Viral, Bacterial, Fungal Infections of the Oral Cavity

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Learning Outcomes

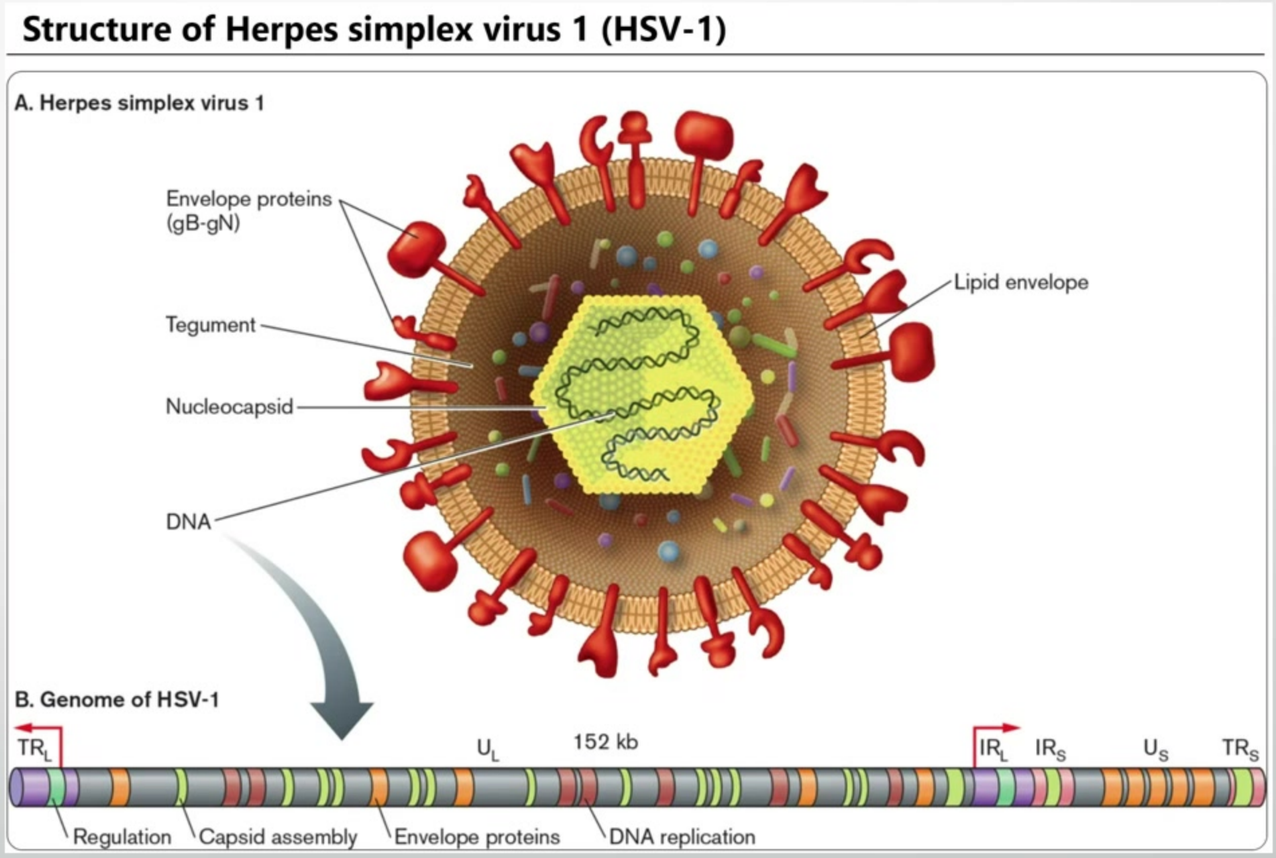
- Knowledge of **viral**, **bacterial** and **fungal** infections of the oral soft tissues including:
  - Herpes simplex infection
  - Varicella zoster infection
  - Hand foot and mouth disease
  - Syphilis
  - Gonorrhoea
  - Tuberculosis
  - Oral candidiasis

1. Discuss the clinical features, histopathology, investigation and management of common and important infections that:
   - Are primary or reactivated infections of oral soft tissues;
   - Have oral soft tissue manifestations but also involve other parts of the body.
2. Describe the clinical features of infections in immunocompromised patients.
3. Describe appropriate measures to reduce risks of infection spread.

Herpes Simplex Virus

- **Background**
- Part of HHV family
- DNA virus
- α- herpevirinae virus
- Short reproductive cycle
- **Irreversible destruction of infected cells, then maintain latent infection in the sensorial neural ganglion**

HSV – 1, HSV – 2, VZV



Herpes Simplex Infection

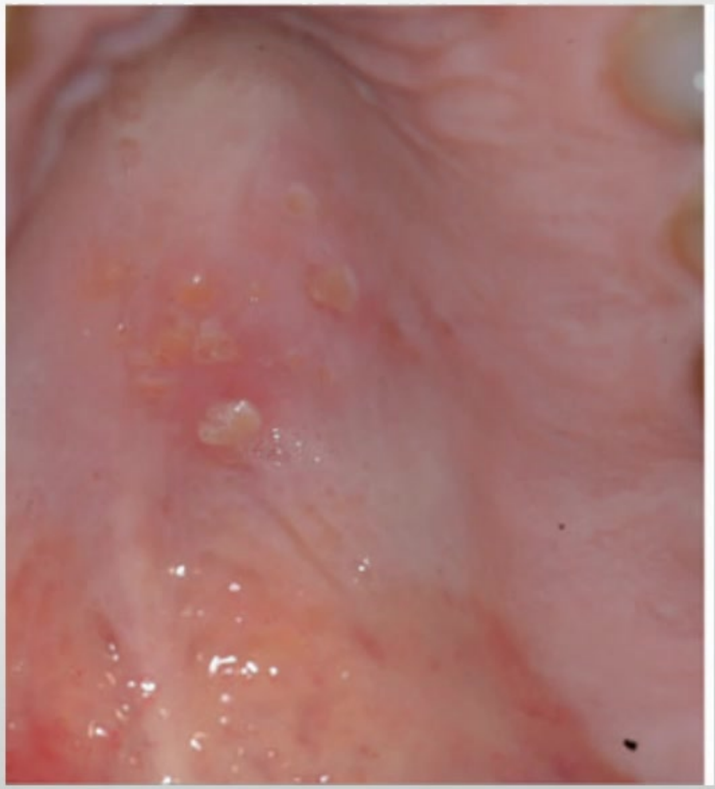
- **HSV-1**

Herpes Simplex Infection

- **Primary HSV-1 Infection**
- Clinical Features

Herpes Simplex Infection

- **Primary HSV-2 Infections**
- **Clinical Features**
  - Similar clinical picture to HSV – 1
  - Illness may be less severe
  - Not as prolonged as that caused by HSV - 1



Herpes Simplex Infection

- **Secondary HSV- 1 infections**
- **Clinical Features**
- Reactivated HSV – 1 infection
- Affects about 30% of patients with history of primary infection
- Typically affects vermillion of lips = **herpes labialis** (cold sores)
- Can also affect perioral or perinasal skin
- Sole involvement of is rare manifestation
- Clinical pattern: paraesthesia → erythema → vesiculation → pustule formation → superficial ulceration → eventual spontaneous healing
- Lasts about 5 – 7 days

Herpes Simplex Infection

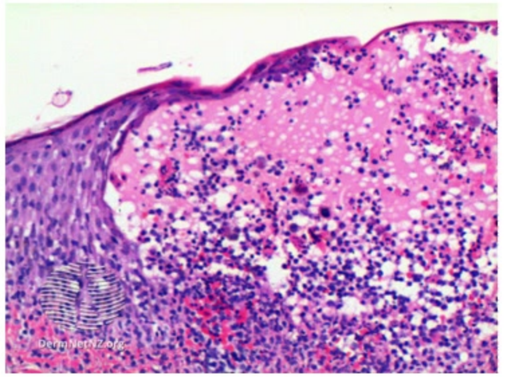
- **Clinical Features**
- Precipitating factors: concomitant illness, exposure to sunlight or UV, phases of menstrual cycle, pregnancy
- Immunosuppression can also lead to onset of herpes labialis – severe, prolonged, involve intra-oral sites
- Recur at exact same site each time
  - Location of residency of herpes simplex virus within the trigeminal ganglion
- Precipitant of erythema multiforme minor
- Herpetic Whitlow – complication of primary oral or genital herpes by inoculation of the virus through a break in the skin barrier

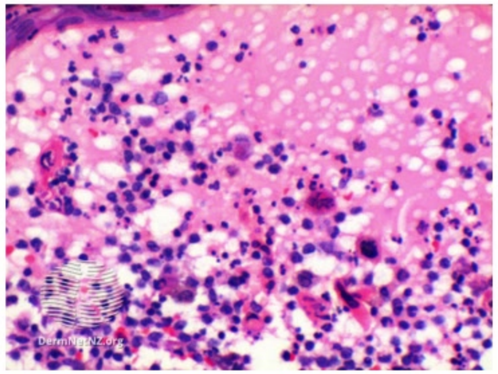
Herpes Simplex Infection

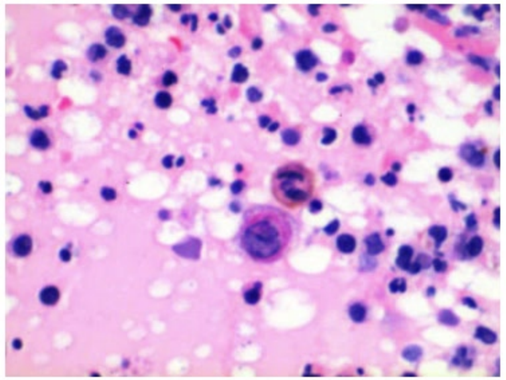
- **In Immunocompromised Patients**
- Present as more severe disease and complications
  - Severe pharyngitis, oral exudative and ulcerative lesions, fever, malaise, myalgia, cervical lymphadenopathy
  - Chronic mucocutaneous herpes simplex infection extending into deeper cutaneous layers → tissue necrosis
- Frequent recurrences
- Risk factors for increased severity:
  - History of HIV infection – can occur anywhere: skin, oral, perianal ulcers
    - HSV can affect viral replication of HIV
    - Frequent mucosal reactivation of HSV is associated with higher levels of plasma HIV RNA
  - Malignancy
  - Organ Transplantation – reactivation rates of 60 – 80% in patients previously infected with HSV - 1
  - Malnutrition
  - Pregnancy
  - Advanced age

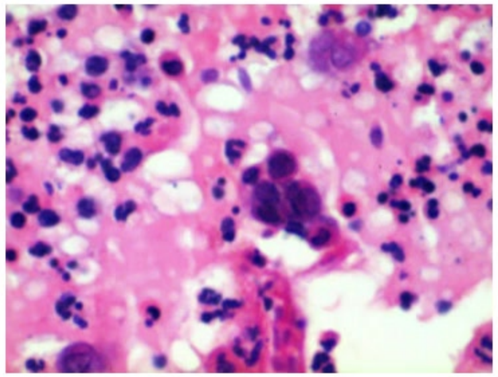
Herpes Simplex Infection

- **Histopathology**
- Ballooning degeneration of infected epithelial cells
- Inclusion bodies
- Form Multinucleated giant epithelial cells
- Acantholysis
- Formation of Tzanck Cells









Herpes Simplex Infection

- **Investigations**
- Molecular: PCR testing
- Viral Culture: vesicular fluid removed with sterile cotton swab and placed in viral medium. Determine presence of HSV- 1, HSV – 2 or other Herpes viruses
- Serology: > Four – fold rise in HSV – 1 specific IgG antibodies between acute (ulcerative) and convalescent phase of illness provides a retrospective diagnosis of primary HSV – 1
- Full blood count should be obtained for adults with primary HSV to rule out cause of immunosuppression
- Immunofluorescence staining: examined for herpes antigens via immunofluorescence microscopy
- Herpes labialis is a clinical diagnosis
- Identification of HSV DNA via PCR can be helpful

Herpes Simplex Infection

- **Management**

Varicella Zoster Infection

- **Clinical Features**
- VZV, HHV – 3
- Primary infection: Chicken Pox
- Secondary infection: Shingles, Herpes Zoster
- Transmitted via droplets or close contact with lesions

Herpes Zoster

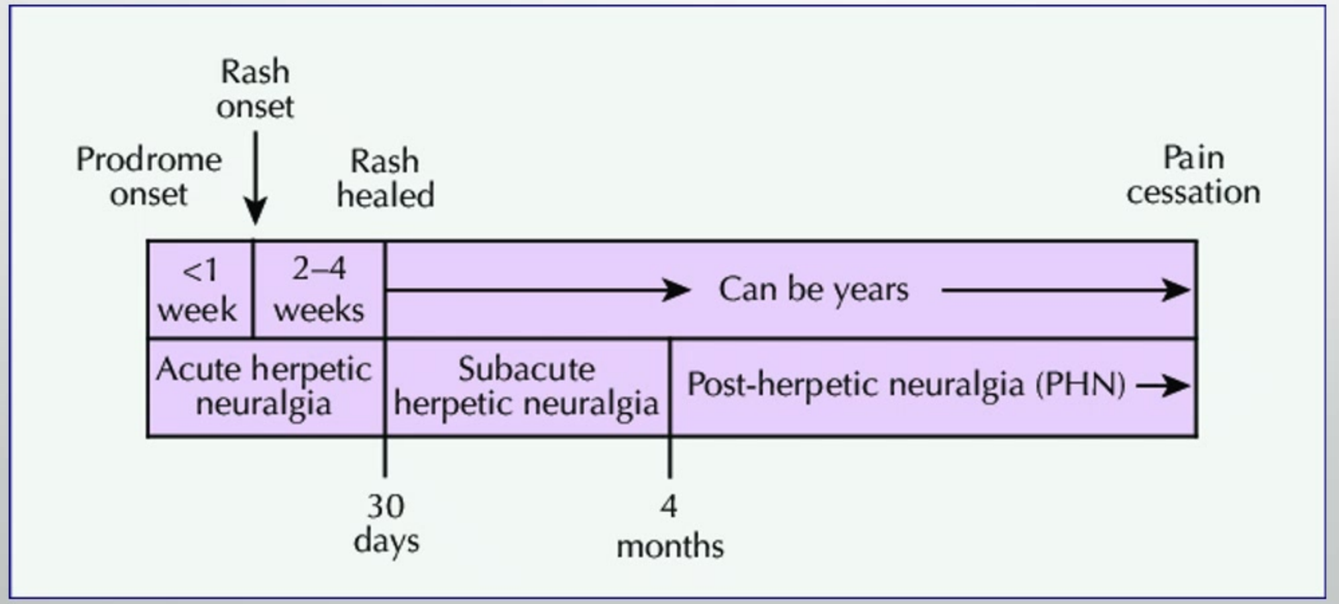
- **Clinical Features**
- Shingles
- Caused by reactivation of VZV in ganglia of cranial nerves or dorsal roots
- Occurs when cellular immunity to VZV impaired
  - Immunosuppression, HIV disease, malignancy
- Occurs later in life
- Affect thoracic dermatomes via reactivation within spinal ganglia
- Painful eruptions of vesicles, ulceration and prolonged erythema of skin supplied by one or more dermatome of one side of the thorax or upper abdomen

Herpes Zoster

- Intense, sharp pain
- Can affect trigeminal nerve – can affect any branch; ophthalmic > maxillary > mandibular division of one side
  - Bilateral involvement rare
- Oral lesions can appear similar to HSV – 1 infections → superficial ulcers that coalesce to give large irregular outlined ulcers
- Site affected depends on affected branch
- Unilateral distribution
- Minor crossover in the midline
- Lasts 5 – 10 days without therapy in immunocompetent host, longer in immunocompromised
- Mimics toothache when oral ulcer commences

Herpes Zoster

- **Clinical Features**
- Complications of orofacial shingles:
  - Post-herpetic neuralgia – pain persisting for 3 or more months after healing of the shingles
  - Meningoencephalitis



Ramsay Hunt Syndrome

- **Clinical Features**
- Rare manifestation of shingles
- VZV reactivation within the geniculate ganglion
- Otitis externa
- Unilateral lower motor neuron palsy of facial nerve
- Ulceration of anterior 2/3 of tongue and soft palate – all on same side as the palsy

Varicella Zoster Virus

- **Histopathology**
- Identical to Herpes Simplex Virus
- Clinical correlation, immunohistochemistry and/or viral culture or PCR required to differentiate viral infections

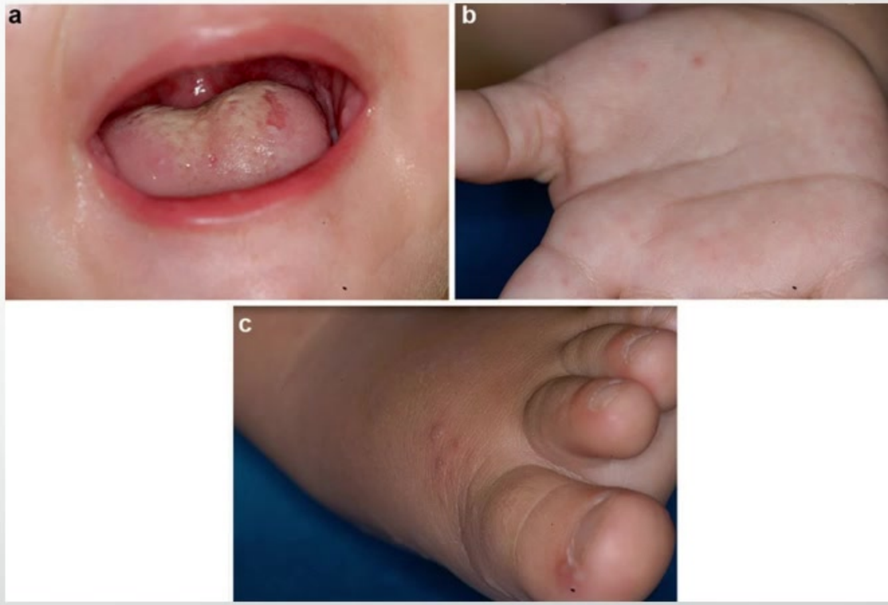
Investigations

- Diagnosis of chicken pox based on clinical history and picture
- Viral or serological investigations rarely warranted
- Identification of VZV DNA via PCR
- Retrospective serological confirmation (4 fold or more rise in specific antibodies between acute and convalescent phases)
- Prudent to assess FBC for evidence of unknown neutropenia, leukemia, white blood cell dyscrasias

Hand Foot and Mouth Disease

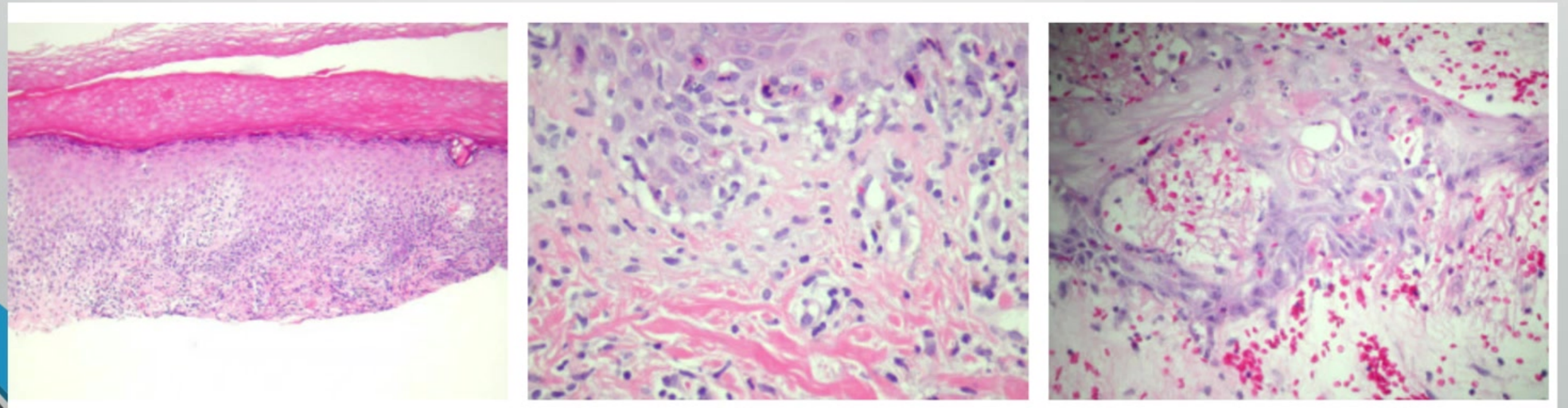
- **Clinical Features**
- Fever
- Reduced appetite
- Sore throat
- Malaise
- Numerous vesicles and oral ulcers (day 1 – 2); 2 – 7 mm in diameter
- Sites affected: buccal mucosa, labial mucosa, tongue
- Disappear after 1 week
- Palms of hand and soles of feet affected after oral lesions

Vesicles or small blisters on distal flexor aspect of fingers or toes



Hand Foot and Mouth

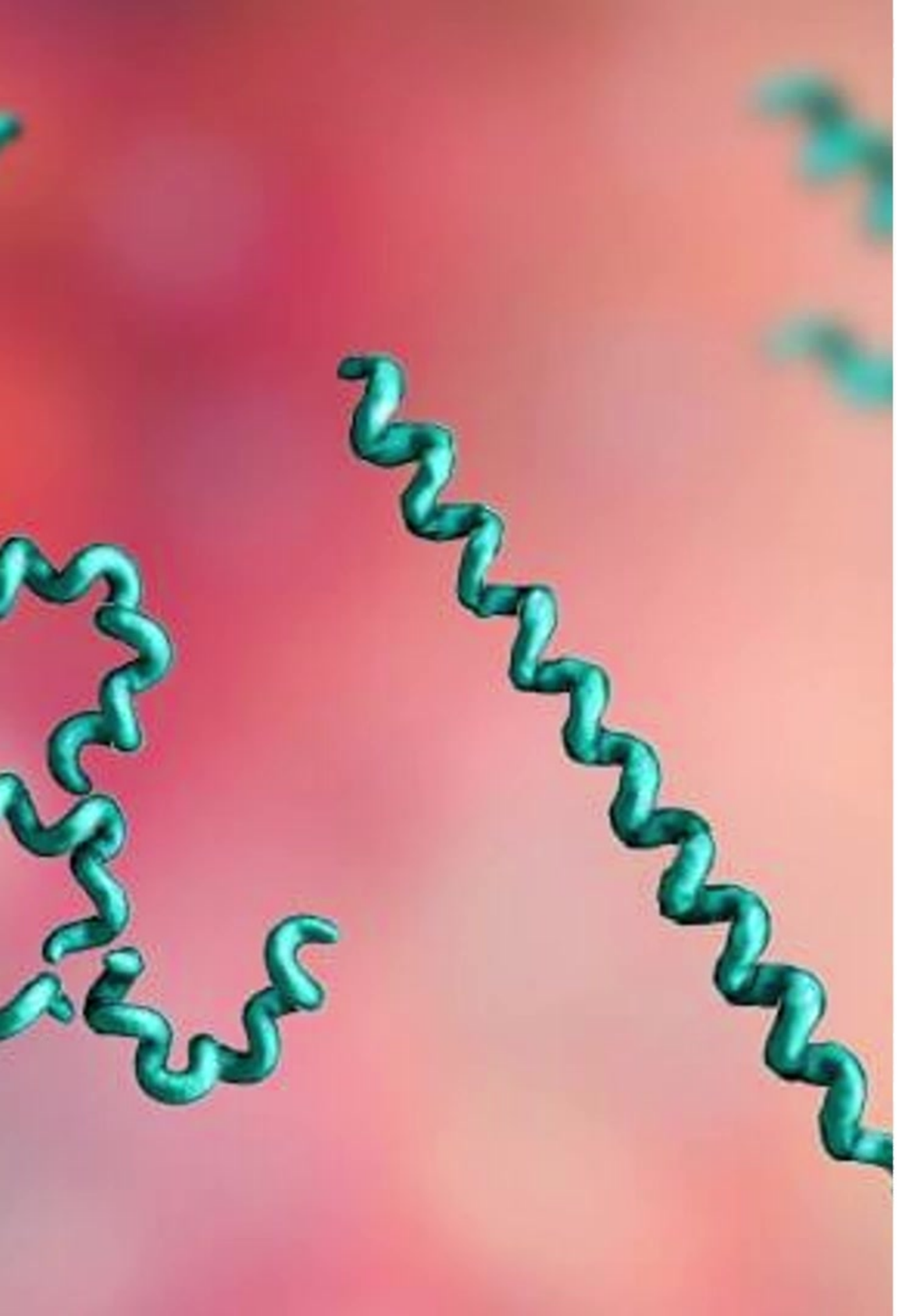
- **Histopathology**
- Rarely biopsied
- Lymphocytic infiltrates the epithelium
- Keratinocyte apoptosis
- Intraepithelial/ intraepidermal vesiculation as a consequence of epidermal oedema



Hand Foot and Mouth Disease

Investigations

- Viral culture
- Immunoassay from cutaneous lesions, mucosal lesions or stool samples
- Oral specimens have highest isolation rate
- **Diagnosis typically based on clinical picture**
- Biopsy of atypical lesions
- Raised white cell count
- Atypical lymphocytes
- Raised serum C-reactive protein (CRP)



Syphilis

- Caused by *Treponema pallidum*
- Anaerobic filamentous spirochete capable of **invading** any organ of the human body
- Sexually transmitted infection
- Acquired (sexual) or congenital (vertical) transmission
- Easily transmissible by kissing or close contact with infectious lesion
- Major global health resurgence
- Rate of Syphilis doubled in WA between 2016 – 2020

Syphilis

- **Communities at Risk (in WA)**
- Historically: Aboriginal communities in remote areas, Men who have sex with men
- People experiencing homelessness
- People who use methamphetamine and/or inject drugs
- Culturally and linguistically diverse (CALD) people
- People who are 16 – 35 years old
- Aboriginal people 16 – 39 years old (Goldfields, Kimberley, Pilbara)
- Women of child bearing age

Primary Syphilis

- **Clinical Features**
- Characteristic Chancre
- Highly infectious lesion occurring at site of inoculation
- Incubation period: 3 – 90 days
- Large, painless ulcer with indurated margin
- Painless lymphadenopathy (80%) of cases occur after chancre develops
- Sites: intrarectal, perianal, oral (4-12%)
- Oral sites: tongue, gingiva, palate, lips
- Chancres can heal in absence of treatment, within 8 weeks without scarring
- Systemic dissemination can occur

Low rate of diagnosis due to it going unnoticed in primary stage

Secondary Syphilis

Clinical Features

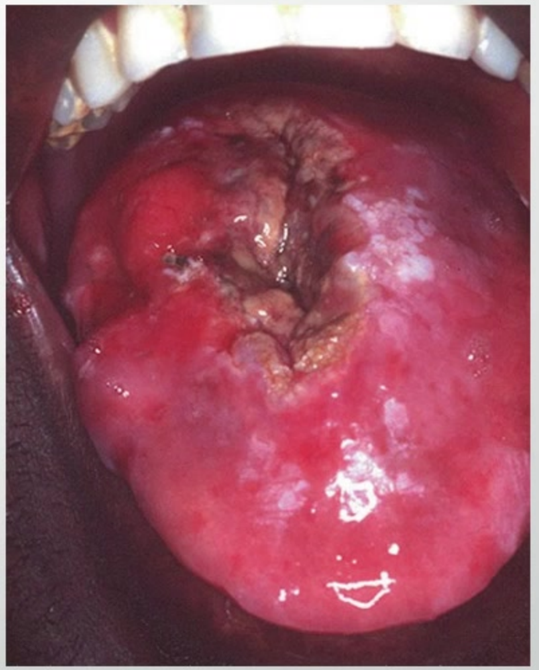
- Occurs 2 – 12 weeks after contact with T. pallidum
- Localised or generalised skin rash (maculopapular lesions on palms and soles), can mimic eczema, psoriasis, drug eruption, lichen planus
- Alopecia
- Malaise
- Sore throat
- Headache
- Weight loss
- Low grade fever
- Generalised lymphadenopathy
- Muscle aches
- Renal, ophthalmologic, hepatic, bone and joint diseases, CNS involvement can be seen
- Oral lesions seen in 30% of individuals
  - Mucous patches highly infectious
  - Slightly elevated plaques that may be ulcerated
  - Multiple lesions that coalesce to give rise to serpiginous lesions
- Lasts for weeks or months with relapses occurring

Latent Syphilis

- **Clinical Features**
- After untreated secondary stage
- No signs of primary or secondary disease
- Only detected by serologic testing
- Sexual transmission unlikely
- Can develop Tertiary Syphilis with neurological, cardiovascular complications

Tertiary Syphilis

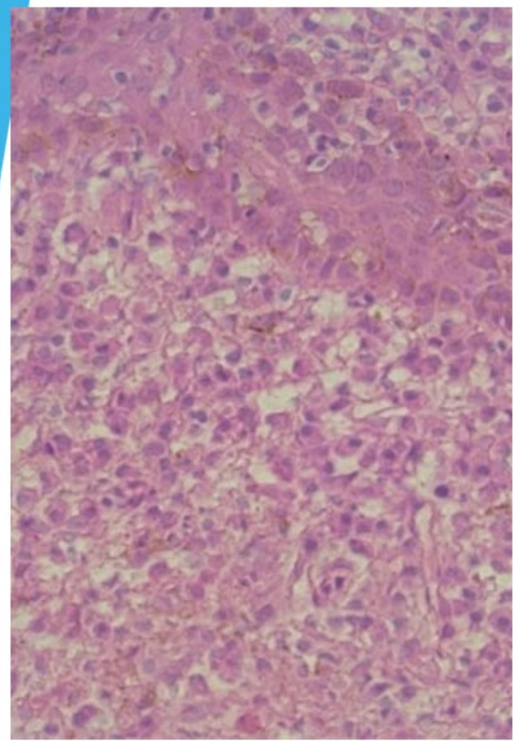
- **Clinical Features**
- Can manifest 1 year after initial infection or decades later
- Nodular, ulcerative lesion = gumma
- Involve skin, mucous membranes, CNS, liver, spleen, bones and other organs
- Cardiovascular complications: aortitis, aneurysm, aortic regurgitation
- CNS manifestations: general paralysis, aortic regurgitation
- Oral cavity: palate, tongue, tonsils, lips, bone involvement
- Pain, swelling, oronasal fistula, osteonecrosis, atrophic glossitis, syphilitic leukoplakia, parotid gland involvement

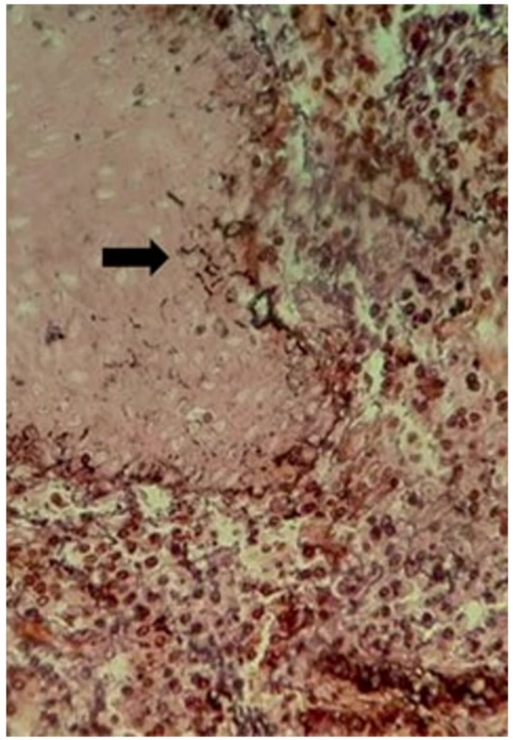


Congenital Syphilis

- **Clinical Features**
- Transmitted in utero or during delivery
- Newborn comes in contact with contagious genital lesion
- 25 – 50% result in miscarriage
- Risk of vertical transmission: 70 – 100%
- Infected infants can have symptoms at birth
- Majority of untreated children who survive first 6 – 12 months will progress to latent and tertiary syphilis
- Generalized lymphadenopathy, maculopapular rash. Hepatosplenomegaly, glomerulonephritis, gummas, bone alterations
- Saddle nose, high arched palate, Frontal bossing of skull, mental retardation
- Oral manifestations: peg-shaped incisors, defective molars, atrophic glossitis, skin fissures

Syphilis





- **Histopathology**
- Plasma cell infiltration
- Proliferative endarteritis
- Plasma cell, lymphocytes, macrophages found in a perivascular distribution or band like infiltrate in lamina propria
- Oral tertiary syphilis shows absence of epithelial lamina with peripheral psuedoepitheliomatous hyperplasia
- Lamina propria contains foci of granulomatous inflammation with large centra zone of acellular necrosis
- Well-circumscribed collections of histiocytes and multinucleated giant cells
- Can be demonstrated in some lesions by silver stain

Syphilis

- **Investigations**
- Clinical and Serological findings
- Biopsy can be undertaken to rule out other pathosis
- Nontreponemal tests – screening
  - Become positive 1 – 4 weeks after appearance of primary lesion
  - 6 weeks after exposure
  - Venereal Disease Research Laboratory (VDRL) test
  - Rapid Plasma Reagin test (RPR)
  - Detect IgM and IgG antibodies to lipoidal material released from damaged cells
  - Can be negative in some latent and tertiary cases
- Treponemal tests – diagnostic confirmation
  - Fluorescent treponemal antibody absorption (FTA-ABS) and agglutination (TP-PA)
  - Once a patient tests positive to any of these tests, they remain positive for life, even after treatment

Syphilis PCR test

Non-Treponemal Tests (non-specific test)	Confirmatory Treponemal Tests
Venereal Disease Research Laboratory test (VDRL)	Treponemal pallidum particle agglutination test (TP-PA)
	Fluorescent treponemal antibody absorbed test (FTA-ABS)
Rapid plasma reagin test (RPR)	T. pallidum enzyme immunoassay antibody test (TP-EIA)
	Chemiluminescence immunoassay (CIA)
Note: The non-treponemal tests (titers) detect antibodies that are not specific for *Treponema pallidum*.	Note: As a group, these tests are based upon the detection of antibodies directed against specific treponemal antigens. Treponemal tests are qualitative only and are reported as "reactive" or 'non-reactive".

The use of only one type of serologic test is insufficient for diagnosis.

Syphilis

- **Management**
- High sensitivity to penicillin

Syphilis

- **Management**
- Tested for HIV infection
- Management of sex partners
- Unless oral lesions present, necessary dental care can be provided and normal treatment can recommence once oral lesions successfully treated
- Disease prevention centred around education, reduction of sexual partners, consistent use of barrier protection

Gonorrhoea

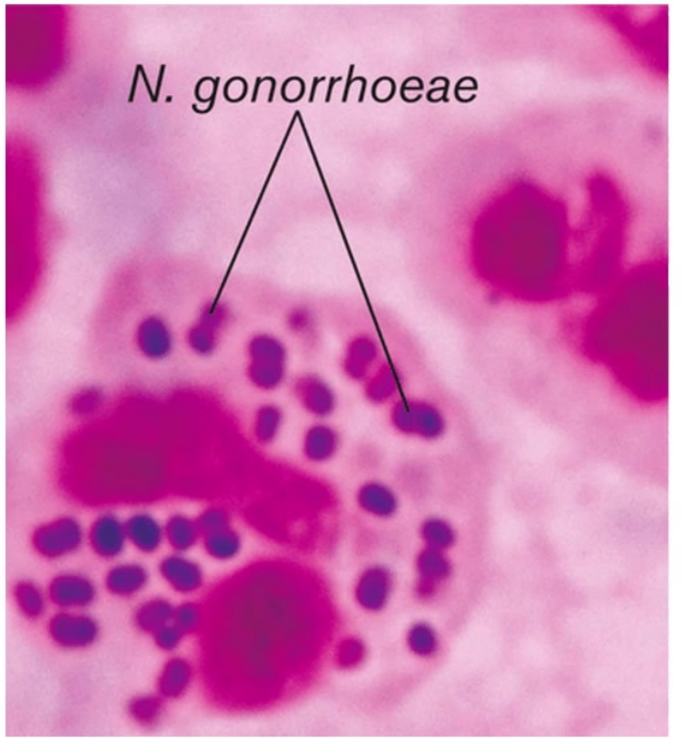
Oropharyngeal Involvement:

- 20 – 25%
- Diffuse oropharyngeal erythema
- Small pustules noted
- Submandibular or cervical lymphadenopathy
- Gonococcal Tonsillitis
- Fever infrequent

Gonorrhoea

Histopathology

- Gram-stained samples
- Sensitivity and specificity varies
- Tests for characteristic Gram-negative diplococci within PMNL's
- Gram-stain not suitable for diagnosis of N. gonorrhoeae from pharyngeal specimens
- Methylene blue staining alternative method to gram stain



Gonorrhoea

- **Investigations**

Parameter		Microscopy	Culture	NAAT
Specimen types[a]				
Urine	Female	No	No	Yes[b]
	Male	No	No	Yes
Urethral swab		Yes	Yes	Yes
Rectal swab		No	Yes	Yes/no[c]
Pharyngeal swab		No	Yes	Yes/no[c]
Conjunctival swab		Yes	Yes	Yes/no[c]
Performance				
Sensitivity[d]		Low–high	Moderate–high	Very high
Specificity[d]		Moderate–high	Very high	Moderate–very high
Cost		Low	Moderate	Moderate–very high
Instrumentation		Microscope	Routine microbiology	Moderate–large footprint
Technical complexity		Low–moderate	Moderate	Low–high
Level of laboratory infrastructure		Low	Low–intermediate	Intermediate–high
Potential as a POCT		Yes	No	Yes

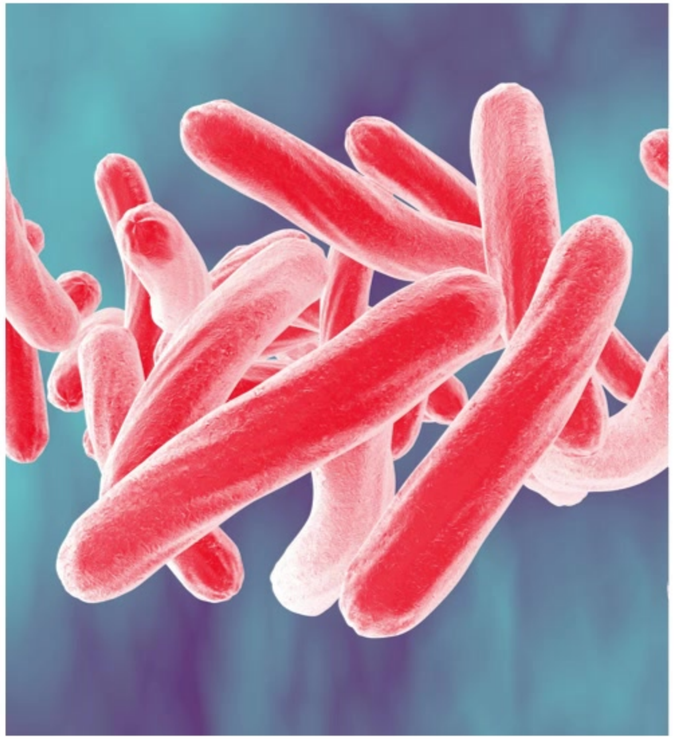
NAAT, nucleic acid amplification test; POCT, point-of-care test. [a]Yes or no indicates appropriateness of specimen type. [b]The sensitivity is substantially lower than in other approved specimen types and a negative result does not exclude gonococcal infection. [c]Yes/no indicates that not all platforms have received FDA approval for that specific specimen. [d]Can highly depend on specimen type. Adapted from Unemo,

Gonorrhoea

- **Management**
- Dual antimicrobial therapy
- Uncomplicated gonococcal infections of cervix, urethra, rectum, pharynx:
  - ceftriaxone 250 mg IM as single dose
  - azithromycin 1 g orally as single dose
- Infected individuals should be counselled about importance of referring any-one with whom they have had sexual contact in the preceding 60 days for screening
- Check for co-infections

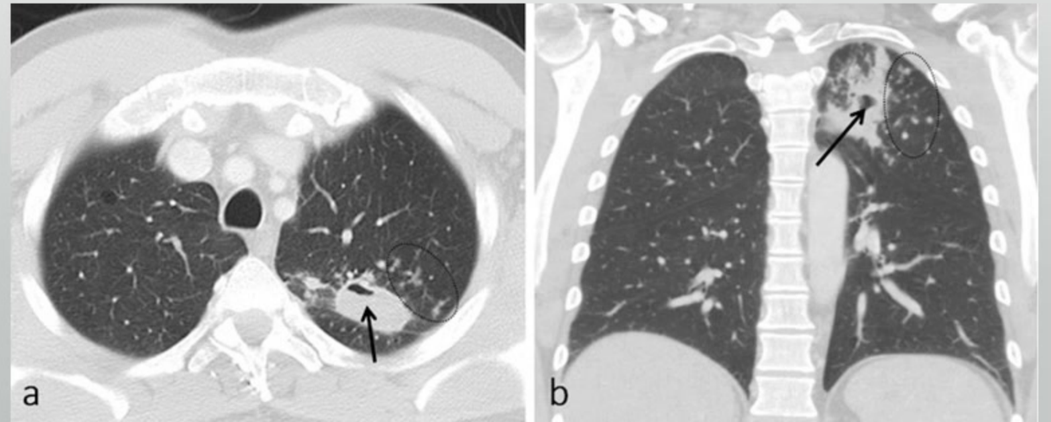
Tuberculosis

- Mycobacterium tuberculosis
- Aerobic, acid-fast, non-motile, non-encapsulated and non-spore forming bacillus
- Transmitted through respiratory droplets through coughing, sneezing, talking
- Mortality > 50% if untreated
- Immunocompromised people at greatest risk
  - HIV positive individuals 20 – 40 times more likely to develop active disease → leading cause of death in these patients
  - Accelerates progression of HIV
  - Impacts efficacy of HIV treatment



Tuberculosis

- **Clinical Features**
- Pulmonary TB accounts for 85% of all clinical presentations
- 15 – 25% can manifest as extra-pulmonary sites
  - Lymph nodes – painful, firm, not mobile
  - Pleura
  - Bones
  - Meninges
  - Genitourinary tract
- Night sweats, fever, weight, cough, haemoptysis, pleuritic pain
- Tuberculous meningitis follows CNS involvement

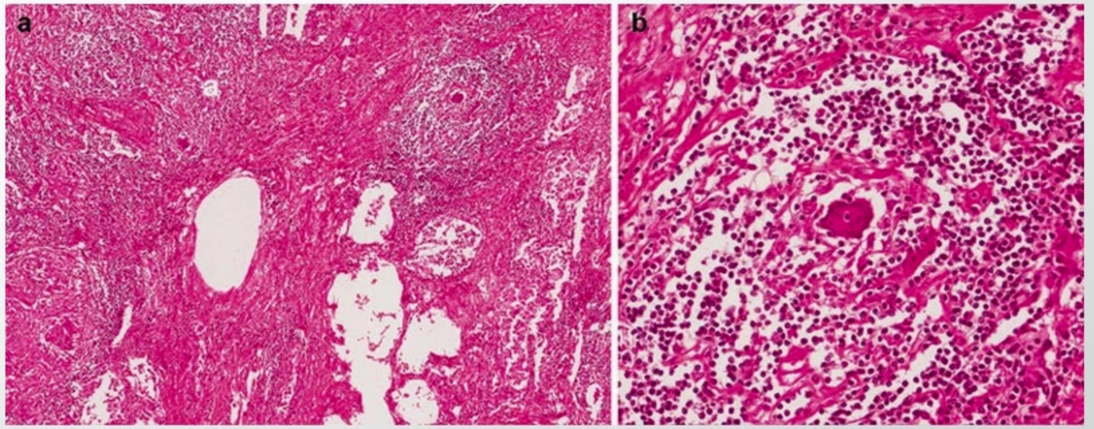


Tuberculosis

- **Clinical Features**
- Oral Manifestations:
  - Uncommon (0.1 – 0.5%)
    - More common in men than women
    - Can present as primary or secondary to systemic disease
  - Primary oral TB more common in younger individuals
  - Common on tongue – but can include any oral site
  - Non-specific
  - Oral ulceration most common – indurated, ill-defined margins, hard necrotic base, or covered with grayish-yellow slough
  - Can range from patches, papillomatous lesions, indurated soft tissue lesions
  - Single or multiple
  - Tuberculosis osteomyelitis involve maxilla, mandible with sequestration of bone, pain
  - Rare involvement of parotid gland

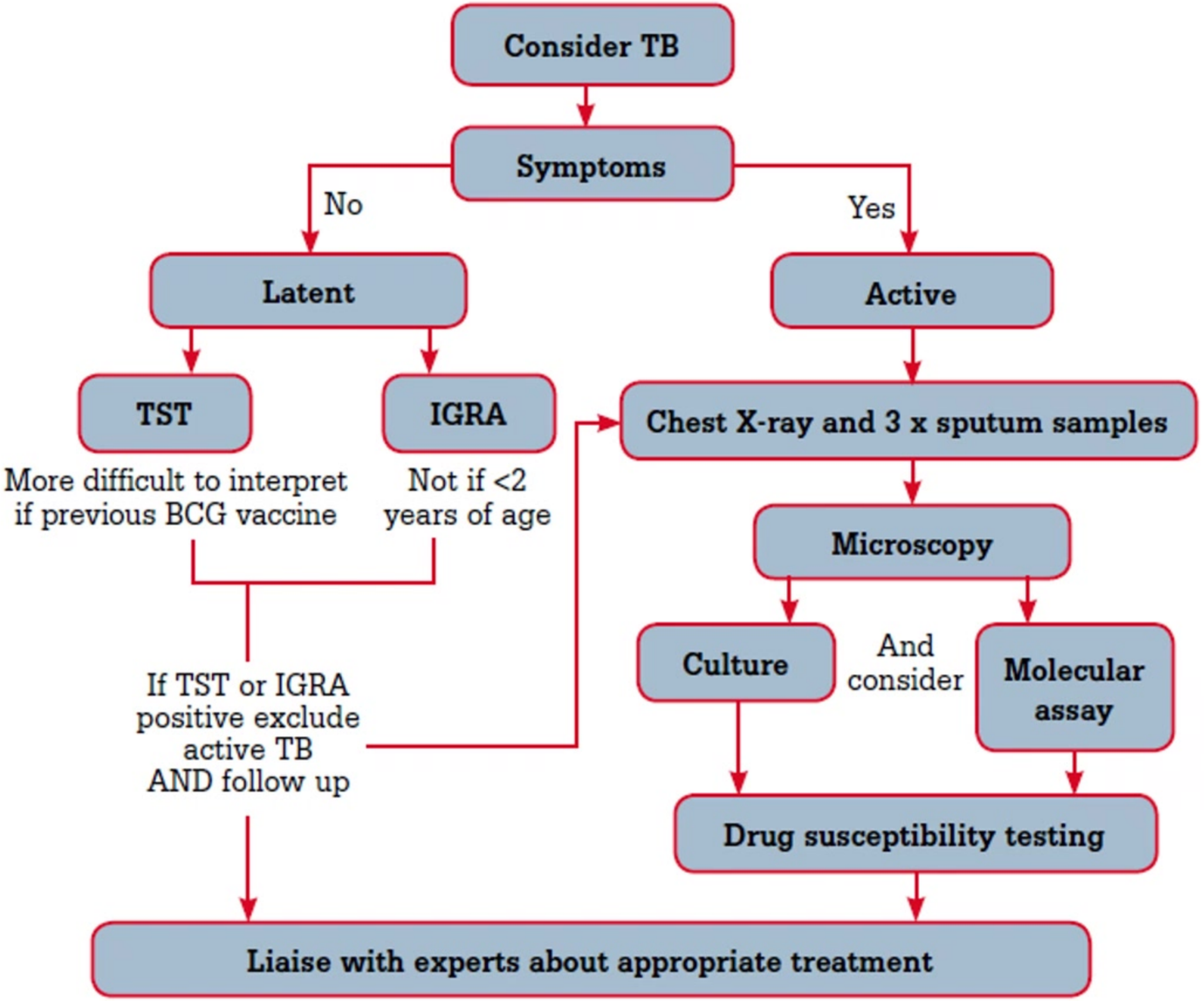
Tuberculosis

- **Histopathology**
- Central area of caseous necrosis
- Epithelioid macrophages
- Langerhans giant cells
- Lymphocytes
- Outer zone of lymphocytes, plasma cells, immature macrophages
- Peripheral fibrosis
- Special stains: Ziehl – Neelsen stain positive for the bacilli



Tuberculosis

- Investigations
- TST: Tuberculin Skin Test
- IGRA: Interferon –γ- release assay
- Fine needle aspiration cytology
- Histopathology
- Ultrasound
- MRI
- CT can be additionally used in diagnosis of TB of major salivary glands



Tuberculosis

- **Management**
- Appropriate antimicrobials
- High antibiotic resistance
- Adults with TB:
  - 2 month-long course of combination of isoniazid, rifampin, pyrazinamide, etheambutol
  - Further 4 month course of combination of isoniazid and rifampicin
  - Antibiotic susceptibility: isoniazid, rifampin, pyrazinamide
  - Sputum specimen for acid fast bacilli and culture obtained at monthly intervals

Tuberculosis

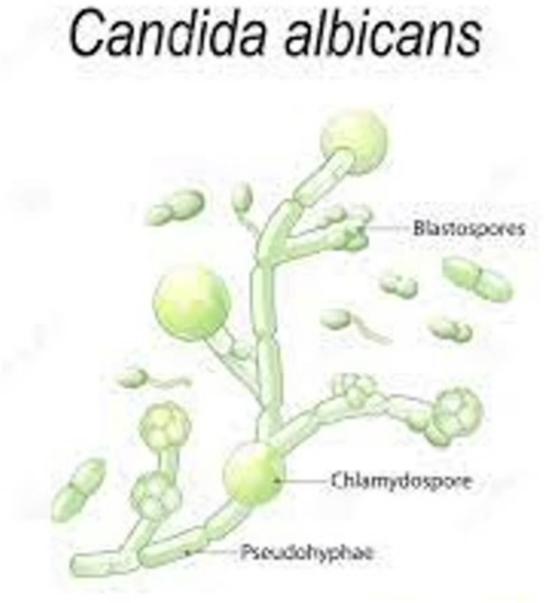
- **Prevention**
- Occupational risk for healthcare workers
- Universal Infection control policies
- Use of appropriate ventilation, filtration, control of aerosols
- Good quality face masks
- Notifiable disease
- BCG (bacille Calmette–Guérin) vaccine is recommended for: (highest risk for TB) in Australia
  - Aboriginal and Torres Strait Islander neonates
  - some healthcare workers
  - some travelers
  - some Australian-born children of migrants
  - young children born to parents with leprosy, or household contacts with leprosy

Recap on Bacterial Infections

- 1) What are the stages of acquired syphilis?
- 2) What are some manifestations of oral/oropharyngeal gonorrhoea?
- 3) What tests are required if you suspect active TB?

Oral Candidiasis

- Thrush
- Candida albicans; opportunistic
- Colonize mucocutaneous surfaces which can be portals of entry into deeper tissues when host defences are compromised
- Dimorphic fungus
- Exists in yeast and hyphal phase
- Host factors play an important role than organism virulence attributes in pathogenesis of oral candidiasis
- Imbalance between fungal virulence factors and host defence that gives rise to infection



Candidiasis

Predisposing factors to oral candidiasis

Local predisposing factors	Systemic predisposing factors
Prostheses (changes in environmental conditions, trauma, denture usage, oral hygiene)	Physiological (e.g., elderly, pregnancy, infancy)
Endogenous epithelial changes (atrophy, hyperplasia, dysplasia)	Endocrine disorders (e.g., diabetes mellitus)
Qualitative (pH, glucose concentrations) and quantitative (xerostomia, Sjogren's syndrome, radiotherapy, drug-therapy) salivary changes	Nutritional deficiency (e.g., iron, folate, vitamin B12)
Commensal flora	Malignancies (e.g., leukemia, agranulocytosis, others)
High-carbohydrate diet	Primary immunodeficiency (e.g., DiGeorge's syndrome)
Smoking (?)	Secondary immunodeficiency (e.g., HIV disease, corticosteroids, anticancer therapy)

Table 2 Classification of oral candidosis

Primary oral candidosis (Group I)	Clinical features	Site involved
Pseudomembranous candidosis (acute and chronic)	Semi-adherent, whitish, soft and creamy, drop-like, or confluent patches. They can be removed leading to a red and slightly bleeding surface. The lesions may recur in patients using corticosteroids topically or by aerosol, in HIV-infected patients or in immunocompromised patients	Acute form: palate, dorsum of the tongue, buccal mucosa Chronic form: palate, oral pharynx, dorsum of the tongue
Erythematous candidosis (acute and chronic)	Small or large erythematous areas following topical or systemic corticosteroid use, broad-spectrum antibiotic therapy, or HIV disease	Dorsum of the tongue, opposing palate surface, rarely buccal mucosa
Chronic hyperplastic candidosis	Small or large erythematous areas following topical or systemic corticosteroid use, broad-spectrum antibiotic therapy, or HIV disease	Commissures of the mouth, less commonly on the buccal mucosa, palate, tongue

Pseudomembranous candidiasis

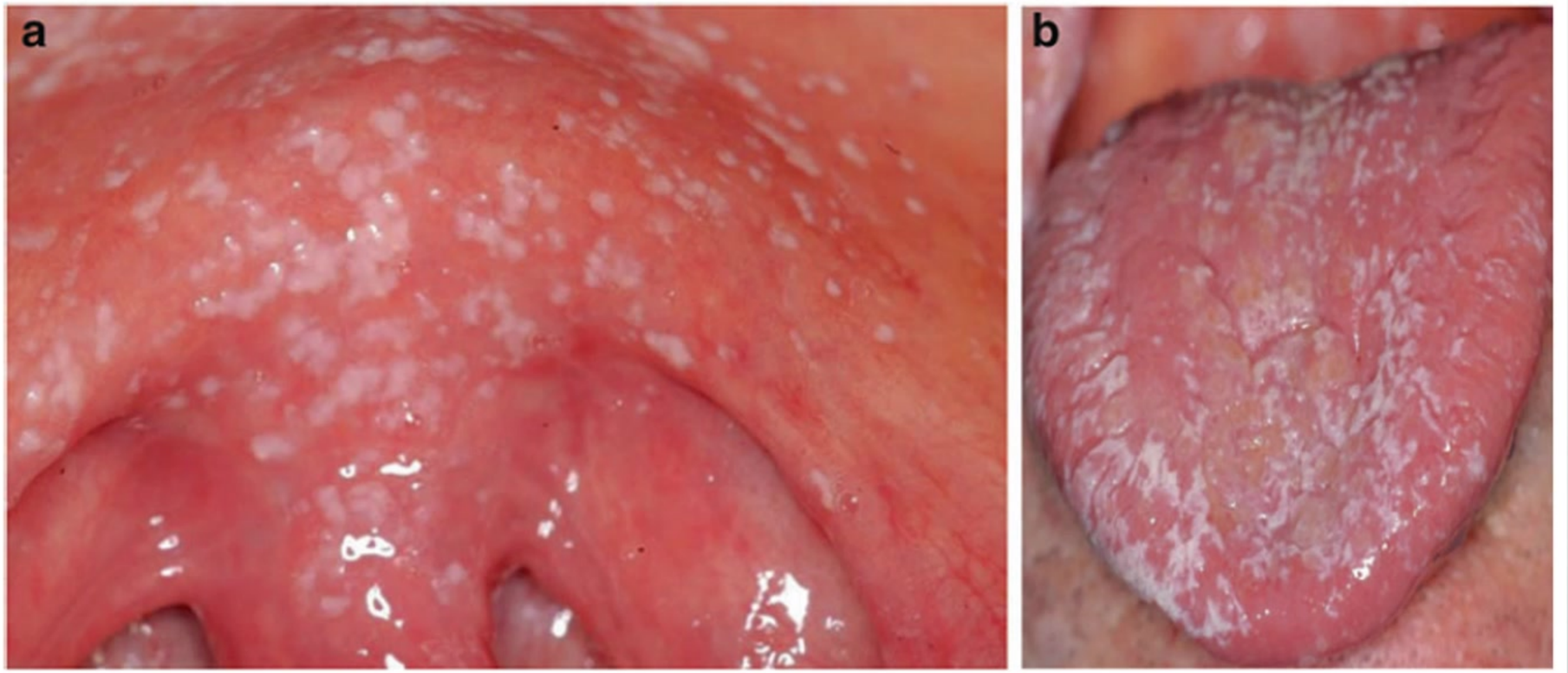
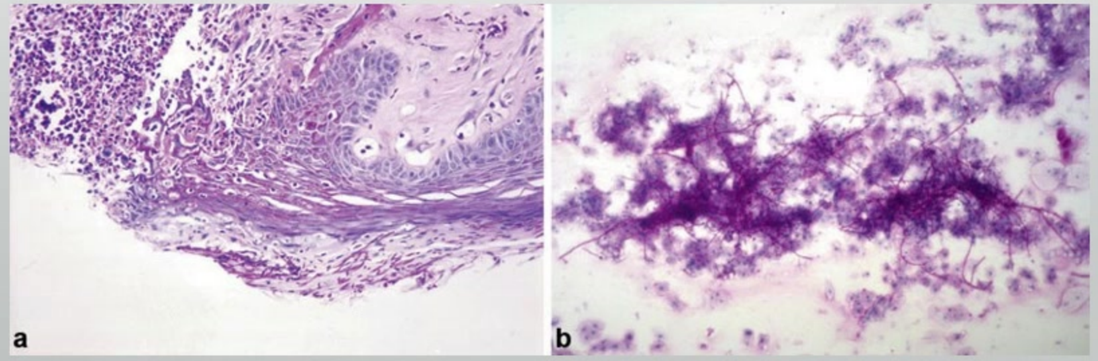


Fig. 1 Pseudomembranous candidosis presenting on the soft palate (**a**) and tongue (**b**) in same patient

Pseudomembranous Candidiasis

- **Histopathology**
- Hyphae penetrate epithelium up to spinous cell layer
- Presence of oedema
- Micro-abscesses containing polymorphonuclear leukocytes within outer layers of epithelium
- Deeper parts of epithelium show acanthosis and inflammatory infiltrate



Erythematous candidiasis

Fig. 3 Erythematous candidosis of the dorsum of the tongue

Fig. 4 Erythematous candidosis of the palate occurring simultaneously with tongue lesions (kissing lesions)

Erythematous Candidiasis

- **Histopathology**
- Similar to Pseudomembranous Candidiasis
- Pseudo hyphae penetrating and extending to superficial layers of epithelium
- Inflammatory reaction seen in epithelium and connective tissue

Chronic hyperplastic candidiasis

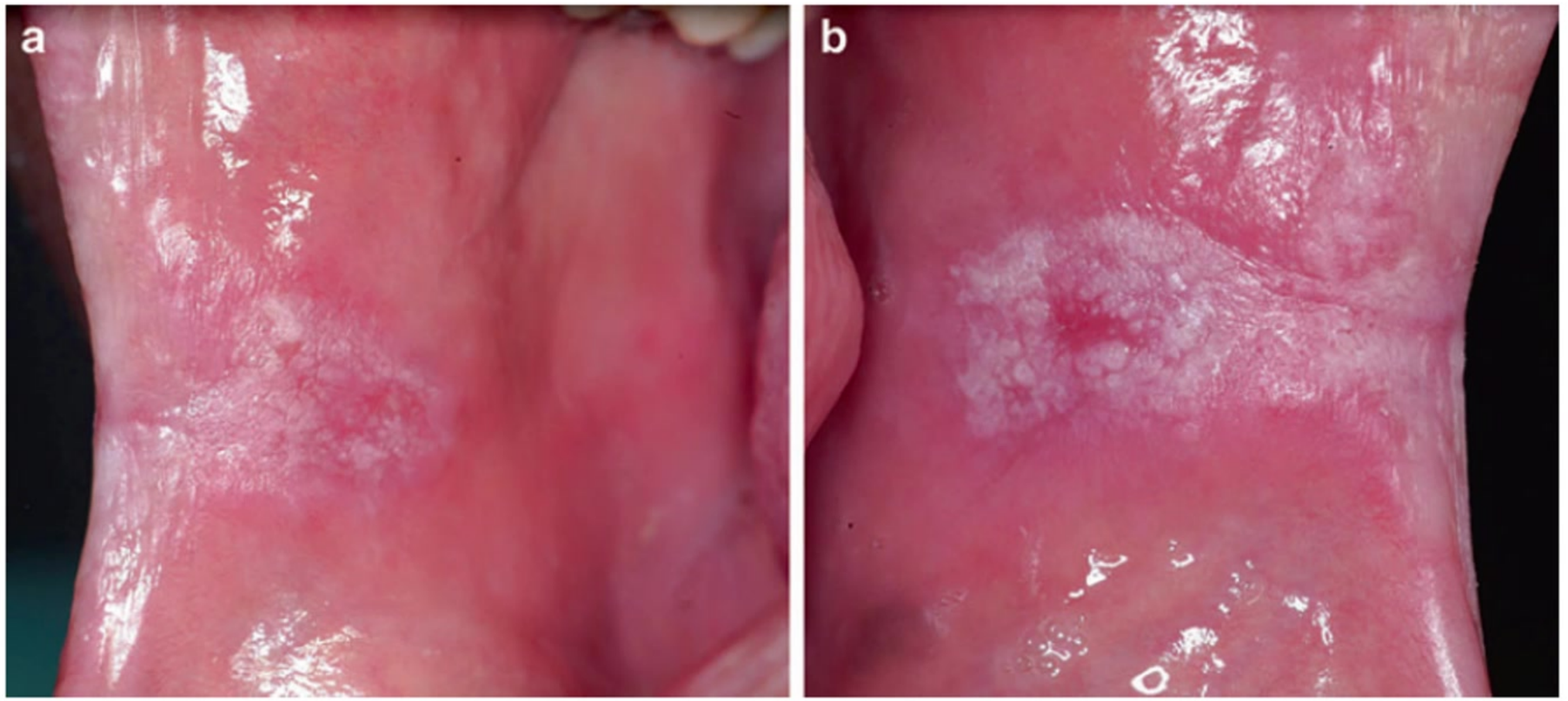
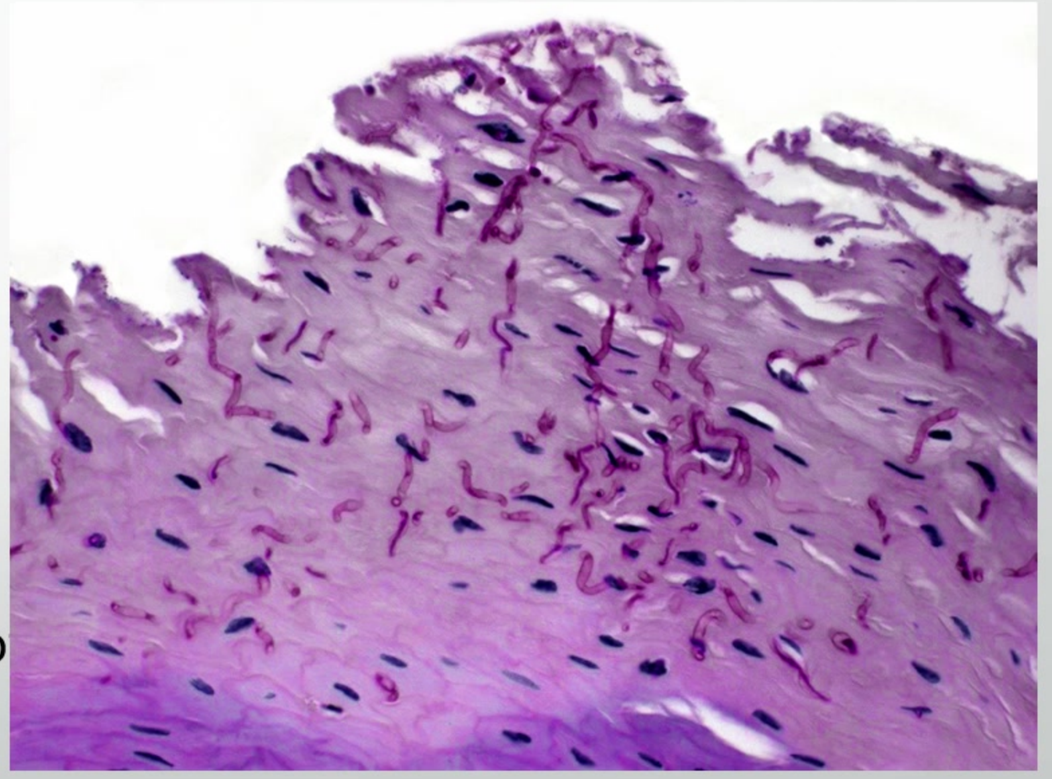


Fig. 5 Chronic hyperplastic candidosis in the postmodiolus area of the right (**a**) and left (**b**) buccal mucosa (same patient)

Chronic hyperplastic candidiasis

Histopathology

- Parakeratosis
- Hyperplastic epithelium
- Inflammatory infiltrate
- Candida hyphae invasion of upper layers o

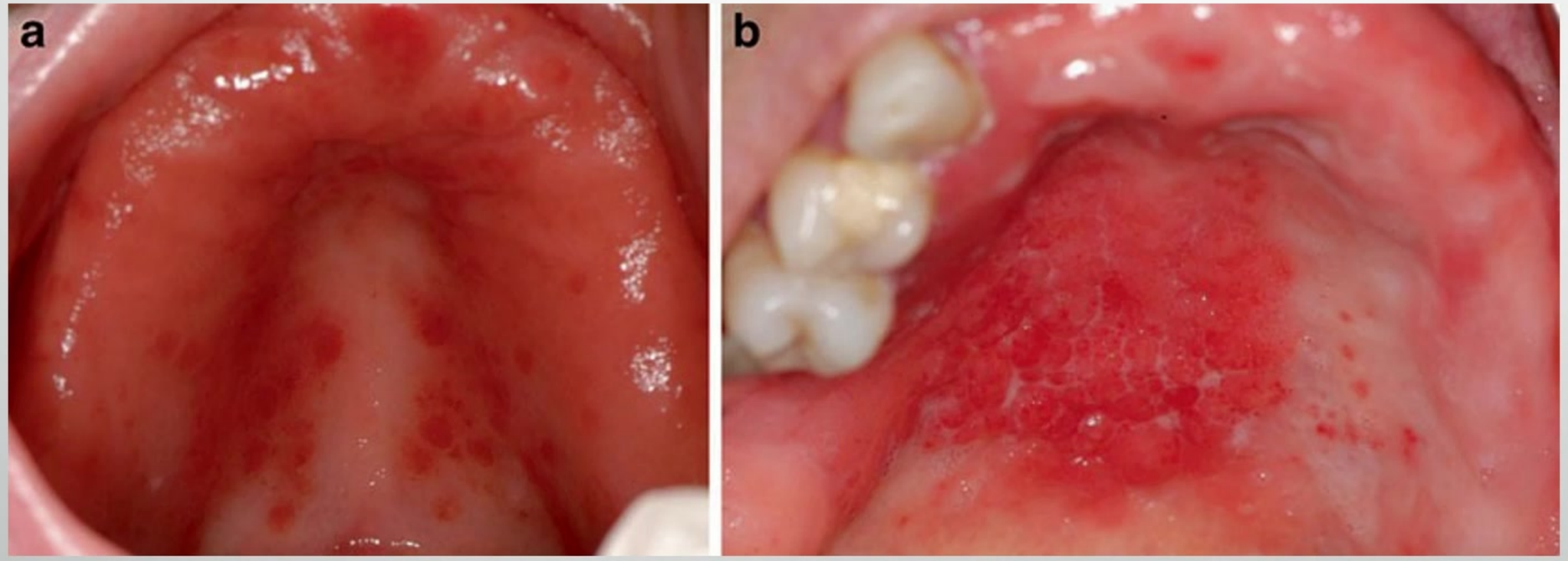


***Candida*-associated lesions**	**Clinical features**	**Site involved**
Angular cheilitis	Edema, soreness, burning, and fissuring with a tendency to local bleeding. *Candida* spp. and *Staphylococcus aureus* involved	Angles of the mouth
Median rhomboid glossitis	Area of papillary atrophy (occasionally hyperplastic, exophytic) elliptical or rhomboid in shape	Midline of the tongue, centrally, anterior to the circumvallate papillae
Denture-associated erythematous stomatitis	Chronic erythema and edema of the oral mucosa in contact with a denture	Palatal mucosa, the mucosa below the mandibular denture is rarely affected
Linear gingival erythema	Non-plaque-induced linear erythematous gingival band of 2–3 mm. First described in HIV-infected patients	Localized or diffuse marginal gingivae and attached gingiva
Secondary oral candidosis	**Clinical features**	**Site involved**
Chronic mucocutaneous candidosis	Persistent or recurrent candidal infections of the oral cavity and other sites of the body. Associated with several immunodeficiency disorders	Infections of the oral cavity (90%), possibly the larynx and pharynx. Cutaneous and vulvovaginal involvement is frequent

Angular Cheilitis

Median Rhomboid Glossitis

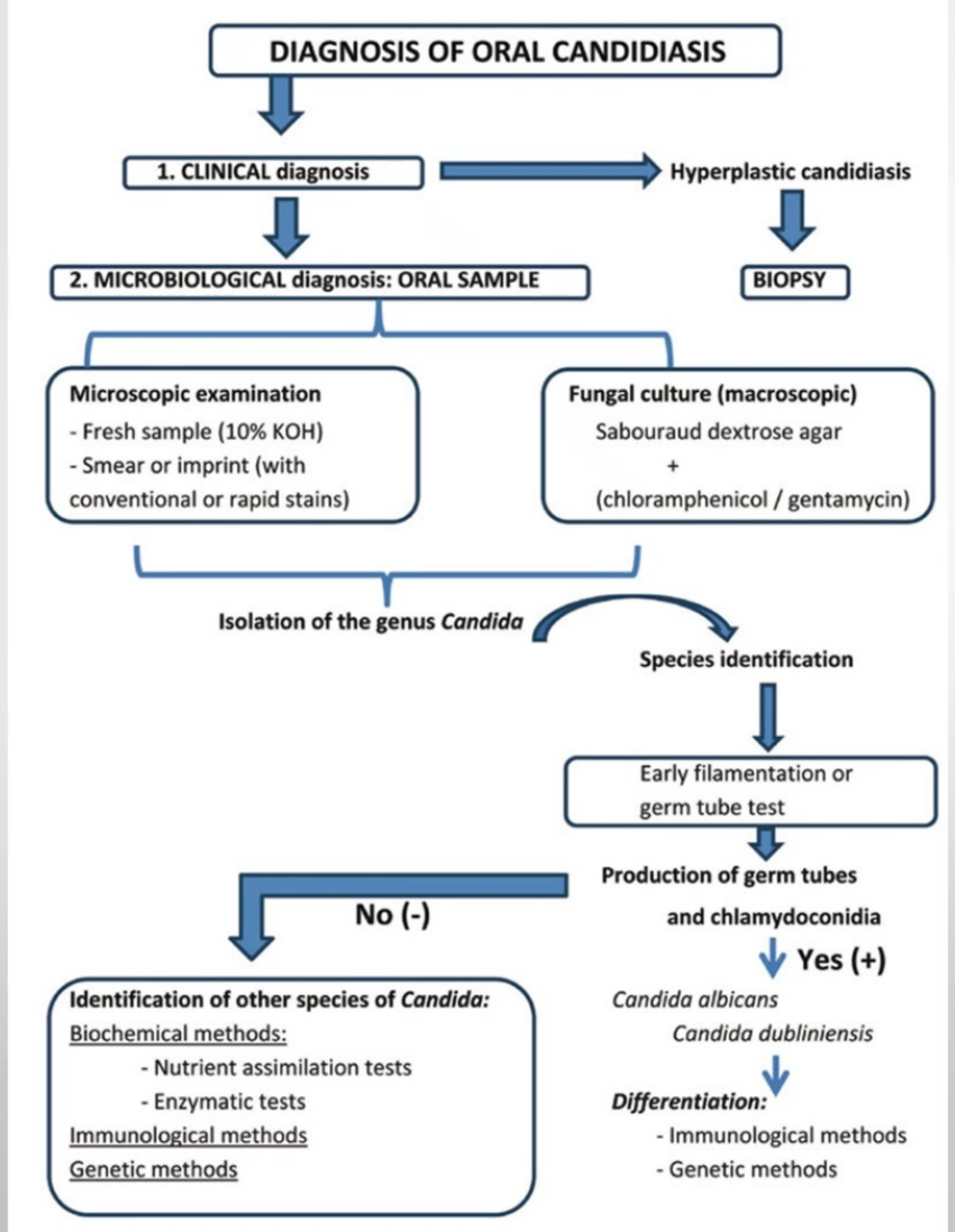
Denture-Associated Erythematous Stomatitis



Linear Gingival Erythema

Oral Candidiasis

- **Investigations**
- Several clinical and laboratory techniques used to confirm provisional diagnosis
- Presence of candida hyphae confirmed with Periodic Acid-Shiff Staining of cytology smear of pseudomembrane
- Cultures of swabs taken from mucosal tissues and under surface of denture useful in erythematous candidosis
- Quantitative determination of fungal burden also marker of infection
  - Infected individual counts range from 4000 to 20 000 CFU/ml
- Haematologic investigations to check for underlying immunosuppression, or nutritional deficiencies


DIAGNOSIS OF ORAL CANDIDIASIS
1. CLINICAL diagnosis
Hyperplastic candidiasis
2. MICROBIOLOGICAL diagnosis: ORAL SAMPLE
BIOPSY
Microscopic examination
- Fresh sample (10% KOH)
- Smear or imprint (with conventional or rapid stains)
Fungal culture (macroscopic)
Sabouraud dextrose agar
+
(chloramphenicol / gentamycin)
Isolation of the genus Candida
Species identification
Early filamentation or germ tube test
Production of germ tubes and chlamydoconidia
No (-)
Yes (+)
Identification of other species of Candida:
Biochemical methods:
- Nutrient assimilation tests
- Enzymatic tests
Immunological methods
Genetic methods
Candida albicans
Candida dubliniensis
Differentiation:
- Immunological methods
- Genetic methods

Oral Candidiasis

- **Management**
- Identify and correct underlying predisposing factors – e.g. underlying anaemia
- Pharmacologic treatment should be started
  - Determined by immunological status of patient
  - Polyenes: nystatin, amphotericin B)
  - Azoles: miconazole, clotrimazole, ketoconazole, itraconazole, fluconazole)
  - Echnocandins: caspofungin, micafungin, anidulafungin
- Adjunctive chlorhexidine

Oral Candidiasis

Antifungal agent	Form	Dosage
Amphotericin B	Lozenge, 10 mg	Slowly dissolved in the mouth 3–4 times a day after meals for 2 weeks
	Oral suspension, 100 mg/ml	Placed in the mouth after meal and retained near lesions 4 times daily for 2 weeks
Nystatin	Pastille, 100,000 units	Dissolve 1 pastille slowly after meals 4 times daily, usually for 7 days
	Oral suspension, 100,000 units	Apply after meals 4–5 times daily, usually for 15 days, and continue use for several days after post-clinical healing
Clotrimazole	Cream	Apply to affected area 2–3 times daily for 3–4 weeks
	Solution	5 ml 3–4 times daily for at least 2 weeks
Miconazole	Oral gel	Apply to affected area 3–4 times daily for 3–4 weeks
	Cream	Apply twice per day and continue for 10–14 days after post-clinical healing
	Muco-adhesive buccal tables, 50 mg	Apply on the upper gum once a day for 7–14 days
Ketoconazole	Tablets	200–400 mg tablets taken once or twice daily with food for 2 weeks
Fluconazole	Capsules	50–200 mg capsules once daily for 2–3 weeks
	Oral suspension	200 mg once on the first day, then 100 mg for at least 2 weeks
Itraconazole	Capsules	100 mg capsule once daily taken after meals for 2 weeks

CHECK FOR DRUG INTERACTIONS

Oral Candidiasis

- **Management**
- Avoid nocturnal use of denture
- Clean them, keep them in DRY environment
- Mechanical cleaning with soft toothbrush and soap 2/day effective to remove biofilm from denture material
- Twice weekly soaking in white vinegar (diluted 1:20) or 0.1% hypochlorite (diluted 1: 10) or chlorhexidine
- If appropriate, miconazole gel application to denture bearing surface – 4/day for 4 weeks