

**Subjects****Oncology 2****Pathology 7****Microbiology 11**

## 1) ONCOLOGY

### A) Choroidal Melanoma

#### Clinical Risk factors for choroidal melanoma

- 1) size - the most reliable sign  
(1cm<sup>3</sup> is the key number) - diameter and height
- 2) location - anterior worse
- 3) pigment - darker worse ?
- 4) age of patient ? older worse
- 5) extraocular extension

#### Histopath Risk Factors for prognosis after enucleation (Yanoff 1996)

- 1) size \*\* most important \*\* (1 cm<sup>3</sup> key size)
- 2) cell type
- 3) scleral or extraocular extension
- 4) mitotic activity
- 5) vascular loops on pathology
- 6) standard deviation of nucleolus area  
- extremely accurate predictor of death (larger nucleolus is worse)
- 7) increased reticulum stain path: better (old)

#### Clinical Risk factors for growth in choroidal melanocytic lesion (Shields)

- 1) tumor thickness
- 2) touching optic disc
- 3) flashes & floaters
- 4) subretinal fluid
- 5) blurred vision
- 6) lipofuscin (orange) over tumor

#### Shields classification of melanoma (1983)

(pick the worse category if different)

type	diam.	height
small	5-10	2-3
medium	10-15	3-5
large	15-20	5-10
very large	>20	>10

#### COMS Clinical Classification of Melanoma

(pick the worse category if different)

type	diam.	height
nevus	1-5	0-1
small	5-?10	1-3
medium	10?-16	4-8
large	> 16	> 8

\*\* plaque will not treat more than 8mm

#### Classification in Yanoff (1996)

melanoma size	diam	height
very small	< 7	< 2
small	7-10	2-3
medium	10-15	3-5
large	> 15	> 5

#### Zimmerman Classification

- 1) small < 10mm (diameter?)
- 2) medium: 11 - 15 mm
- 3) large > 15 mm

#### Revised Callender Classification

- 1) *Spindle cell nevus*  
- histo: slender and benign appearing  
- size: < 10 mm diam., < 3 mm height  
(Shield's small melanoma)  
- clinical: no growth, necrosis or extrachoroidal invasion
- 2) *Spindle cell melanoma*  
- histo: nucleoli, clumped chromatin  
- violates one of the size or clinical characteristics of nevus (above)
- 3) *mixed cell melanoma*: see epithelioid cells

#### Treatment of choroidal melanoma (COMS)

- 1) small (and medium?) non-growing → observe
- 2) small slow-growing: radiotherapy (beam or plaque)
- 3) medium slow growing: enucleate or plaque radiotherapy
- 4) large: enucleate with or without previous radiation (external beam)

exceptions:

- 1) observe small and medium slow growing melanoma in elderly, sick, or 1 eyed
- 2) 1 eyed: radiation only (not enucleation) for large tumors
- 3) small and medium tumors invading optic nerve → enucleate (plaque will damage nerve anyway)

#### DDx of iris lesions

##### A) Melanotic

- 1) nevus
- 2) melanoma
- 3) adenoma of iris epithelium
- 4) adenocarcinoma of iris epithium
- 5) neurofibroma
- 6) ICE (iris nevus syndrome)

**B) Amelanotic**

- 1) amelanotic melanoma
- 2) granuloma (TB, leprosy, sarcoid)
- 3) Busacca/Koeppe nodules
- 4) JXG
- 5) leiomyoma
- 6) seeding of intraocular tumor (eg. RB)
- 7) rhabdomyosarcoma
- 8) iris cyst (pigment epithelial)
- 9) iris cyst (stromal)
- 10) iris cyst post-op
- 11) f.b.
- 12) metastasis
- 13) syphilis (granuloma)

**Risk factors for iris nevus/melanoma**

All seen in both but more common in melanoma  
 - iris melanomas are 50% of childhood choroidal melanomas but 10% in adult melanomas

- 1) rate of growth - most important!
- 2) size
- 3) tapioca appearance
- 4) surrounding melanosis
- 5) angle involvement
- 6) transscleral involvement
- 7) blue iris
- 8) inferior location
- 9) seeding of cells into AC

*Non-specific* - signs of "chronicity" - Chaim

- 1) hyphema
- 2) glaucoma
- 3) cataract
- 4) ectropion iridis

**Treatment of Iris Melanoma**

*Shields:*

- 1) observation for slow-growing tumors
- 2) sector iridectomy when:
  - i) growth is more pronounced
  - ii) the lesion covers the pupillary margin and interferes with vision
  - iii) the lesion produces secondary glaucoma that is not controlled by medication
- 3) iridocyclectomy:
  - i) lesions that are growing and involve the chamber angle
  - ii) peripheral lesions with glaucoma

B) *Jakobiec*

- fine needle biopsy of lesion;  
 if:

- 1) spindle A: observe
- 2) spindle B: iridectomy
- 3) epithelioid: enucleation (rare)

**B) Retinoblastoma****Reese Ellsworth classification (1950's)**

- 1) A) 1 tumor less than 4 DD post. to equator  
 B) mult. tumors less than 4 DD
- 2) 1 tumor 4 DD - 10 DD post. to equator  
 B) mult. tumors 4 - 10 DD
- 3) A) tumor ant. to equator  
 B) 1 tumor larger than 10 DD post. to equator
- 4) A) multiple tumors larger than 10DD  
 B) tumor ant. to ora
- 5) A) tumors over half the retina  
 B) vitreous seeding

**Hungerford classification (simpler)**

- 1) tumors less than 4 DD; no vitreous seeding
- 2) tumors 4-10 DD
- 3) greater than 10 DD

**Treatment of RB****Traditional**

- 1) unilateral RB with poor visual potential (macular tumors and large tumors - i.e. half the vitreous) → enucleate (still true today)
- 2) bilateral tumors: enucleate the poorer eye (if advanced)
- 3) enucleate for: rubeosis, glaucoma, vitreous seeding

**Newer treatment for bilat and small tumors  
St. Bartholomew's (London)**

- 1) chemo (VP-16, carcoplastin, vincristine)
- 2) then radio (4500 rads) then repeat chemo

**Newer options**

- 1) cryo for small ant. tumors
- 2) laser for small post. tumors
- 3) radiation plaque (small to medium post. lesions)

**Shields**

- 1) laser small RB tumors (< 4 x 4 x 2.5mm)  
 - about 3 DD
- 2) cryo small anterior RB ( 3.5 x 3.5 x 2.0mm)

**Brenda Gallie's group**

- 1) initial chemo followed by either cryo or laser

No radiation for her group!

### Clinical Risk factors

- 1) spread down optic nerve (most imp)
- 2) size 1-4 DD, 4-10 DD, >10 DD
- 3) multifocality (multiple worse)
- 4) location (anterior worse)
- 5) vitreous seeding

### Prognosis of Death if ON invasion in RB

- 1) 8% - no invasion
- 2) 15% - prelaminar
- 3) 44% - retrolaminar and before resected end
- 4) 64% - retrolaminar and past resected end

### Prognosis of RB

- 1) optic nerve not involved: 90% survive
- 2) tumor into lamina cribosa: 40%
- 3) tumor past cut end of nerve: 20%

**Follow up after enucleation:** every 4 months for EUA until age 4, then Q 6 months

### Sites for mets for RB

- 1) CNS
- 2) skull
- 3) long bones

### DDX of Homer Wright rosettes

(fleurette specific for RB)

- 1) RB
- 2) medulloepithelioma
- 3) neuroblastoma

### Ddx of Flexner-Wintersteiner rosettes

- 1) retinoblastoma
- 2) pinealoblastoma
- 3) ectopic intracranial retinoblastoma

### Maturity:

fleurette>FW>HW

### DDx of small to medium size retinoblastoma

- 1) astrocytic hamartoma
- 2) retinal capillary hemangioma
- 4) posterior pole granuloma

### Workup for RB

- 1) CSF (LP) - during EUA
- 2) bone marrow - during EUA

- 3) bone scan
- 4) CXR

### Treated RB appearance

- 1) tumor disappeared
- 2) cottage cheese
- 3) fish flesh - looks like untreated tumor

### Genetic counselling for RB

Risk of next child to have inheritable RB

- 1) parent had bilateral RB: 45%
- 2) "normal" parents with 2 children with RB: 45%
- 3) parent has unil. RB : 7-15%
- 4) "normal" parents with 1 child with bil. RB: 5%
- 5) "normal" parents with child with unil. RB: <1%
  - 15% of sporadic unilateral RB patients are carriers of RB gene and therefore are transmittable (see 2)
  - 6% of RB patients have FH of RB

### C) Rhabdomyosarcoma

#### Types:

- 1) embryonal - most common
- 2) alveolar - 2<sup>nd</sup> most common; worst prognosis
- 3) differentiated (pleomorphic) - least common; best prognosis
- 4) botryoid - usually in conj; grapelike

### Treatment of Rhabdo of orbit

- 1) biopsy (incisional or if possible, excisional)
- 2) radiation and chemo
- 3) no exenteration for primary rhabdo

### Workup for Rhabdo

- 1) physical (neck and pre-auricular lymph nodes)
- 2) CT orbit
- 3) CXR
- 4) bone scan?
- 5) b.m. aspirate (speak to oncologist)
- 6) LP (speak to oncologist)
- 7) LFT's

### D) Lid Skin tumors

#### BCC clinical types:

- 1) nodular
- 2) cystic
- 3) nodulra/ulcerative
- 4) morpheaform
- 5) pigmented
- 6) basosquamous

7) undifferentiated

### **BCC poor prognosis**

- 1) canthal area
- 2) previous irradiation
- 3) neglected tumors

### **Cutaneous melanoma types: (Clark-McGovern scheme)**

- 1) superficial spreading melanoma (80%)
- 2) lentigo maligna melanoma (10%)
- 3) nodular melanoma (10%) - most common in eyelid

### **Lid Skin Melanoma**

A) *Clark Classification* (1969)

- I: epidermis
- II: papillary dermis
- III: jxn of papillary and reticular dermis
- IV: reticular dermis
- V: hypodermis (fat)

B) *Breslow Classification* (1970)

- I: <.75 mm depth of dermis involvement
- II: .75-1.50
- III: 1.50-4.00 (need systemic W/U for this level)
- IV: >4.00

### **E) lacrimal gland tumors**

histo types of adenoid cystic CA

- 1) swiss cheese
- 2) basaloid
- 3) comedo
- 4) tubular
- 5) sclerosing

### **Treatment of Lacrimal gland tumors**

- 1) if appear to be benign cystic; unilateral, painless, > 1 year duration, globe indentation, no bony erosions, then lateral orbitotomy and complete excision with capsule intact
- 2) if is bilateral and molding (lymphoma) or painful, with bony erosions (adenoid cystic) and less than 1 year, then anterior orbitotomy with incisional biopsy

### **F) Conjunctival tumors**

#### **Conjunctival melanoma**

- 1) 33% de novo
- 2) 33% follow PAM

3) 33% follow nevus

#### **Conjunctival melanoma:**

- less than 0.8 mm → don't develop mets (or rare)

#### **Treatment of conj. melanoma**

- 1) excision followed by
- 2) cryotherapy
- unproven: chemo, radiation, laser
- 3) if very extensive → exenteration

#### **Treatment of PAM**

- 1) regular multiple biopsies from thick areas
- 2) if shows atypia → remove all areas involved and cryo the base (50% chance of malignancy - higher chance if not showing basaloid activity)
- 3) if area extensive, may have to do cryo instead of excision
- 4) enucleation useless (on conj)
- 5) exenteration does not change the mortality and is reserved for debulking only

#### **PAM risks to become melanoma**

- 1) all PAM: 25%
- 2) without atypia: 0%
- 3) with atypia: 50% (46%)
- 4) with epithelioid melanocytes: 80%
- 5) growth other than basal hyperplasia: 80%

#### **Treatment of conj. tumors**

- 1) biopsy
- 2) if CIN or cancer: excise + weak cryo to margins (not cornea)

### **G) Varia**

#### **Radiation doses**

- generally in doses of 200
- 1) TRO: 1500-2000 (20 x 100)
  - 2) OID: 2000
  - 3) BRLH: 1500
  - 4) lymphoma: 2000-4000
  - 5) melanoma: 7000-10000
  - 6) rhabdo: 4500-6000
  - 7) RB: 4000

#### **complication of radiopathy - doses**

- 1) dry eye: 1000
- 2) cataract: 2000
- 3) retinopathy: 4000

4) neuropathy: 4000

### Indications for FNAC

- 1) suspected mets (known primary)
- 2) lymphoid tumor (Nancy)

### Fleshy lid tumors

- 1) lymphoma
- 2) plasmacytoma
- 3) Merkl cell

### Medulloepithelioma

- 1) can be lethal but usually not
- 2) enucleation is treatment
- 3) teratoid elements
- 4) originates from non-pigmented epithelium

### Lymphoma W/U

- 1) physical
- 2) CBC
- 3) bone marrow biopsy
- 4) liver, spleen scan (or CT abdo)
- 5) CXR (or CT chest)
- 6) bone scan
- 7) SPEP

### Congenital Ocular(/dermal) Melanosis

- Oculodermal more common in Asians, blacks, hispanics
- Ocular melanosis alone more common in whites
- melanoma more common in whites
- assoc. with melanoma of:
  - 1) uvea
  - 2) conj (rare)
  - 3) lid
  - 4) orbit
  - 5) meninges

### Histiocytosis X (Langerhans cell histiocytosis)

- 1) eosinophilic granuloma
  - best prognosis
  - osteolytic lesions of orbit with proptosis
  - Rx: excision, radiation or steroids
- 2) Hand Shuller Christian ("multifocal eosinophilic granuloma")
  - medium prognosis
  - lesions of orbit and systemic
  - Rx: chemo

3) Letterer - Siwe

- ("diffuse histiocytosis")
- soft tissue lesions of viscera
  - bad prognosis
  - Rx: chemo

## 2) PATHOLOGY

### Stains

PAS: basement mb.  
 Alcian blue: MPS  
 colloidal iron: MPS  
 Masson's trichrome: hyaline  
 Congo red: amyloid  
 Ziel-Nielson: mycobacterium  
 Oil Red O: lipids (sebaceous cell)  
 Sudan Black (same as Oil red O)  
 Acridine orange: bacteria, fungi, ameba  
 Calcufluor white: fungi, ameba  
 Giemsa: cell morphology  
 Gram: bacteria, yeast  
 modified Gram: bacteria  
 Leder stain: granulocytic sarcoma

### Preservation Media

1) formalin: most tumors  
 2) frozen section: for immediate answer of involvement of tissue in known tumor  
 3) gluteraldehyde: EM (eg rhabdo)  
 4) fresh tissue on saline covered gauze: lymphoma for cell surface markers  
 5) 50% alcohol: used to fixate cytology specimen  
 6) conj biopsy: placed on a flat mount then into 10% formalin  
 7) cystinosis, oxalosis on conj biopsy: 50% alcohol  
 8) urate: 100% alcohol (absolute alcohol)

### Immunohistochemical Stains

A) *Epithelial*  
 1) keratin  
 2) EMA (epithelium mb antigen)  
 3) cytokeratins  
 B) *Mesenchymal*  
 1) Factor 8: vascular endothelium  
 2) vimentin: SM, fibrocytes, Schwann cells  
 3) MSA (muscle-specific actin): muscle  
 4) desmin: muscle  
 5) myoglobin: muscle  
 C) *Neural origin/ neural crest*  
 1) NSE: (neuron-specific enolase): nerve tissue tumors  
 2) GFAP: astrocytes, Schwann cells  
 3) neurofilament: neurons  
 4) S-100: melanoma, neural tissue  
 5) HMB-45: melanoma

### Ocular Surface Cytology in conjunctivitis

A) *Neutrophils*  
 1) bacterial  
 2) early viral  
 3) allergic  
 4) atopic  
 5) chlamydia  
 B) *Lymphocytes, monocytes (same as follicular conjunctivitis)*  
 1) viral  
 2) allergic  
 3) toxic  
 4) chlamydia  
 C) *Mast cells/basophils*  
 1) vernal  
 2) GPC  
 D) *plasma cells, macrophages*  
 1) chlamydia  
 E) *multinucleated cells*  
 1) HSV  
 F) *keratinized epithelial cells*  
 1) tear dysfunction (dry eye)  
 2) OCP  
 3) Stevens Johnson  
 4) SLK  
 G) *cytoplasmic inclusions*  
 1) chlamydia  
 H) *eosinophils*: see list

### Ocular Surface Cytology in conjunctivitis

1) Chemical: PMNs, few lymphocytes  
 2) Chlamydia: PMNs, lymphocytes, plasma cells, Leber cells, intracytoplasmic basophilic inclusions  
 3) Bacteria: PMNs  
 4) Virus: lymphs, plasma cells, multinucleated giant cells, intranuclear eosinophilic inclusions

### Acute follicular conjunctivitis cytology

1) EKC: lymph  
 2) PCF: lymph, PMN  
 3) HSV: lymph  
 4) chlamydia: lymphs  
 5) rubella: lymphs

### Eosinophilia on conj. scraping

1) atopic KC  
 2) vernal KC  
 3) hay fever conjunctivitis  
 4) OCP

- 5) erythema multiforme
- 6) drug allergy (atropine, but not pilo; pilo gives lymph infiltration)
- 7) makeup
- 8) GPC - type I
- 9) parasitic infection

#### **True RD on path**

- 1) subretinal fluid
- 2) RPE degeneration
- 3) photoreceptor degeneration
- 4) rounded edges

#### **Intraocular cartilage**

- 1) trisomy 13
- 2) chromosome 18 *deletion*
- 3) PHPV
- 4) dictyoma (medulloepithelioma)
- 5) phthisis bulbi
- 6) angiomas retinae

#### **Ocular calcification**

- A) *globe wall*
- 1) episcleral osseous choristoma (congenital)
  - 2) scleral calcification (senile plaque?)
  - 3) band keratopathy
- B) *Uvea*
- 1) choroidal osteoma
  - 2) uveoscleral calcification (seen in fundus)
  - 3) phthisis bulbi ?
- C) *Retina*
- 1) RB
  - 2) disc drusen
  - 3) astrocytic hamartoma
  - 4) calcified drusen
  - 5) retinocytoma

#### **Retinal dysplasia**

- A) *Ocular*
- 1) uveal coloboma
  - 2) microphthalmos
  - 3) cyclopia/synophthalmia
  - 4) Peter's anomaly
  - 5) congenital glaucoma
- B) *Syndrome*
- 1) trisomy 13
  - 2) chromosome 18 *deletion*
  - 3) Norrie's disease
  - 4) LSD abuse in mother

#### **Dalen Fuchs nodules**

- 1) S.O.
- 2) VKH
- 3) TB
- 4) sarcoidosis

#### **Systemic Conditions with Iris nodules**

- 1) sarcoid
- 2) JXG
- 3) NF
- 4) TB
- 5) syphilis
- 6) leprosy

#### **Multinucleated Giant cells**

- 1) Touton
- 2) Langhans
- 3) f.b.
- 4) osteoclasts
- 5) CMV, HSV, HZV
- 6) epithelioid melanoma

#### **Langhans giant cells**

- 1) TB
- 2) sarcoid
- 3) leprosy

#### **Touton giant cells**

- 1) JXG
- 2) NXG
- 3) Erdheim Chester disease (4 orbit cases)
- 4) liposarcoma

#### **Path signs of optic atrophy**

- 1) increased cellularity
- 2) redundant dura
- 3) thickened pial septa

#### **Lacy vacuolization of iris**

- 1) DM
- 2) multiple myeloma
- 3) Leigh's
- 4) mucopolysaccharidoses

#### **Absent dilator muscles**

- 1) rubella
- 2) Marfan's
- 3) Lowe's oculocerebral syndrome
- 4) microcoria
- 5) ectopia lentis et pupillae

**Stages of globe degeneration:**

- 1) atrophial bulbi: normal or increased IOP, cataract, RD develop
- 2) atrophial bulbi with shrinkage: decreased IOP
- 3) phthisis bulbi: disorganization, calcification

**Pathognomonic findings:**

**Dutcher bodies** (Ig intra-nuclear inclusions) are seen in:

- 1) plasmacytoma
- 2) multiple myeloma
- 3) Waldenstrom's
- 4) lymphoma
- 5) orbital inflammatory disease (Yanoff p. 532)

**Russel body:** plasma cells full of antibody so nucleus is displaced or lost (AAO p. 29)  
"Bill Russel pushed everyone out"

**Schaumann Body:**

- seen in Langhans giant cells (esp. sarcoid)
- basophilic, calcified, ovoid
- 100 micron diameter

**Asteroid body:** ("asteroid" = acidophilic)

- seen in Langhans giant cells (esp. sarcoid)
- eosinophilic
- 25 micron diameter

**Inclusions found in giant cells**

- 1) Schaumann body
- 2) cholesterol
- 3) oxalates

**Heinz Body:** old RBC that has lost its biconcave shape and has become spherical  
- seen in ghost cell glaucoma

**Psammoma body**

- arise in type 4 collagen (b.m.) next to small b.v.

  - 1) meningiomas ("pathognomonic")
  - 2) phakomatous choristoma
  - 3) ossifying fibroma (pseudopsammoma body)
  - 4) normal arachnoid

**Verocay body:** collection of spindle cells that resemble sensory corpuscles; seen in neurilemmoma Antoni-A type

**Cowdry type A body:** nuclear inclusion body seen in HSV and HZV

**Rosenthal fibers** seen in: glioma; eosinophilic, sometimes with microcalcifications

**squamous eddy**

- whorls of benign epithelial cells
- seen in inverted follicular keratosis
- may mimic SCC

**squamous (keratin) pearl**

- seen in SCC

**pseudohorn cysts:** seen in seborrheic keratoses

**Cataract**

- 1) bladder (Wedl) cells: PSCC
- 2) Morgagnian globules: cortical cataract

**Birbeck granules**

- 1) racket shaped granules in eosinophilic granuloma (seen in EM)

**M-D-F dystrophy**

- 1) dots: epithelial cell cysts
- 2) fingerprints: intrapithelial basement mb.
- 3) maps: subepithelial basement mb.

**Filaments:** degenerating epithelial cells with mucus

"**starry sky**": seen in Burkitt's lymphoma

"**storiform**" pattern: seen in fibrous histiocytoma

"**owl's eye**": CMV

**Splendore Hoeffli phenomenon:**

- granulomas containing eosinophils
- seen in parasitic infections

**Charcot-Leyden crystals**

- 1) asthma
- 2) parasitic infections

**DDx of ragged red muscle fibers**

**(abnormal mitochondria)**

- 1) CPEO/Kearns Syare
- 2) MELAS (mito encephalopathy, lactic acidosis, strokes)
- 3) MERFF (mito encephalopathy, ragged red fibers)

**MPS seen in**

- 1) macular dystrophy
- 2) Schnalbel's cavernous atrophy
- 3) peripheral cystic degeneration of retina
- 4) pars plana cyst
- 5) some medulloepitheliomas

**Glycogen seen in**

- 1) lacy vacuolization in DM
- 2) Meesman's "peculiar" substance

**Nature of KP's**

- 1) small dots + strands: fibrin and protein
- 2) neutrophils and lymphocytes: punctate
- 3) macrophages : mutton fat

**Endothelialization of Iris**

- 1) PPD
- 2) ICE
- 3) trauma

**Ciliary Body tumors**

- 1) glioneuroma
- 2) non-teratoid: adenoma
- 3) teratoid: medulloepithelioma

**Balloon cells ?**

- 1) melanoma
- 2) balloon cell nevus
- 3) angiomas
- 4) Wadl cells (PSCC)

**Temporal arteritis involves**

- 1) internal elastic lamina primarily (jxn between intima and media)
- 2) secondarily media and adventitia
- 3) can see giant cells

**conjunctival cytology**

- 1) taken from upper tarsus (lid everted)
- 2) spatula to conjunctiva
- 3) dip specimen into buffer solution
- 4) floated cells concentrated on millipore filter

**Conjunctival biopsy**

- useful in chronic conjunctivitis, OCP
- 1) cut small piece from inferior fornix
  - 2) don't crush
  - 3) place in formalin (light microscopy) and gluteraldehyde (EM)

**Path signs of cancer**

- A) Cell
- 1) increased N:C ratio
  - 2) abnormal configuration (anaplasia)
  - 3) darker staining (hyperchromasia)
  - 4) abnormal mitotic figure
  - 5) abnormal nucleus (indented, several nuclei)
  - 6) loss of cell polarity
- B) Tissue
- 1) loss of tissue polarity
  - 2) increased mitotic figures

### 3) **MICROBIOLOGY**

#### **Cultures**

##### A) *Bacteria*

- 1) non-specific: blood agar
- 2) neisseria and hemophilus: chocolate agar (factor V and X - NAD and hemin) with 5% CO<sub>2</sub>
- 3) TB: Lowenstein-Jensen
- 4) anaerobes:
  - thioglycolate
  - Thayer Martin
- 5) after tx. with ABC's: brain-heart infusion

##### B) *virus*

- 1) animal/human cell lines

##### C) *Chlamydia*

- 1) McCoy fibroblasts
- 2) chlamydiazyme
- 3) Microtrac

##### D) *Fungi*

- 1) blood Agar
- 2) Sabouraud's ( without cyclohexamide - inhibitor of fungi)
- 3) brain-heart infusion

##### E) *Acanthamoeba*

- 1) non-nutrient agar with E.Coli overlay

#### **Stains for infections**

##### A) *Bacteria*

- 1) Gram
- 2) Giemsa

##### B) *Virus*

- 1) Giemsa
- 2) PAP

##### C) *Chlamydia*

- 1) Giemsa

##### D) *Fungi*

- 1) Gram
- 2) GMS
- 3) Calcofluor white
- 4) acridine orange

##### E) *Acanthamoeba*

- 1) Calcofluor white
- 2) acridine orange

##### 3) PAS

##### 4) Giemsa

##### F) *TB*

- 1) Ziehl-Nielson
- 2) acid-fast

##### G) *filamentous bacteria*

- 1) acid-fast stain

#### **Gram staining**

- 1) crystal violet for 1 minute (purple)
- 2) rinse
- 3) Gram's iodine (KI) for 1 minute (or acetone or alcohol)
- 4) rinse
- 5) safranin solution (pink): 1 minute (counter stain)
- 6) rinse

#### **Cultures in corneal ulcer**

- 1) cornea
- 2) conj
- 3) lid
- 4) CL
- 5) CL case
- 6) CL solution
- 7) other topical meds

#### **Culture instruments**

- 1) Kimura spatula (tradition)
- 2) calcium alginate ("Calgi") swab
- 3) Dacron swab

#### **conjunctival swab**

- 1) no anesthetic
- 2) calcium alginate swab for bacteria
- 3) cotton swab for virus
- 4) wipe conj with swab moistened with media
- 5) inoculate media

#### **Oxidase + bacteria**

- mostly G-

- 1) neisseria
- 2) moraxella
- 3) TB
- 4) pseudomonas
- 5) Hemophilus

#### **Catalase - bacteria**

## 1) Strep

**Hemolysis**

alpha: green (strep viridans and pneumococcus)

beta: clear zone (strep pyogenes)

gamma: none

- strep pneumo: resist. to optichin

**Tests for Neisseria**

Gonococcus: glucose fermenter

Meningococcus: glucose and maltose fermenter

Branhamella Catarrhalis: neither

**RNA viruses**

- R: rubella, rubeola, rabies, retrovirus (HIV)

- poliovirus, Influenza, parainfluenza

- mumps, Newcastle disease

- coxsackie virus, enterovirus, rhinovirus

- arbovirus,

- note: mostly aggressive 1 shot deals

1) Picorna: entero, coxsackie

2) Orthomyxo: flu, paraflu

3) Paramyxo: mumps, measles, Newcastles'

**DNA Viruses**

- adeno, variola, vaccinia, molluscum (warts, and classic diseases)

- HPV, HSV, HZV, CMV, EBV, Hep B

note: many chronic or recurrent

1) Herpes viruses: HSV, HZV, CMV, EBV

2) Pox: molluscum, variola (smallpox)

3) Papova: HPV (6, 11, 16: conj tumors)

**G+ rods**

1) Bacillus (spore former) - in soil

2) Corynebacterium ("chinese letters")

3) Clostridium (spore former) - in soil

4) P acnes

**G+ filaments (Acid Fast)**

1) mycobacteria - aerobic (top of lung, choroid)

2) Nocardia -

3) actinomyces - anaerobe

**Limulus Lysate**

- test to detect G- endotoxins

**Inclusion bodies in infections**

l) *Eosinophilic*

A) Nuclear

1) HSV

2) HZV

3) CMV (both)

4) variola (both)

5) adenovirus (both)

B) Cytoplasmic

1) molluscum

2) vaccinia

3) variola (both)

4) Newcastles?

ll) *Basophilic*

A) Nuclear

1) adenovirus (both)

B) Cytoplasmic

1) **chlamydia**

2) CMV (both)

**Enterobacteria**

1) Escherichia coli

2) Klebsiella

3) Serratia

4) Proteus

**Proteus**

1) ferments: maltose, sucrose, NOT lactose

2) urease +

3) fecal odor (like other enterobacteria)

4) greyish

5) swarming or ameboid growth on plate

**Serratia**

1) red pigmentation on colonies

**E Coli****Pseudomonas**

1) fruity odor

2) flagellated

3) gray/blue appearance on gel

4) blue-green hemolysis on gel

5) ferments maltose, sucrose, lactose

**H Flu**

1) small G - rod

2) needs NAD and hemin to grow

3) grows on chocolate agar or blood (hemin) agar with Staph (NAD)

**Neisseria**

- 1) kidney bean shape G-
- 2) grows best in chocolate agar in 5-10% CO<sub>2</sub> but can grow in blood agar

### **Moraxella**

- 1) dumbbell shape diplobacilli G-
- 2) produces exoenzyme → blepharitis

### **S Aureus**

- 1) produces dermatonecrotin → blepharitis
- 2) ferments mannitol (S epi does not)
- 3) other toxins: phlyctenules, keratitis, marginal ulcers

### **S Pneumo**

- 1) alpha hemolytic
- 2) lancet shaped diplococcus
- 3) resistant to optochin (as opposed to S Viridans)

### **Intracellular bacteria**

- 1) gono
- 2) meningococcus
- 3) H. Egyptius
- 4) chlamydia

### **Diplococci**

- 1) pneumo (G+ cocci)
- 2) moraxella (G- rod; boxcar)
- 3) Neisseria (G- cocci)

### **Fungus staining:**

- 1) candida: Gram or PAS
- 2) Aspergillus, Fusarium: GMS
- 3) Mucor: H & E

### **Yeast**

- 1) candida
- 2) Malassezia furfur (was P. Ovale)
- 3) cryptococcus

### **Septate fungi (eye)**

- 1) Fusarium
- 2) Aspergillus

### **Nonseptate fungi (orbit)**

- 1) mucor
- 2) rhizopus

### **Dimorphic fungi (yeast and mycelial phase)**

- 1) histoplasmosis
- 2) coccidioides
- 3) blastomyces

### **Microsporidia**

- 1) healthy: stromal keratitis
- 2) AIDS: superf. keratitis