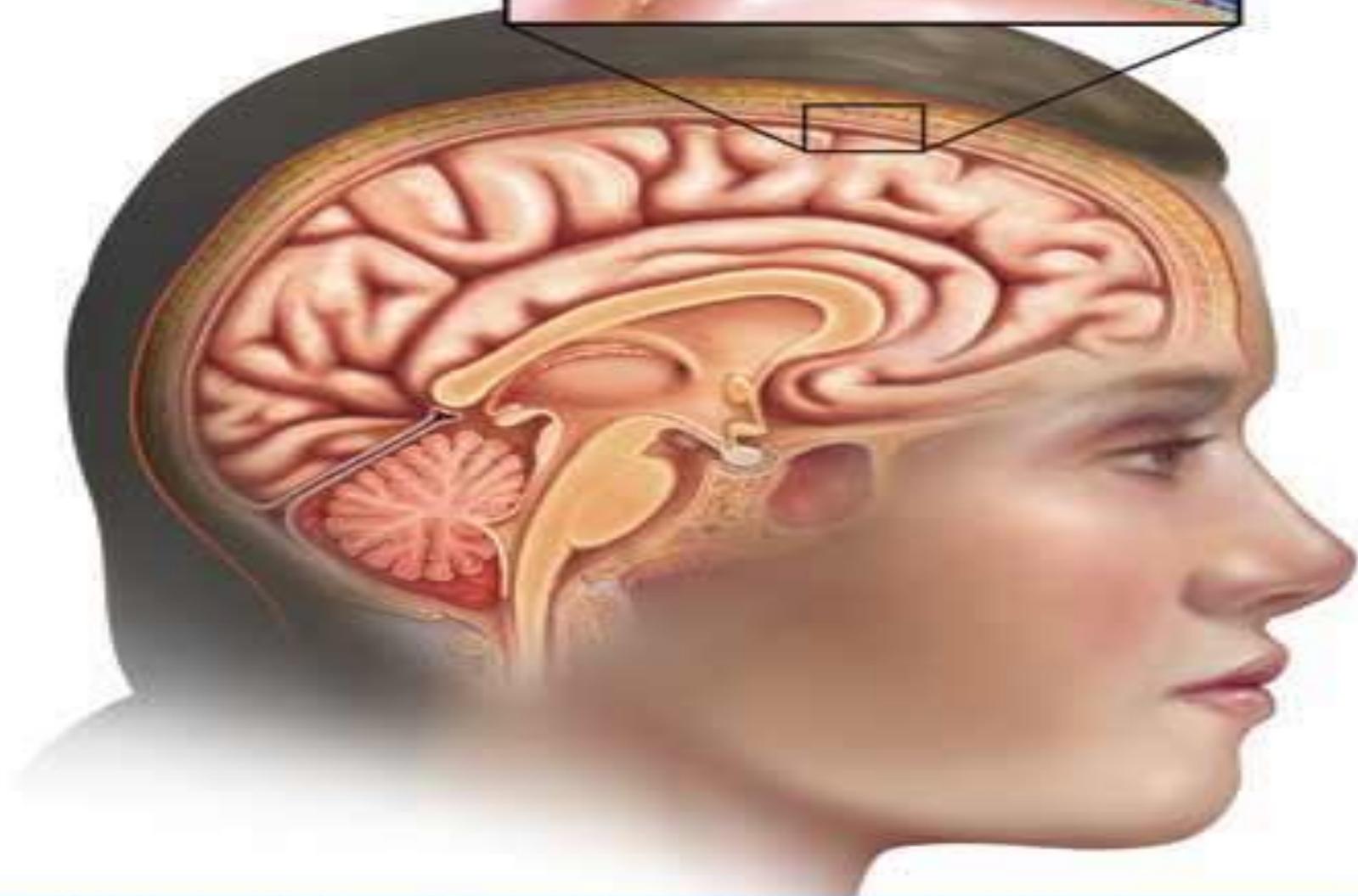
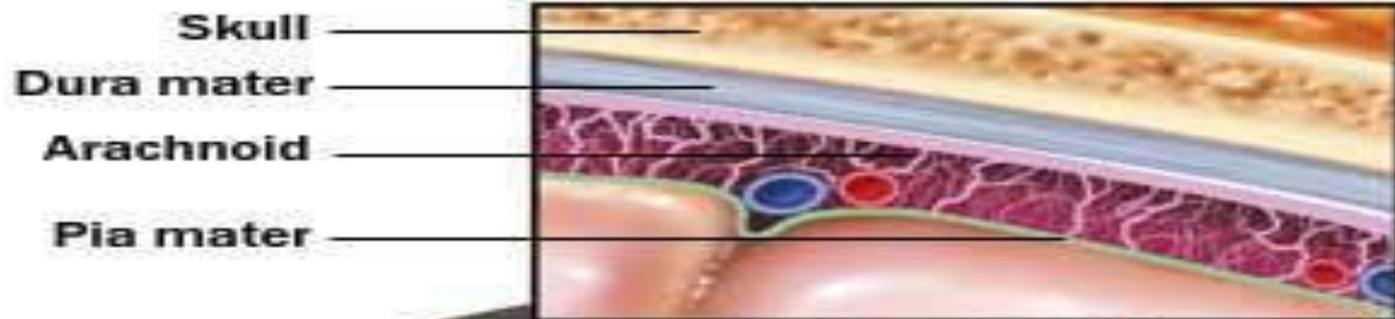


MENINGITIS

By Dr. Swathi Swaroopa. B



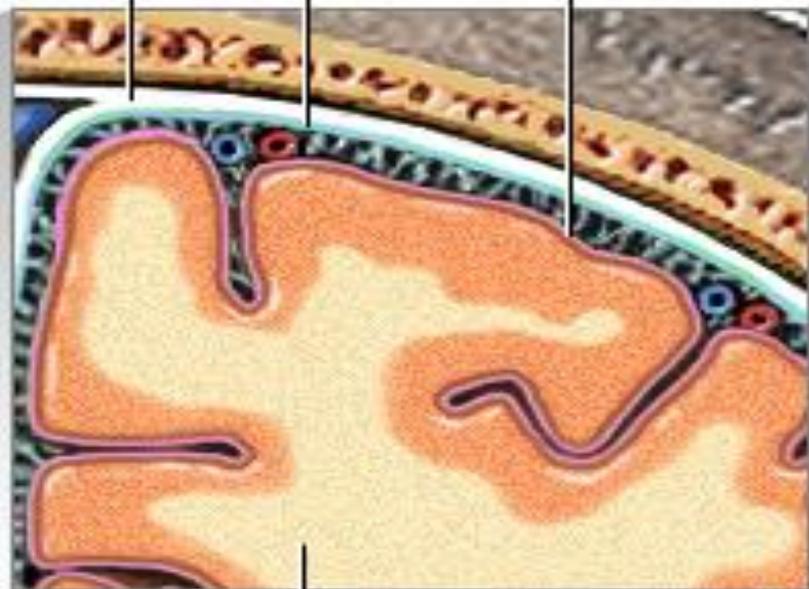
The meninges are the membranes covering the brain and spinal cord



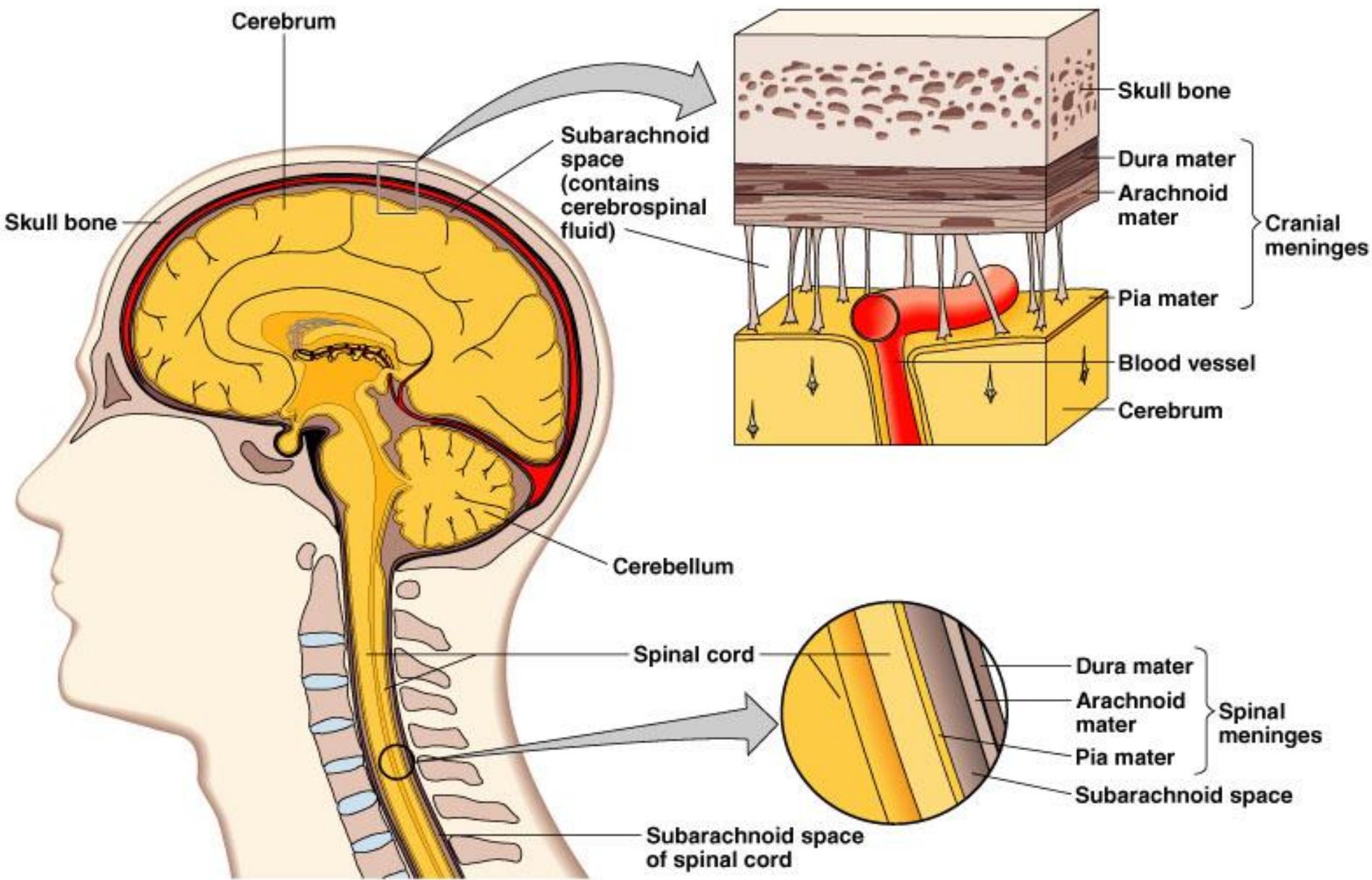
Dura mater (2 layers)

Arachnoid

Pia mater



Brain



INTRODUCTION

- Inflammation of **pia matter, arachnoid, and the CSF filled sub arachnoid space.**
- Inflammation **spreads rapidly** because of CSF circulation around the brain and spinal cord

TYPES

- **ACUTE PURULENT MENINGITIS (USUALLY BACTERIAL)**
- **ACUTE LYMPHOCYTIC (USUALLY VIRAL)**

FACTORS FOR SEVERITY

- **Virulence factors**
- **Host factors**
- **Brain edema**
- **Presence of permanent neurologic sequelae**

BACTERIAL MENINGITIS

BACTERIA

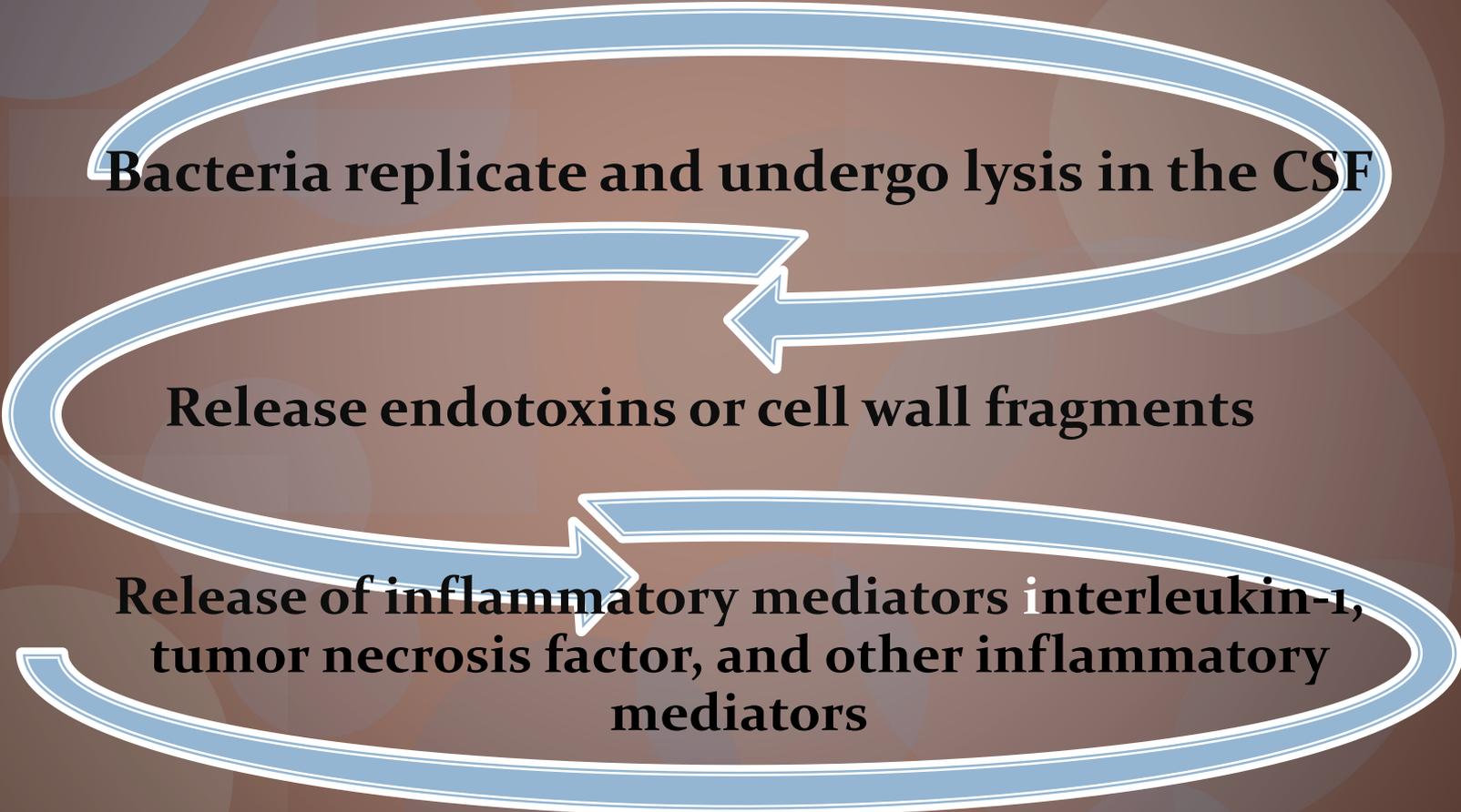
- **Streptococcus pneumoniae**
- **Neisseria meningitidis**
- **Group B streptococci (except in neonates)**
- **Hemophilus influenzae (incidence  now)**
- **Gram negative bacilli**
- **Listeria monocytogenes**

RISK FACTORS

- **Head trauma with basilar skull fractures**
- **Otitis media**
- **Sinusitis**
- **Mastoiditis**
- **Neurosurgery**
- **Dermal sinus tracts**
- **Systemic sepsis**
- **Immunocompromise**

PATHOGENESIS

Bacteria replicate and undergo lysis in the CSF



```
graph TD; A["Bacteria replicate and undergo lysis in the CSF"] --> B["Release endotoxins or cell wall fragments"]; B --> C["Release of inflammatory mediators interleukin-1, tumor necrosis factor, and other inflammatory mediators"]; C --> A;
```

Release endotoxins or cell wall fragments

Release of inflammatory mediators interleukin-1, tumor necrosis factor, and other inflammatory mediators

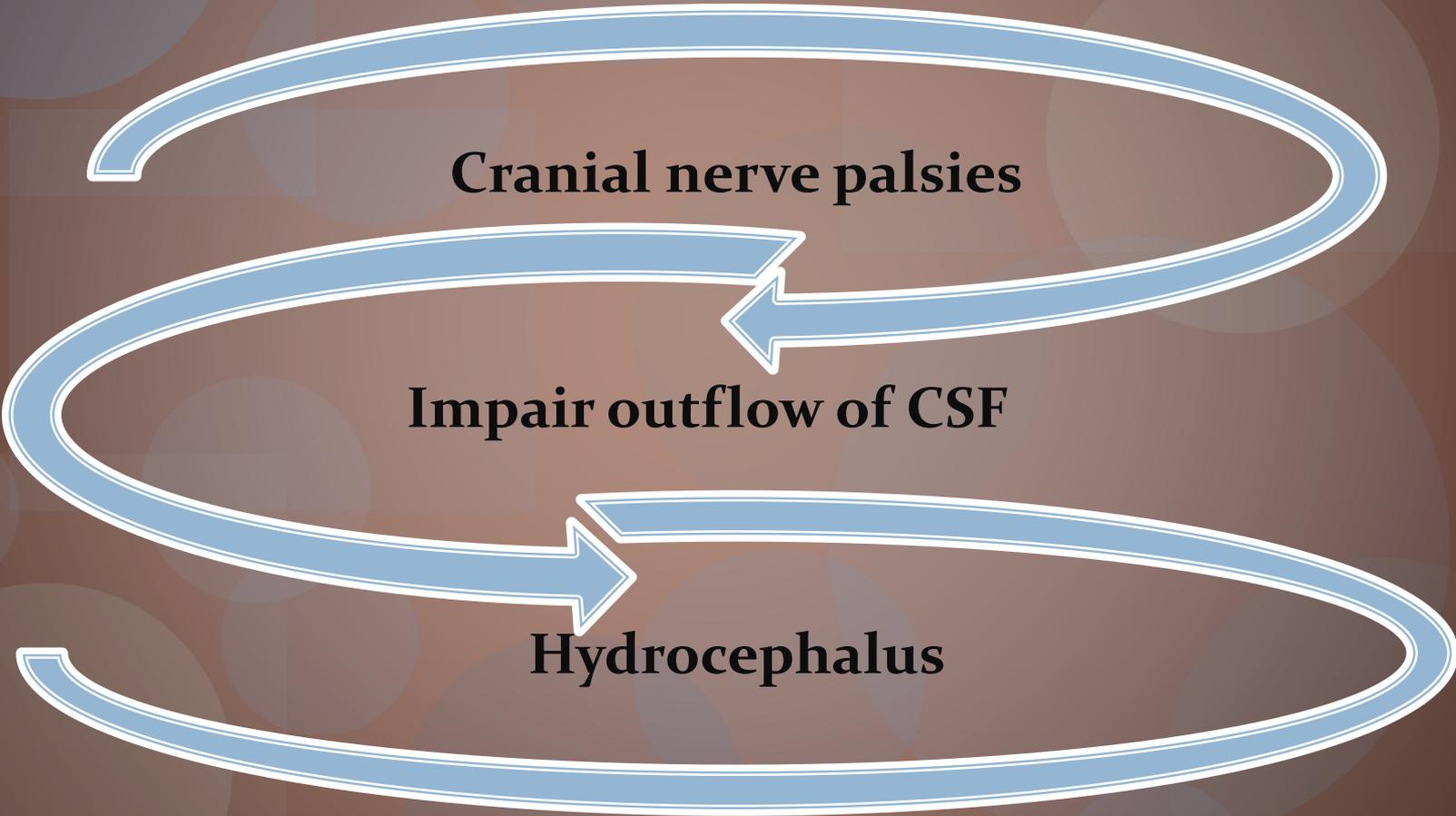
Proteolytic products and toxic oxygen radicals cause an **alteration of the blood–brain barrier**, whereas platelet-activating factor **activates coagulation**, and arachidonic acid metabolites stimulate **vasodilation**

These events lead to **cerebral edema**, elevated **intracranial pressure**, cerebrospinal fluid (CSF) pleocytosis, decreased cerebral blood flow, cerebral ischemia, and death.

Cranial nerve palsies

Impair outflow of CSF

Hydrocephalus



SYMPTOMS

- Headache
- Fever
- Nuchal rigidity
- Nausea
- Vomiting
- Photophobia
- Altered mental status
- Seizures
- Cranial nerve palsies
- Focal cerebral signs
- Petechial rash , palpable purpura, acute hypotension and adrenal hemorrhage-waterhouse friderichsen syndrome (meningococcul)

Waterhouse–Friderichsen syndrome (WFS), hemorrhagic adrenalitis or fulminant meningococemia is defined as **adrenal gland failure due to bleeding into the adrenal glands**, commonly caused by severe bacterial infection: Typically the pathogen is the meningococcus *Neisseria meningitidis*.

VIRAL MENINGITIS

VIRUS

- **HSV (HERPES SIMPLEX VIRUS)type 2**
- **Enterovirus**
- **Coxsackievirus**
- **Poliovirus**
- **Echovirus**
- **Epstein-Barr virus**
- **Mumps virus**
- **West nile virus**

- Manifestation is same like bacterial meningitis, but **course is less severe**
- CSF findings are also markedly different
 - lymphocytes present rather than polymorphonuclear cells)
 - Proteins moderately elevated
 - Sugar is normal
- Viral meningitides is **self limiting** and usually require symptomatic treatment
- HSV type 2-respond to IV acyclovir

CLINICAL SYMPTOMS: (General)

1- Infectious manifestations:

- Chills
- Headache
- Fever
- Myalgia
- Malaise

2- Increased intracranial pressure, manifested as

- Headache
- lethargy
- Vomiting
- Papilledema
- Unilateral or bilateral 6th nerve palsy,

3- Meningeal irritation

(noted by elicitation of Brudzinski's and/or Kernig's sign) .

- Nuchal rigidity.

4. Hemorrhage:

- Petechia
 - Purpura
 - Ecchymosis.
-

5. Eye affects:

- Photophobia
- Unequal pupils, Pupil dilation
- Sluggish reaction to light.

6. Mental state:

- Drowsiness
- Coma
- Delirium
- Stupor



Brudzinski's neck sign



Signo de Kernig



TABLE 36-1

Mean Values of the Components of Normal and Abnormal Cerebrospinal Fluid

Type	Normal	Bacterial	Viral	Fungal	Tuberculosis
WBC (cells/mm ³ or $\cdot 10^6/L$)	<5 (<30 in newborns)	1,000–5,000	5–500	100–400	25–500
Differential ^a	Monocytes	Neutrophils	Lymphocytes	Lymphocytes	Variable
Protein (mg/dL)	<50 (<500 mg/L)	Elevated	Mild elevation	Elevated	Elevated
Glucose (mg/dL)	45–80 (2.5–4.4 mmol/L)	Low	Normal	Low	Low
CSF: blood glucose ratio	50–60%	Decreased	Normal	Decreased	Decreased

Children and Adults

Meningitis and Septicaemia often occur Together



Fever, cold hands & feet



Stomach cramps & diarrhoea



Vomiting



Spots/Rash see Glass Test



Drowsy, difficult to wake



Severe headache



Confusion & irritability



Stiff neck



Severe muscle pain



Dislike bright lights

MENINGOCOCCAL DISEASE: WARNING SIGNS

Classic signs

Severe headache

Dislike of bright lights

Fever/vomiting

Stiff neck

Rapid breathing

Drowsy and less responsive

Stomach/joint/muscle pain

Rash - at later stages of disease

Early signs

Skin very pale, blue or dusky around lips

Severe leg pain

Cold hands or feet with high temperature



Symptoms of Meningitis

Central

- Headache
- Altered mental status

Ears

- Phonophobia

Eyes

- Photophobia

Neck

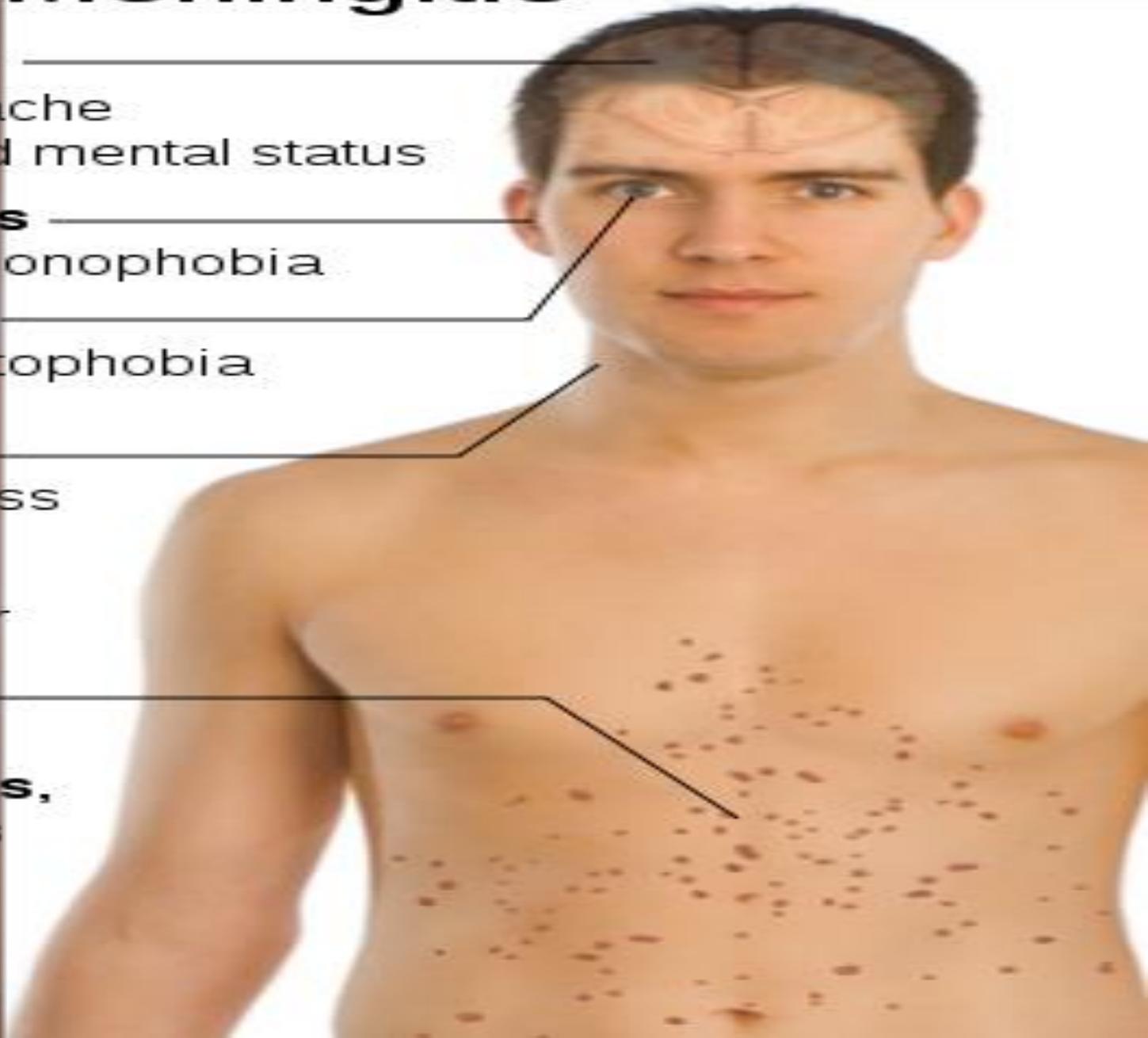
- Stiffness

Systemic

- High fever

**Trunk,
mucus
membranes,
extremities**
(if meningo-
coccal
infection)

- Petechiae



CHRONIC MENINGITIS

- Tubercular meningitis
- Fungal meningitis
- Syphilitic meningitis
- Amoebic meningitis