, HeLa

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Recognition of Viral growth

Cytopathic Effect - cell change

Hemeadsorption - Myxoviridae

Interference – Rubella and Enterovirus

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Characteristic CPE

1. **Rounding necrosis** – Enterovirus
2. **Ballooning/ Giant cell** – HSV
3. **Grape like cluster** – Adenovirus
4. **Syncitium form** – RSV/ Measles/ Rubella
5. **Hemeadsorption** – Influenza, Parainfluenza, Measles and Mumps
6. **Refractile, round cell** – Rhinovirus (33°C)
7. **No CPE** – Influenza, Parainfluenza and Mumps

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DNA Viruses

1. All are D-S DNA except Parvovirus
2. All are ICOSAHEDRAL except poXvirus (compleX)
3. All are ENVELOPED except PAPOVAVIRUS, ADENOVIRUS AND PARVOVIRUS
4. All multiply in the NUCLEUS except POXVIRUS

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SENSE

POSITIVE SENSE: Calicivirus, Picornavirus, Flavivirus, Togavirus, Coronavirus and Retrovirus – ICOSAHEDRAL

NEGATIVE SENSE: Paramyxovirus, Orthomyxovirus, Rhabdovirus, Bunyavirus and Arenavirus - HELICAL

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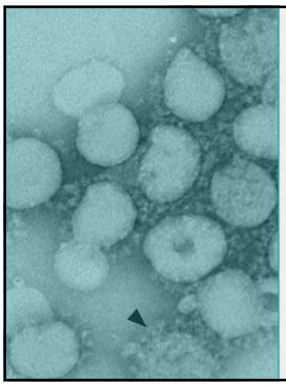

VIROLOGY

DNA VIRUSES

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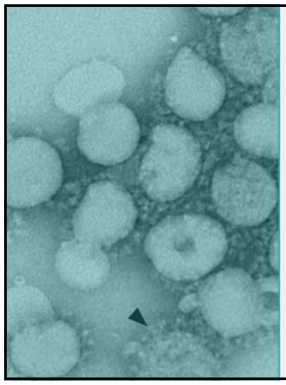

VIROLOGY

POXVIRIDAE

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POXVIRUS

Double- Stranded DNA genome, **BRICK**-shaped, **COMPLEX**

LARGEST VIRUS

Inclusions: Guarnieri bodies

Vesicular skin lesions in the host

- **Molluscum contagiosum:** wart like tumors
- **Variola Major**: Smallpox
  Minor: Alastrim
- Vaccinia: vaccine against smallpox
- Monkeypox and Orf

Diagnosis: CPE on culture or Pocks on chorioallantoic membrane

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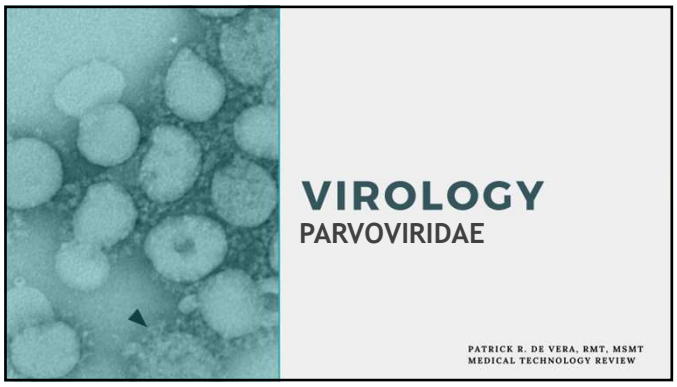

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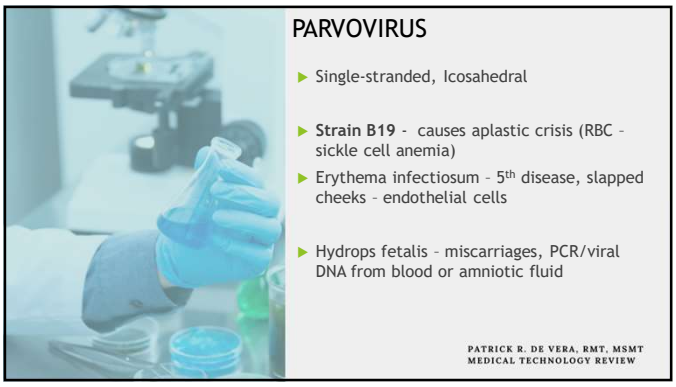

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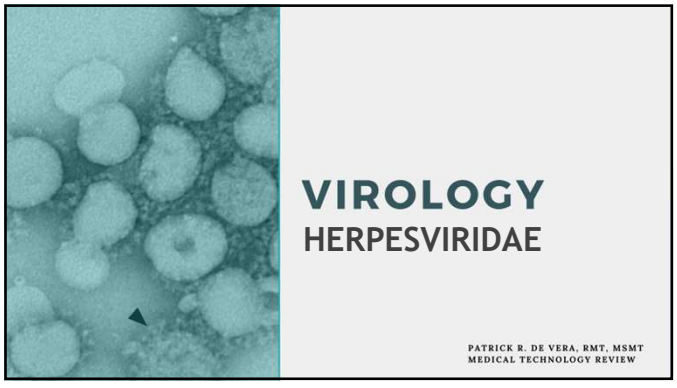

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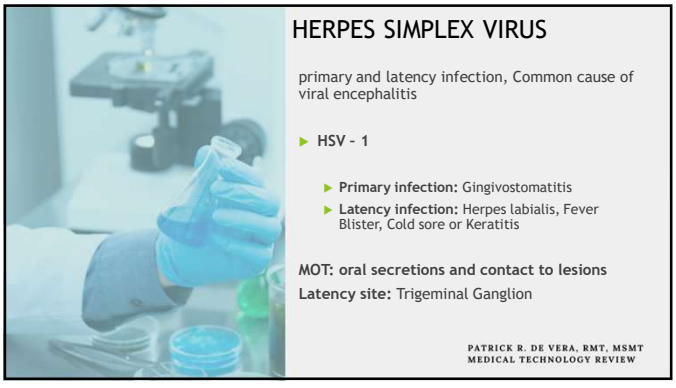

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HSV - 2

- Genital herpes, Neonatal herpes or Aseptic meningitis
  - Cervical Cancer (HPV)

MOT: sexual contact

Latency site: Sacral Ganglion

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Laboratory Diagnosis

- **Tzanck smear** - Giemsa stained, scraping from the base of the vesicle
- **Immunofluorescent** = (+) multinucleated giant cells with cowdry
- **Cell culture** - most diagnostic, CPE occur in 1-5 days - Identification by IFT

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VARICELLA-ZOSTER VIRUS

Human Herpes Virus 3
- **Primary infection:** Varicella - chicken pox

MOT: highly infectious (direct contact, droplet)

Recurrent: Shingles

Latency site: Dorsal root of ganglia
- **Reye's Syndrome -** Induced by aspirin

- **Tzanck smear** - multinucleated giant cell w/ cowdry type inclusions (HSV, HZV)
- **IFT**- method of choice

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EPSTEIN-BARR VIRUS

Human Herpes Virus 4

Infects B cells, Heterophile Antibodies
- **"Infectious Mononucleosis, Burkitt's Lymphoma, Glandular fever or Nasopharyngeal CA"**

MOT: saliva or sexual contact

Diagnosis:
1. Heterophile antigen test: **Monospot test**
2. EBV specific Ab test: EBVCA IgM, EBNA
3. Hematology: **Downey cells**

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CYTOMEGALOVIRUS

Human Herpes Virus 5

- #1 congenital infection, 40 days fever, Mononucleosis like but heterophile Ab (-)

MOT: Transplacental, Oral, SI and blood & tissue transplant

Inclusion: "Owl's Eye"

Urine and Tissue: Giemsa/PAP

Culture: best, Human Diploid Fibroblast (HDF)

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HUMAN HERPES VIRUS

HHV- 6

- **"Roseola Infantum"** - 6th disease, skin rash of childhood, Exanthum subitum.

HHV - 7

- no known disease

HHV- 8

- **"Kaposi Sarcoma"** - bluish purple discoloration of the skin. #1 cause of CA in AIDS.

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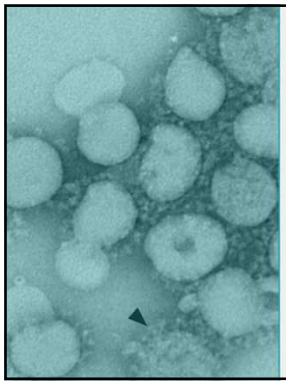

VIROLOGY
POLYMAVIRIDAE

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HUMAN PAPOVAVIRUS

Clinical association:

1. **BK Virus:** Renal disease, Cystitis - urine
2. **JC Virus:** Progressive Multifocal Leukoencephalopathy (PML)

GI tract then cross the blood brain barrier → CSF

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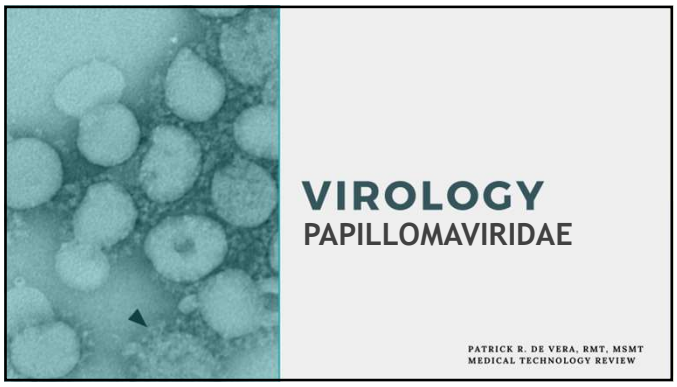

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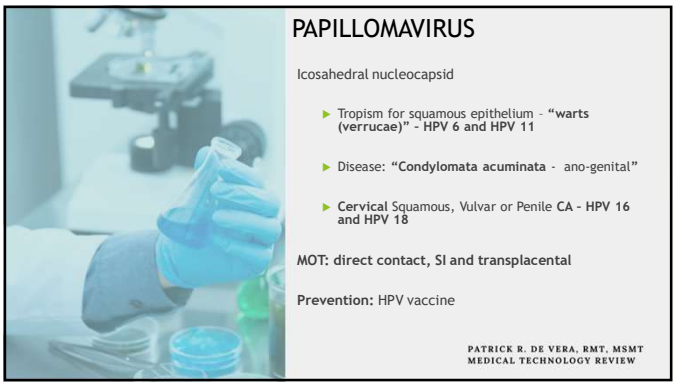

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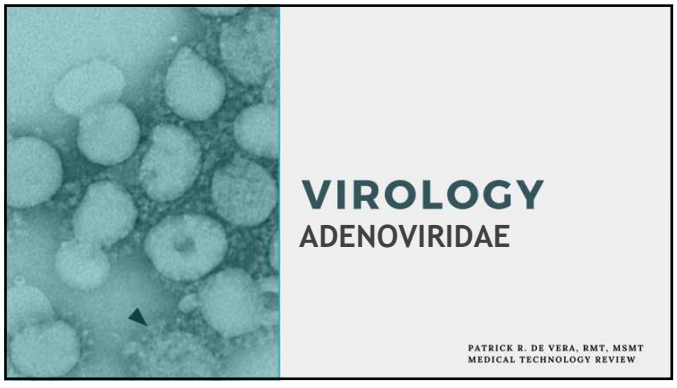

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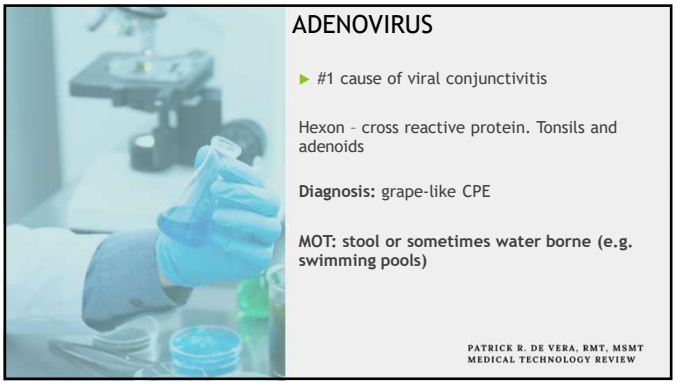

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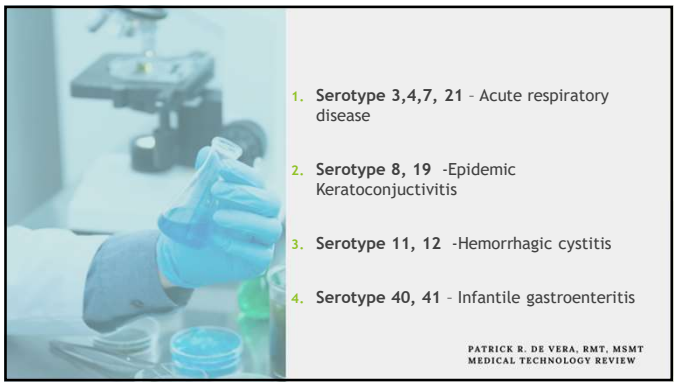

1. **Serotype 3,4,7, 21** - Acute respiratory disease
2. **Serotype 8, 19** -Epidemic Keratoconjuctivitis
3. **Serotype 11, 12** -Hemorrhagic cystitis
4. **Serotype 40, 41** - Infantile gastroenteritis

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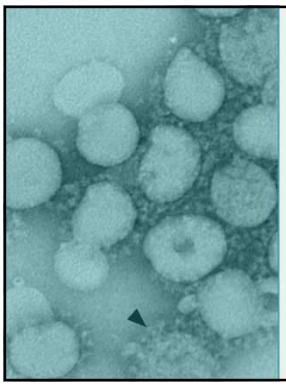

VIROLOGY
HEPADNAVIRIDAE

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HEPATITIS B VIRUS

Dane particle or Australian antigen

- Acute and Chronic Hepatitis B - #1 cause of Hepatocellular CA

MOT: IV, Blood Transfusions or Sexual intercourse

Hepatitis D (co-infection)

Diagnosis: ELISA, PCR

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Serologic Interpretation

Antigens

- HbsAg - EXPOSURE *carrier state
- HBeAg - INFECTIVITY (HIGH)
- HBcAg -

Anti-bodies

- Anti-HBsAg - VACCINATION
- Anti-HBcAg - IgM (ACUTE)
  IgG (CHRONIC)

*window period

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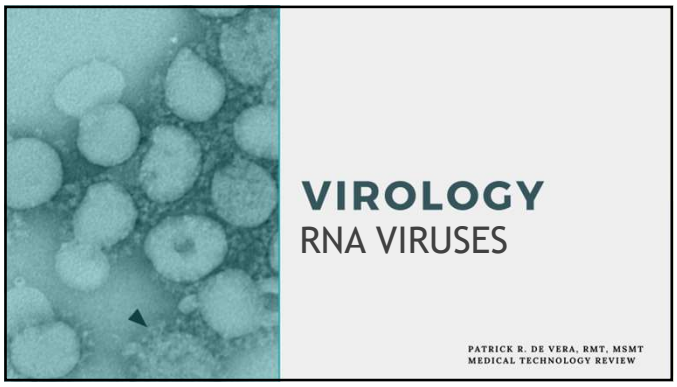

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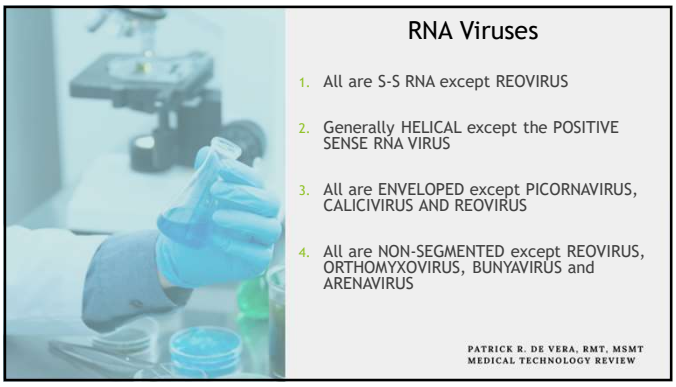

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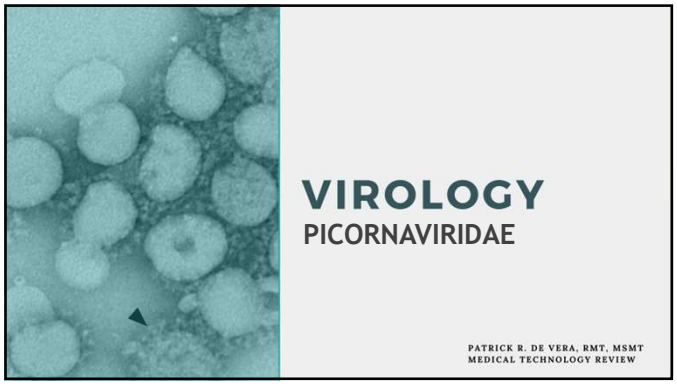

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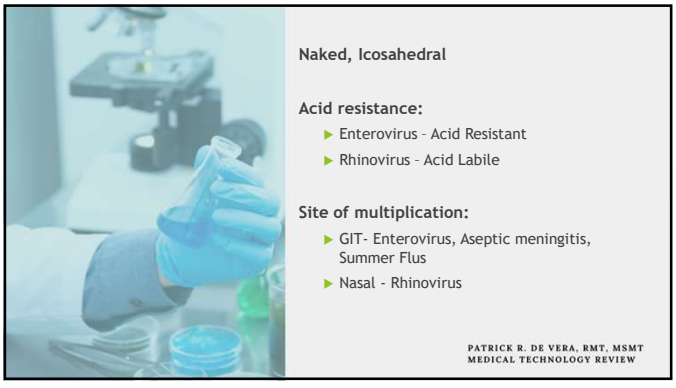

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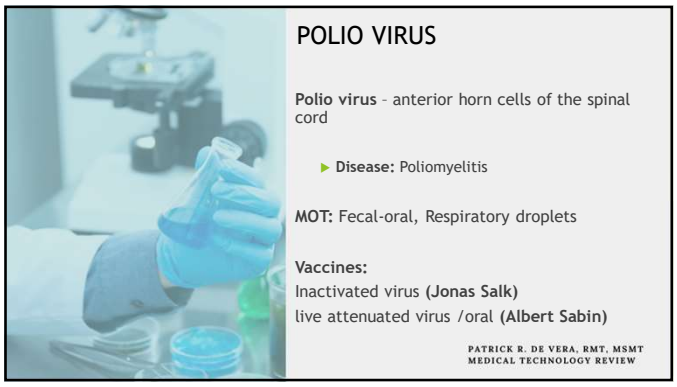

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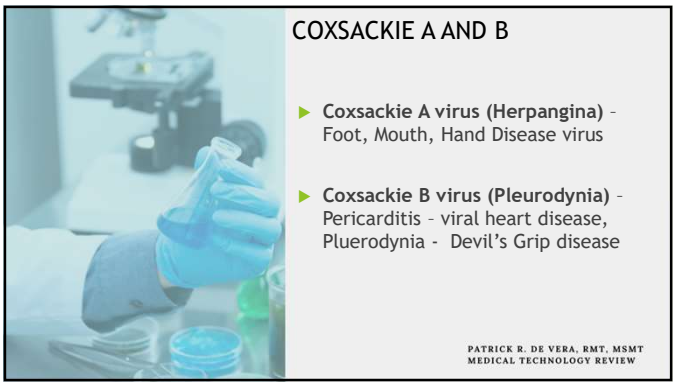

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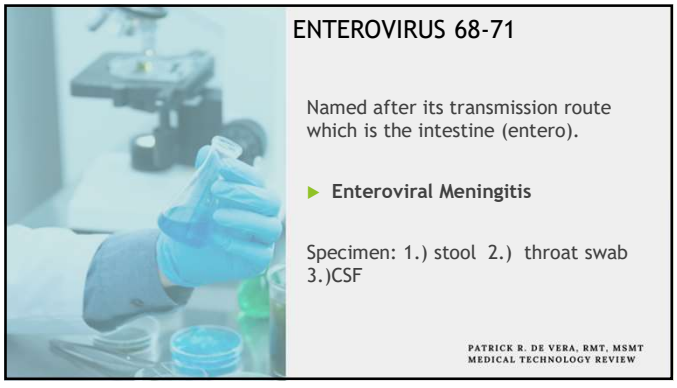

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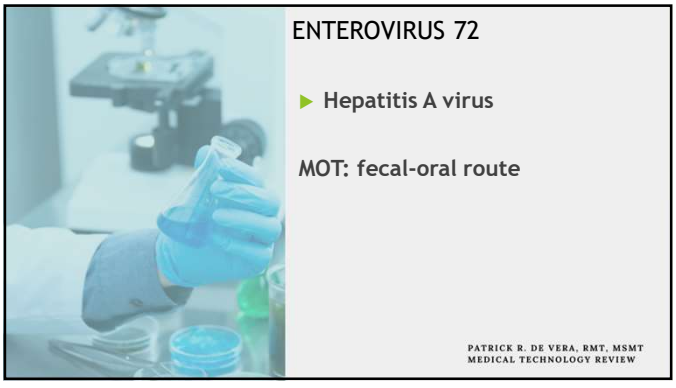

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ECHOVIRUS

ECHO – **E**nteric **C**ytopathic **H**uman **O**rphan virus

Opportunistic, resides on the human GIT and can cause **Aseptic Meningitis**

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RHINOVIRUS

Acid labile, 33°C

- Common cause of "**common colds** or Acute Viral Nasopharyngitis"

MOT: respiratory droplets, fomites and direct contact

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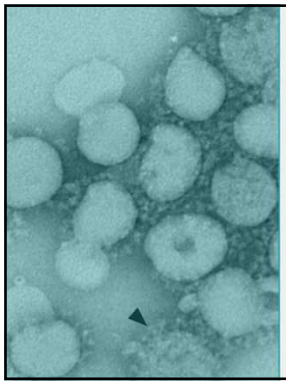

VIROLOGY
ORTHOMYXOVIRIDAE

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Helical, segmented, enveloped

Hemeagglutinin (H) and Neuraminidase (N)

Antigenic changes

1. **SHIFT** (genetic reassortment)- **PANDEMIC**
2. **DRIFT** (point mutation) – **EPIDEMIC**

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INFLUENZA VIRUS

Type A - Pandemic (Antigen shift and drift) - humans, birds and pigs

- AH1:N1 - Spanish flu (1918) and Swine flu (2009)
- AH2:N2 - Asian flu
- AH3:N2 - Hongkong flu
- AH5:N1 - Avian flu, pandemic threat

Type B - Epidemic (Antigen drift) -humans and seals

Type C - humans, pigs and dogs

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Laboratory Diagnosis

- **MOT: Air droplets and direct contact**
- **Antigen test** - throat washing, Nasopharyngeal aspirate by IFT, ELISA
- **Virus Isolation** - throat swab, nasopharyngeal aspirate.
- **Media:** PMKC, MDCK, Embryonated Egg (hemeadsorption)

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Laboratory Diagnosis

- **Test:** Hemeagglutination-Inhibition (reference test)
- **Treatment:** Amantidine, Rimantidine
- **Prevention:** Flu vacccine

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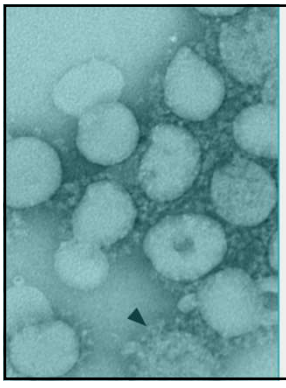

VIROLOGY

PARAMYXOVIRIDAE

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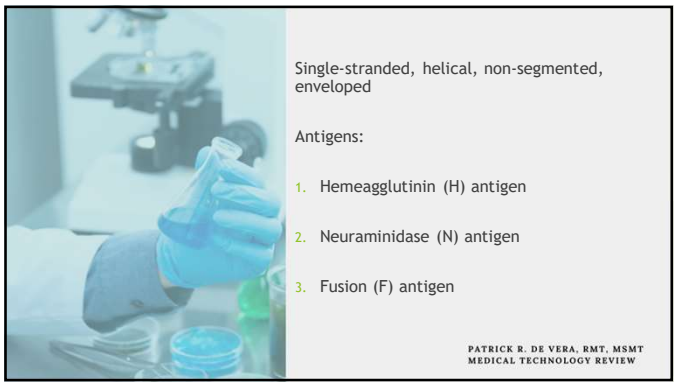

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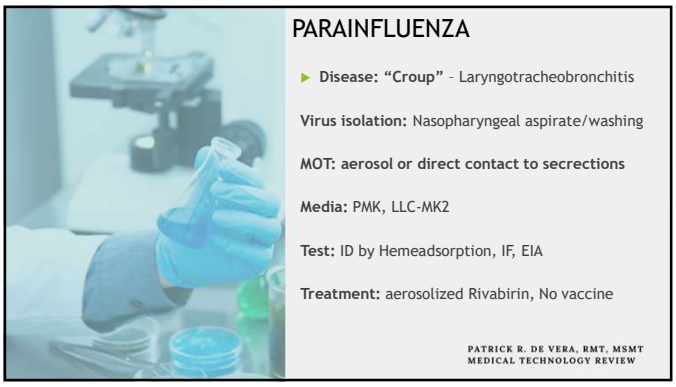

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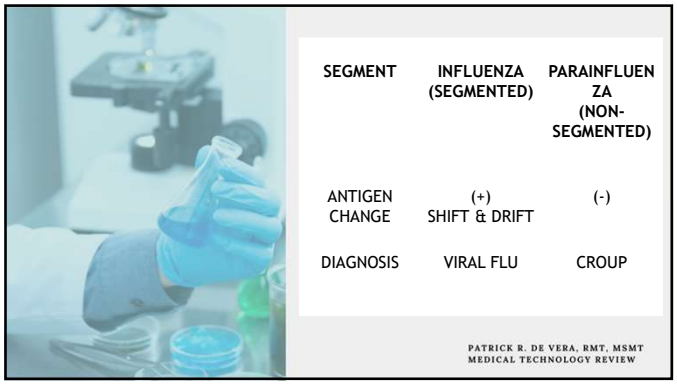

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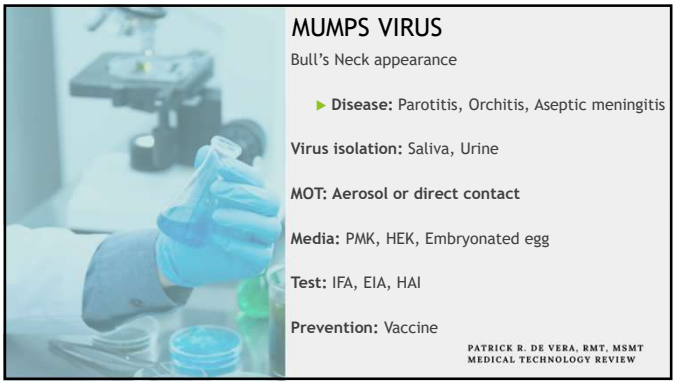

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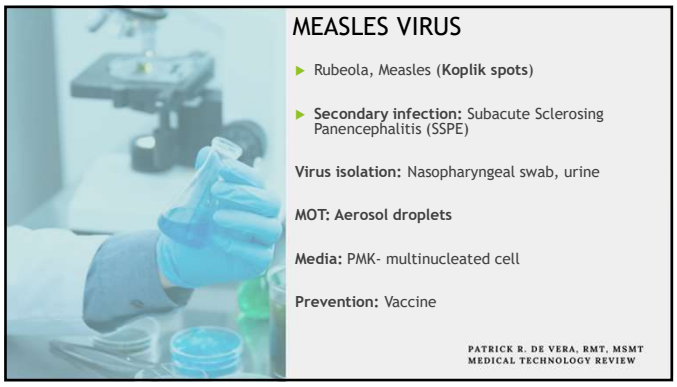

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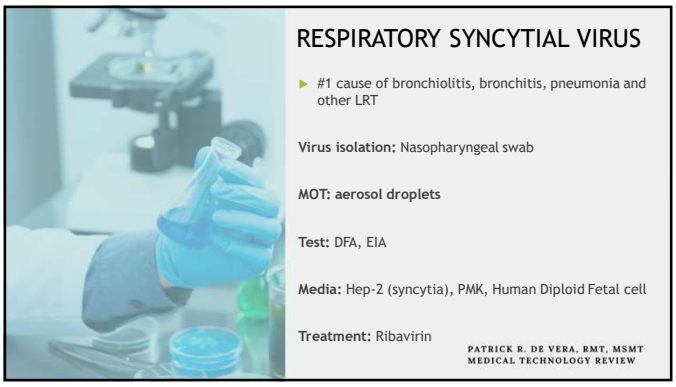

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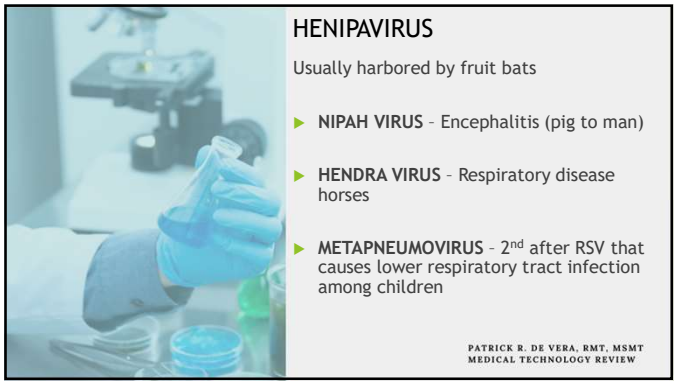

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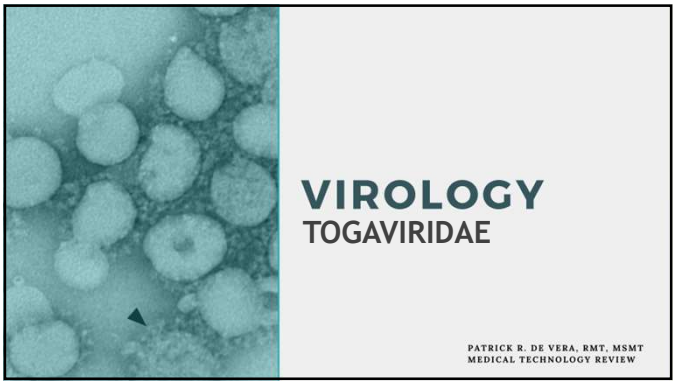

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Icosahedral

- **Disease: WESTERN, EASTERN and VENEZUELA EQUINE ENCEPHALITIS VIRUS, Triple E or sleeping sickness**

Zoonotic (Equine meaning horses)

Reservoir: Birds

Arbovirus: Mosquito

Alphavirus: Encephalitis

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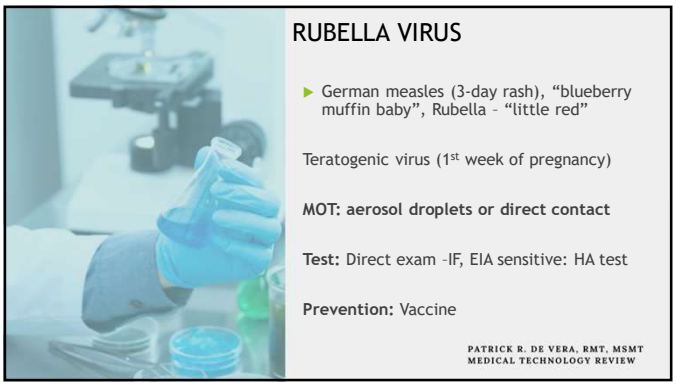

RUBELLA VIRUS

- German measles (3-day rash), "blueberry muffin baby", Rubella - "little red"

Teratogenic virus (1st week of pregnancy)

MOT: aerosol droplets or direct contact

Test: Direct exam -IF, EIA sensitive: HA test

Prevention: Vaccine

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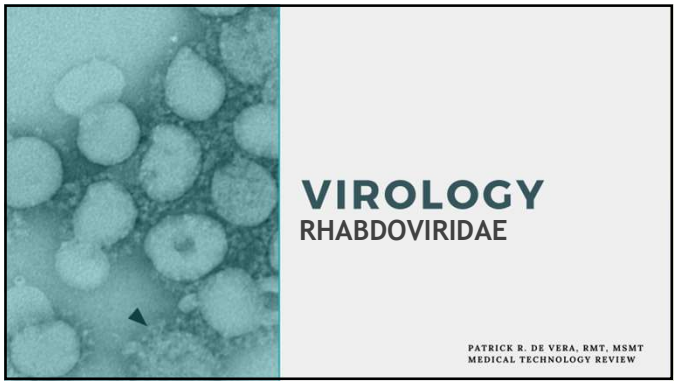

VIROLOGY
RHABDOVIRIDAE

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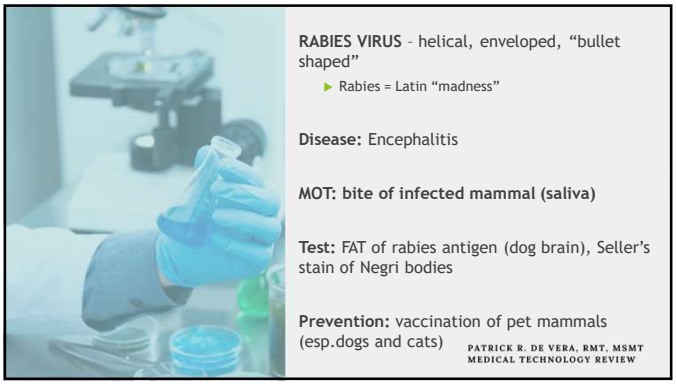

RABIES VIRUS - helical, enveloped, "bullet shaped"

- Rabies = Latin "madness"

Disease: Encephalitis

MOT: bite of infected mammal (saliva)

Test: FAT of rabies antigen (dog brain), Seller's stain of Negri bodies

Prevention: vaccination of pet mammals (esp.dogs and cats)

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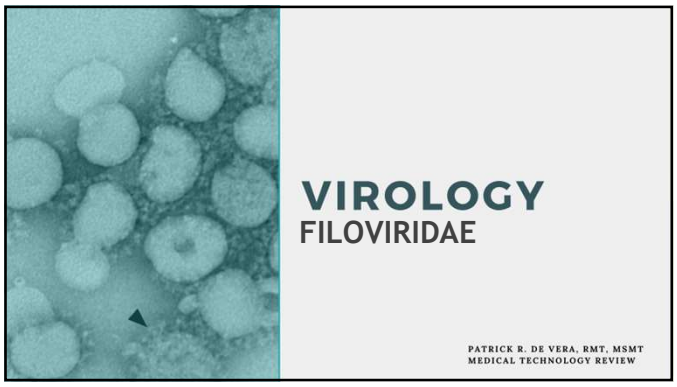

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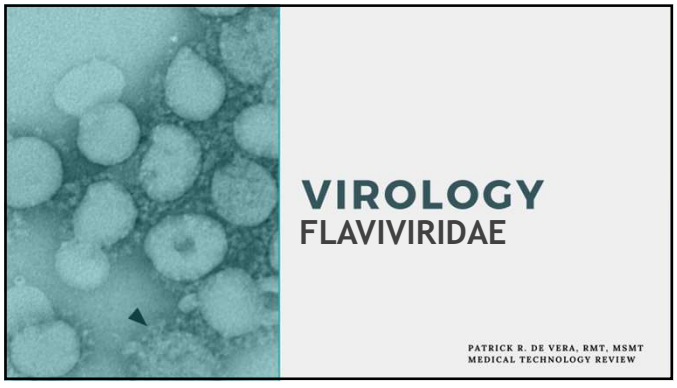

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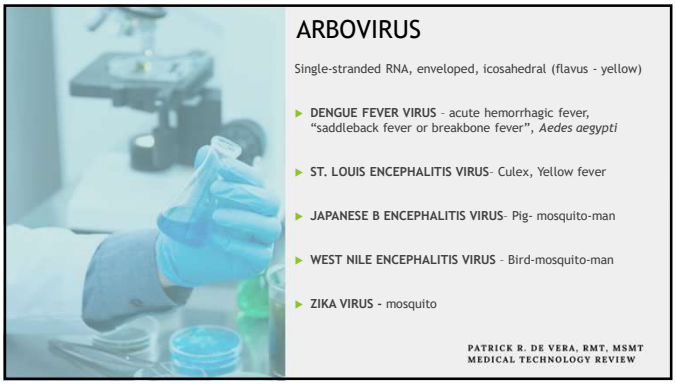

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NON - ARBOVIRUS

HEPATITIS C

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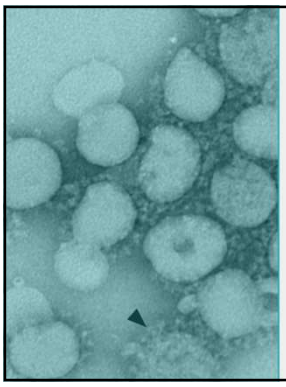

VIROLOGY
BUNYAVIRIDAE

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ARBOVIRUS

Single stranded- RNA, negative sense

- **CALIFORNIA ENCEPHELITIS VIRUS** - Kern County, California
- **LA CROSSE VIRUS**

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NON-ARBOVIRUS

- **SIN NOMBRE VIRUS** - "Four Corners Virus", isolated from rodents
- **RIFT VALLEY FEVER VIRUS** - raw milk, infected blood of domesticated animals (cattle, goats,buffaloes) air around the butchered area. Rift Valley, Kenya
- **HANTAAN RIVER VIRUS** - Korean Hemorrhagic Fever, Hantaan River, Korea:Korean War, field mice

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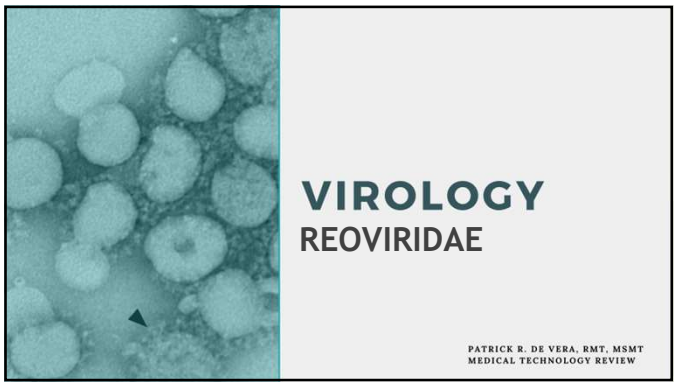

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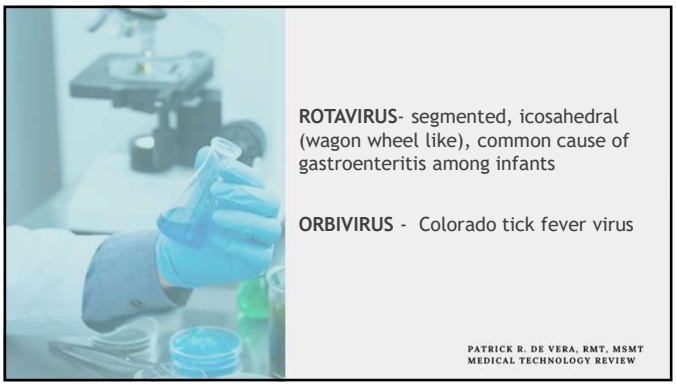

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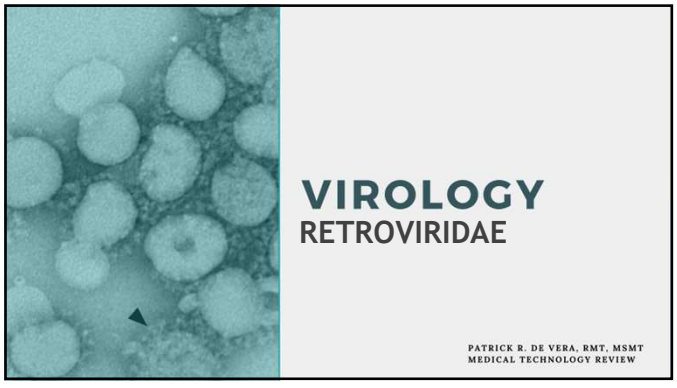

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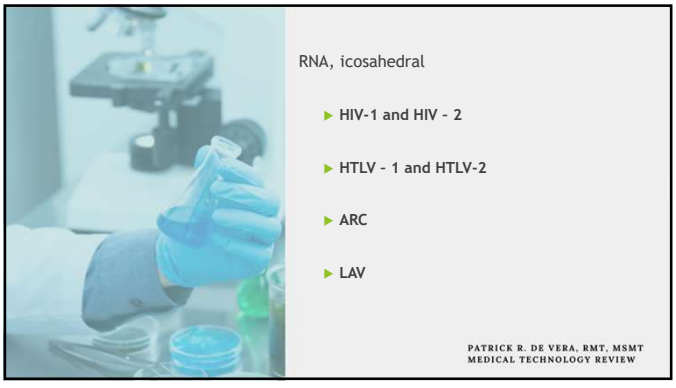

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Major Proteins

- **gag** - capsid protein (CA) - (p24)
  matrix protein (MA) - (p17)
  nucleoprotein (NC) - (p7)
- **pol** - (enzymes) Reverse transcriptase (p51)
  Integrase (p32)
  Protease (p10)
- **env** - gp160 (gp140 and gp41)

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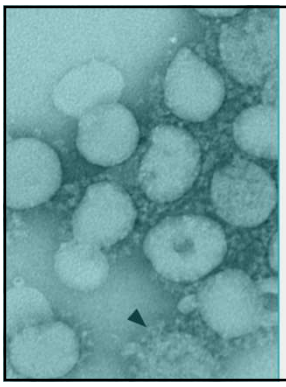

VIROLOGY
CALICIVIRIDAE

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NORWALK or NOROVIRUS - "winter vomiting bug": Norwalk, Ohio.

- Causes gastroenteritis (adult diarrhea)
- MOT: fecal-oral route

HEPATITIS E VIRUS

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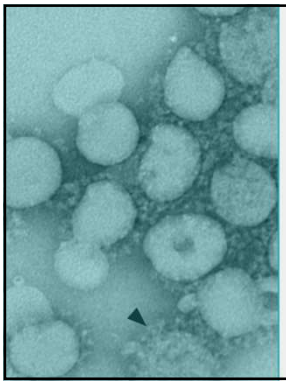

VIROLOGY
ARENAVIRIDAE

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Arena = “sandy” appearance
Hemorrhagic fever, rodents and snakes

LYMPHOCYTIC CHORIOMENINGITIS VIRUS (LCM)

JUNIN VIRUS - Argentinian Hemorrhagic fever

MACHUPO VIRUS- Bolivian Hemorrhagic fever

LASSA FEVER VIRUS - Zoonotic- rats

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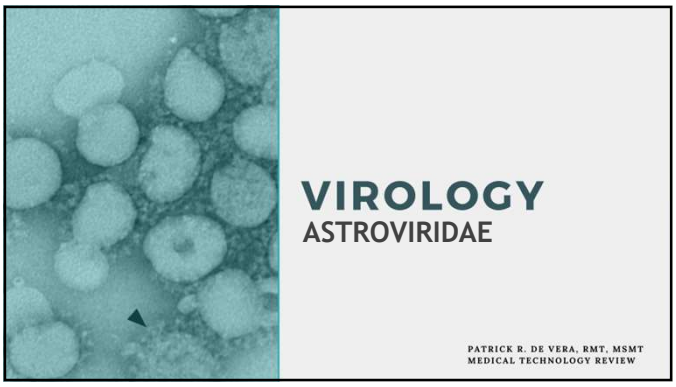

VIROLOGY
ASTROVIRIDAE

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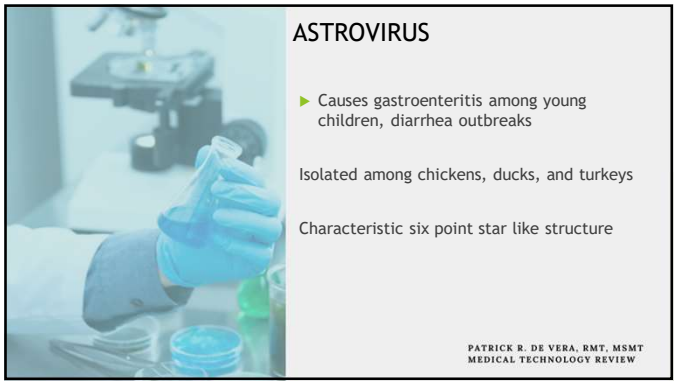

ASTROVIRUS

- Causes gastroenteritis among young children, diarrhea outbreaks

Isolated among chickens, ducks, and turkeys

Characteristic six point star like structure

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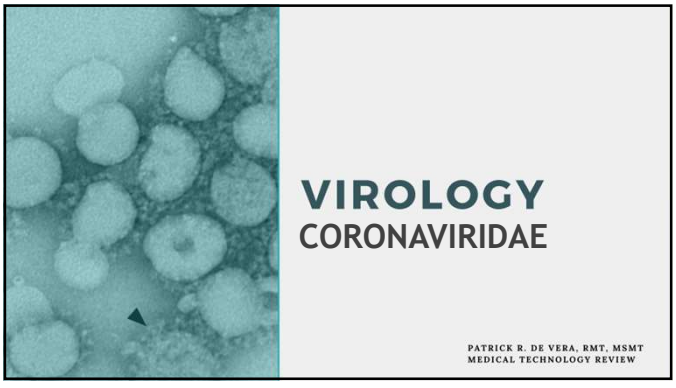

VIROLOGY
CORONAVIRIDAE

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SARS and MERS CoV

Largest RNA viruses, corona = large halo or crown like structure

Novel Human Corona Viruses

1. HCoV - 229E and HCoV - OC43
2. NL63 - New Haven CoV (2004)
3. Human Corona Virus HKU1 (2005)
4. MERS - CoV (2012 and 2013)
5. MERS - CoV (2015 - Korea)
6. SARS - CoV (2020 - Wuhan, 2020-present)

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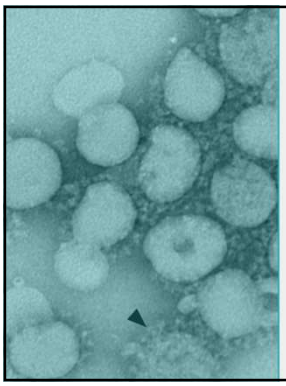

VIROLOGY

NEW EMERGING VIRUSES AND INCREASE SURVEILLANCE

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198

HEPATITIS VIRUS

- Inflammation of the liver
- Can result to scarring or liver cirrhosis

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MEDICAL TECHNOLOGY REVIEW

199

HEPATITIS VIRUS

Types:

1. **Hepatitis A (Picornavirus)** - infectious hepatitis
2. **Hepatitis B (Hepadnavirus)** - serum hepatitis
3. **Hepatitis C (Flavivirus)** - post transfusion, NANB hepatitis
4. **Hepatitis D (Viriod like)** - require HBV infection
5. **Hepatitis E (Calicivirus)** - water borne hepatitis
6. **Hepatitis G (Flavivirus)** - blood borne hepatitis

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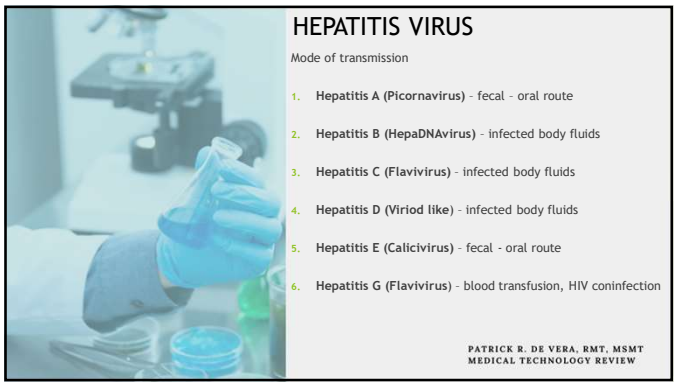

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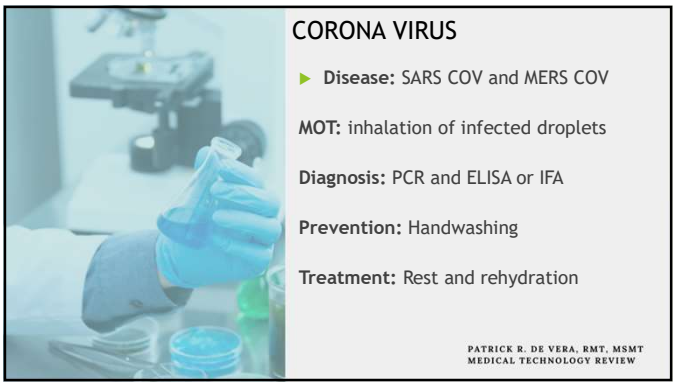

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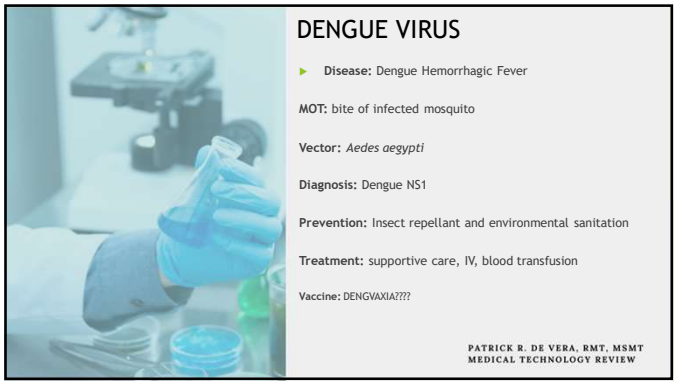

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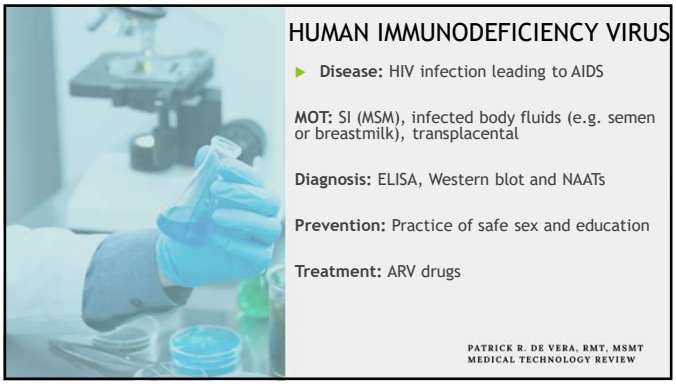

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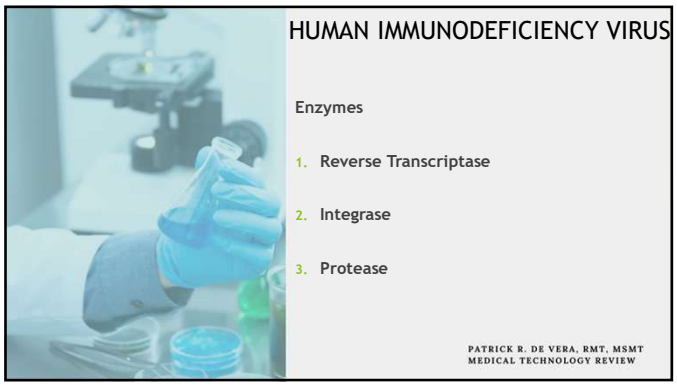

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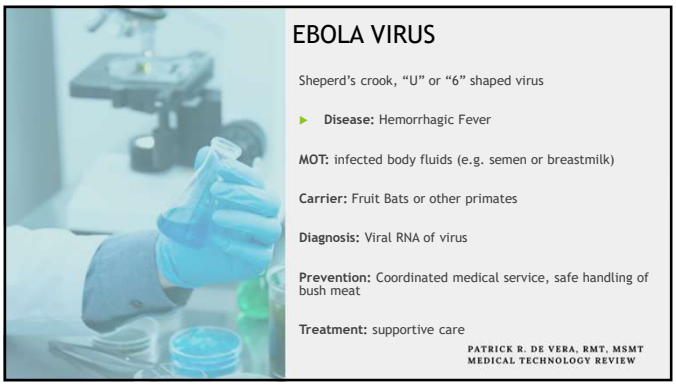

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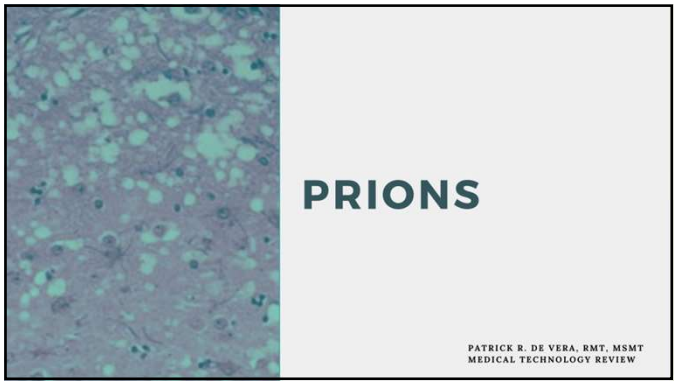

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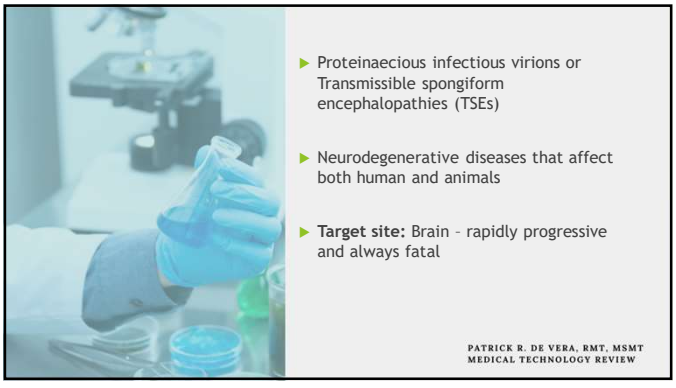

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210

SAMPLE QUESTIONS

German measles is caused by:

A. Rubeola virus
B. Rubella virus
C. Varicella zoster virus
D. Vacinia virus

211

SAMPLE QUESTIONS

German measles is caused by:

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B. Rubella virus
C. Varicella zoster virus
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212

SAMPLE QUESTIONS

What is an alastrim infection?

A. Smallpox
B. Chickenpox
C. Mild form of smallpox
D. Measles

213

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B. Chickenpox
C. Mild form of smallpox
D. Measles

214

SAMPLE QUESTIONS

Myxoviridae virus envelope contains both:

A. Neuraminidase and hemagglutinin
B. Lipoprotein and non segmented nucleocapsid
C. Lipid and double stranded DNA
D. Hemagglutinin and non segmented nucleocapsid

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216

SAMPLE QUESTIONS

What specimen/s should be collected from a patient with suspected influenza?

A. Stool
B. Throat swab
C. Urine
D. All of the above

217

SAMPLE QUESTIONS

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218

SAMPLE QUESTIONS

The best host systems for influenza virus isolation are:

A. Monkey kidney cells and embryonated hen's egg
B. Monkey kidney cells and human embryonic fibroblasts
C. Human embryonic fibroblast and embryonated hen's eggs
D. Monkey kidney cells and A549 cells

219

SAMPLE QUESTIONS

The best host systems for influenza virus isolation are:

A. Monkey kidney cells and embryonated hen's egg
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C. Human embryonic fibroblast and embryonated hen's eggs
D. Monkey kidney cells and A549 cells

220

SAMPLE QUESTIONS

Which of the following viruses may be detected only by use of an electron microscope or EIA methods?

A. Respiratory syncytial virus
B. Influenza A
C. Rotavirus
D. Herpes simplex I

221

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222

SAMPLE QUESTIONS

Rhinoviruses differ from enteroviruses in which way?

A. Acid lability and ether lability
B. Replication primarily in nasal mucosa and acid lability
C. Cytoplasmic replication and formation of inclusion bodies
D. Size of virus and ether resistant

223

SAMPLE QUESTIONS

Rhinoviruses differ from enteroviruses in which way?

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B. Replication primarily in nasal mucosa and acid lability
C. Cytoplasmic replication and formation of inclusion bodies
D. Size of virus and ether resistant

224

SAMPLE QUESTIONS

A virus that is latent in man but becomes activated during pregnancy and is congenitally transferred to the fetus, giving to birth defects is:

A. Rubella virus
B. Rubeola virus
C. Adenovirus
D. Cytomegalovirus

225

SAMPLE QUESTIONS

A virus that is latent in man but becomes activated during pregnancy and is congenitally transferred to the fetus, giving to birth defects is:

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B. Rubeola virus
C. Adenovirus
D. cytomegalovirus

226

SAMPLE QUESTIONS

Latent rubeola virus in brain tissue following childhood measles my later give rise to progressive CNS damage referred to as:

A. Subacute sclerosing panencephalitis
B. Creutzfeld-Jakob disease
C. Reye's syndrome
D. Multiple sclerosis

227

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B. Creutzfeld-Jakob disease
C. Reye's syndrome
D. Multiple sclerosis

228

SAMPLE QUESTIONS

Viral associated spongiform encephalopathies:

A. Kuru and Creutzfeld-Jakob disease
B. Gerstmann-Straussler Scheinker syndrome
C. Bovine spongiform encephalopathy
D. All of the above

229

SAMPLE QUESTIONS

Viral associated spongiform encephalopathies:

A. Kuru and Creutzfeld-Jakob disease
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D. All of the above

230

SAMPLE QUESTIONS

The principal method for serologic diagnosis of influenzae virus diseases is:

A. Complement fixation
B. Hemagglutination-inhibition
C. Neutralization
D. counterimmunoelectrophoresis

231

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232

SAMPLE QUESTIONS

The etiologic agent of "epidemic keratoconjunctivitis" is:

A. Mumps virus
B. Varicella zoster
C. Chlamydia
D. Adenovirus type 8

233

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234

SAMPLE QUESTIONS

Two viruses that are anti-genetically and biologically indistinguishable are

A. Varicella virus and herpes simplex virus
B. Herpes simplex type 1 and 2
C. Cytomegalovirus and herpes virus zoster
D. Rubella and rubeola

235

SAMPLE QUESTIONS

Two viruses that are antigenitically and biologically indistinguishable are

A. Varicella virus and herpes simplex virus
B. Herpes simplex type 1 and 2
C. Cytomegalovirus and herpes virus zoster
D. Rubella and rubeola

236

SAMPLE QUESTIONS

Koplik spots on the oral palate are diagnostic of:

A. Rubella
B. Rubeola
C. Mumps
D. parainfleunzae

237

SAMPLE QUESTIONS

Koplik spots on the oral palate are diagnostic of:

A. Rubella
B. Rubeola
C. Mumps
D. parainfleunzae

238

SAMPLE QUESTIONS

Which viruses are commonly detected by adsorption of guinea pig erythrocytes onto culture cells?

A. Echoviruses
B. Parainfluenzae
C. Poliovirus
D. Coxsackieviruses

239

SAMPLE QUESTIONS

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C. Poliovirus
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240

SAMPLE QUESTIONS

A specimen for viral culture is collected on Friday and must be held for processing until Monday. In general, the optimal temperature for holding this specimen is:

A. 35'C
B. 4'C
C. -20'C
D. -70'C

241

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242

SAMPLE QUESTIONS

The type of cell culture that best supports the growth of cytomegalovirus is:

A. Primary monkey kidney cells
B. Hela cells
C. He-2 cells
D. Human fibroblast cells

243

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244

SAMPLE QUESTIONS

Herpes simplex virus frequently produces

A. fever blisters
B. diarrhea
C. vomiting
D. pneumonia

245

SAMPLE QUESTIONS

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A. fever blisters
B. diarrhea
C. vomiting
D. pneumonia

246

SAMPLE QUESTIONS

Poliomyelitis virus can be isolated from a patient after the onset of illness by using which of the following sample?

A. Blood
B. Throat swab
C. Muscle from the leg biopsy
D. Stool or rectal swab

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248

SAMPLE QUESTIONS

One of the following best describes the viruses

A. Possess RNA only
B. Dependent upon living cells for growth and development
C. Possess ribosomes
D. Multiply by binary fission

249

SAMPLE QUESTIONS

One of the following best describes the viruses

A. Possess RNA only
B. Dependent upon living cells for growth and development
C. Possess ribosomes
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250

SAMPLE QUESTIONS

Warts are characteristically produced when humans are infected with:

A. Papillomavirus
B. Alphavirus
C. Flavivirus
D. Bunyavirus

251

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252

SAMPLE QUESTIONS

The so called “bird’s flu” virus

A. H1:N1
B. H2:N2
C. H4:N2
D. H5:N1

253

SAMPLE QUESTIONS

The so called “bird’s flu” virus

A. H1:N1
B. H2:N2
C. H4:N2
D. H5:N1

254

SAMPLE QUESTIONS

Encephalitis disease virus transmitted from pigs to man

A. Rift valley fever
B. Foot and mouth disease virus
C. Nipah virus
D. Hanta virus

255

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256

SAMPLE QUESTIONS

Most frequent cause of diarrhea during “winter” season

A. Astrovirus
B. Adenovirus
C. Enterovirus
D. Rotavirus

257

SAMPLE QUESTIONS

Most frequent cause of diarrhea during “winter” season

A. Astrovirus
B. Adenovirus
C. Enterovirus
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258

SAMPLE QUESTIONS

Respiratory syncytial virus (RSV) is best isolated using a:

A. Nasopharyngeal aspirate
B. Cough plate
C. Expectorated sputum
D. Throat swab

259

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260

SAMPLE QUESTIONS

Which technique can identify HSV, CMV and Adenovirus infection within 24 hours?

A. Tube monolayers
B. Shell vial
C. Electron microscopy
D. Polymerase chain reaction

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262

SAMPLE QUESTIONS

Which of the following indicates the presence of a viral infection in tissue smears or biopsies?

A. Cytopathic effect
B. Intranuclear inclusion
C. Cell lysis
D. Mononuclear inflammatory cells

263

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264

SAMPLE QUESTIONS

What material should be used to prepare slides for direct smear examination for virus detection by special stains or FA technique?

A. vesicular fluid
B. Leukocytes from the edge of the lesion
C. Top portion of the vesicle
D. Epithelial cells from the base of the lesion

265

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266

SAMPLE QUESTIONS

The most common viral syndrome of pericarditis, myocarditis and pleurodynia is caused by:

A. Herpes simplex
B. RSV
C. EBV
D. Coxsackie B virus

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268

SAMPLE QUESTIONS

Which virus has been implicated in adult gastroenteritis resulting from ingestion of contaminated food such as shellfish and water?

A. Rotavirus
B. Hepatitis C virus
C. Norwalk like virus
D. Coronavirus

269

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270

SAMPLE QUESTIONS

CPE seen as large “balloon” cells and multinucleated giant cells” is diagnostic of:

A. Adenovirus
B. Enterovirus
C. Respiratory Syncitial virus
D. Herpes Simplex virus

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SAMPLE QUESTIONS

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272

SAMPLE QUESTIONS

A virus that infects immature RBCs in the bone marrow and cause a febrile illness with rash and is called the fifth childhood disease:

A. Rubella
B. Rubeola
C. Varicella
D. Parvovirus B19

273

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274

SAMPLE QUESTIONS

The etiologic agent of many common colds are RNA viruses that grow better at 33'C than at 37'C. These viruses are:

A. Adenoviruses
B. Orthomyxoviruses
C. Paramyxoviruses
D. Rhinoviruses

275

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C. Paramyxoviruses
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276

SAMPLE QUESTIONS

Which disinfectant inactivates HIV and HBV?

A. Alcohol
B. Phenol
C. Iodine
D. Sodium hypochlorite

277

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278

SAMPLE QUESTIONS

A highly fatal Arenavirus first described in Africa contracted thru infected rodent urine

A. Marburg-Ebola
B. Machupo
C. Lassa fever
D. Yellow fever

279

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280

SAMPLE QUESTIONS

Viruses that are inactivated by ether usually possess

A. Viral capsid
B. Viral envelope
C. Viral nucleocapsid
D. Polysaccharide capsid

281

SAMPLE QUESTIONS

Viruses that are inactivated by ether usually possess

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282

SAMPLE QUESTIONS

A unique characteristic of Reoviruses is what?

A. Resistance to chlorine
B. Double stranded RNA
C. Contain both DNA and RNA
D. Ether resistant

283

SAMPLE QUESTIONS

A unique characteristic of Reoviruses is what?

A. Resistance to chlorine
B. Double stranded RNA
C. Contain both DNA and RNA
D. Ether resistant

284

SAMPLE QUESTIONS

Respiratory syncitial virus is most readily isolated from clinical material in:

A. Human embryonic lung fibroblast
B. Suckling mice
C. Rhesus monkey kidney cells
D. Hep-2 cells

285

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286

SAMPLE QUESTIONS

A virus causing congenital “German measles” is:

A. Rubeola
B. Rubella
C. CMV
D. HSV

287

SAMPLE QUESTIONS

A virus causing congenital “German measles” is:

A. Rubeola
B. Rubella
C. CMV
D. HSV

288

SAMPLE QUESTIONS

The most common method for laboratory diagnosis of rabies is:

A. Fluorescent antibody test
B. Neutralization test
C. Seller's Negri body stain
D. Mouse inoculation

289

SAMPLE QUESTIONS

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Good luck Future RMTs!

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