Enterobacteriaceae

Enterobacteriaceae

I – Habitat

digestive tube(colon) of human and animals

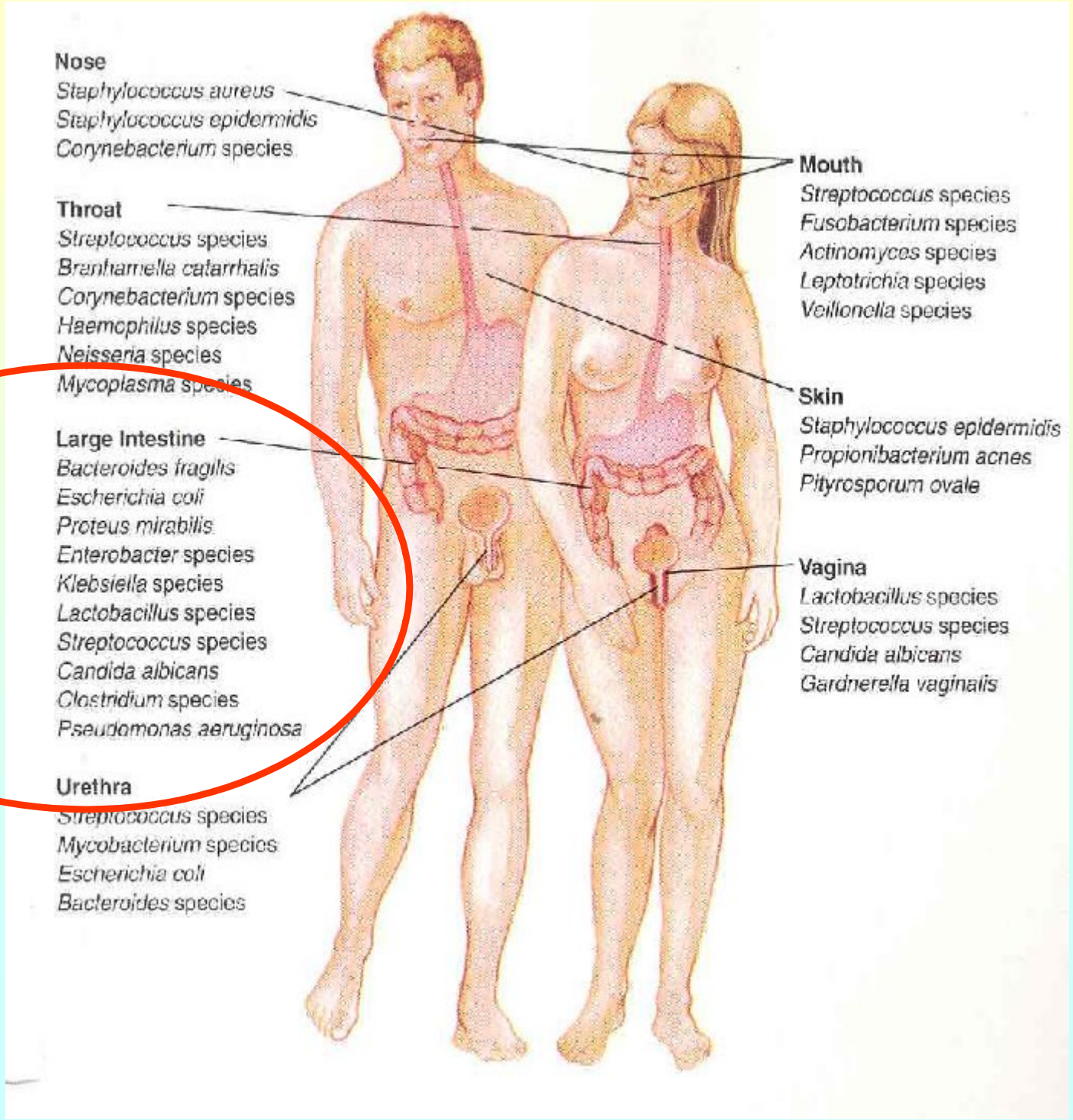
150 Species

Facultative anaerobes

Diarrheal illnesses

3 million death/year

4billion infectoions/ worldwide


Nose
Staphylococcus aureus
Staphylococcus epidermidis
Corynebacterium species
Throat
Streptococcus species
Branhamella catarrhalis
Corynebacterium species
Haemophilus species
Neisseria species
Mycoplasma species
Large Intestine
Bacteroides fragilis
Escherichia coli
Proteus mirabilis
Enterobacter species
Klebsiella species
Lactobacillus species
Streptococcus species
Candida albicans
Clostridium species
Pseudomonas aeruginosa
Urethra
Streptococcus species
Mycobacterium species
Escherichia coli
Bacteroides species
Mouth
Streptococcus species
Fusobacterium species
Actinomyces species
Leptotrichia species
Veillonella species
Skin
Staphylococcus epidermidis
Propionibacterium acnes
Pityrosporum ovale
Vagina
Lactobacillus species
Streptococcus species
Candida albicans
Gardnerella vaginalis

Enterobacteriaceae

II – Pathogenicity

1 – Pthogenic species

Yersinia pestis

Yersinia pseudotuberculosis

Yersinia enterocolitica

Salmonella

Shigella

EHEC

Enterobacteriaceae

II – Pathogenicity

2 – Opportunistic pathogens

normal flora of intestine

E. coli **infectious in urinary tract**

KES

(*Klebsiella – Enterobacter – Serratia*)

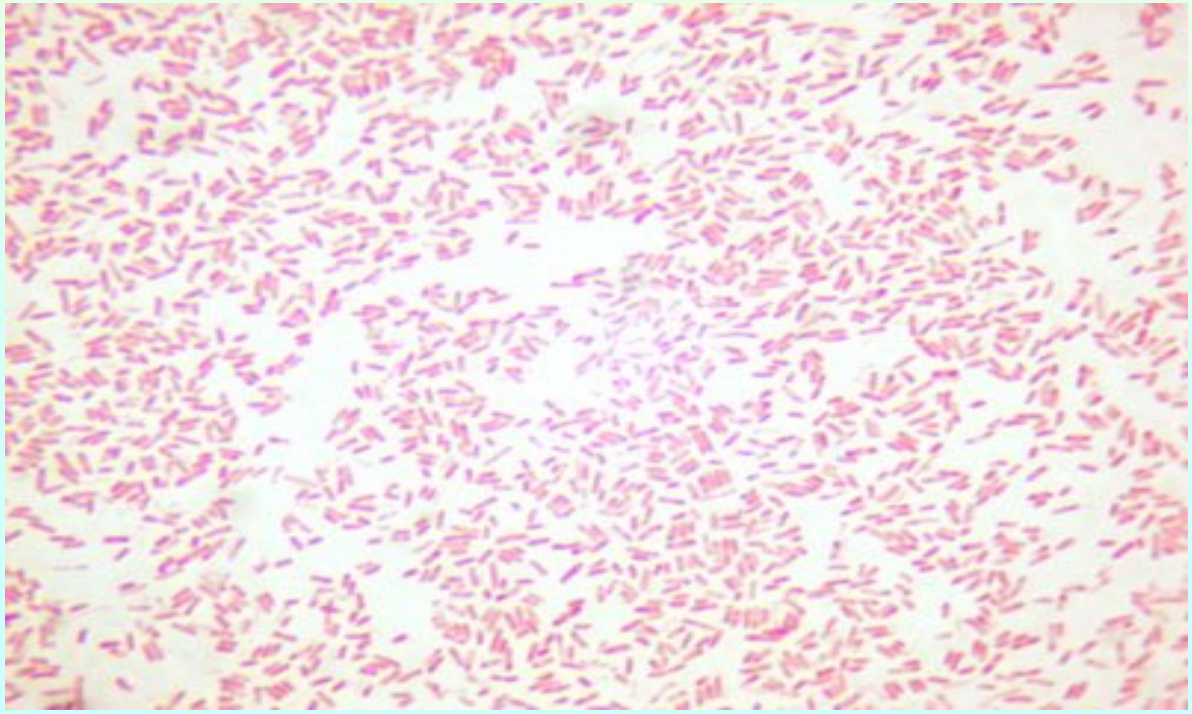
Proteus – Providencia -Citrobacter

Enterobacteriaceae

III – Morphology

Gram negative bacilli

1-3µ length



Enterobacteriaceae

- **Key common properties**
  - **Ferment glucose**
  - **Reduce nitrates to nitrites**
  - **Oxidase negative**
  - **Catalase positive**
  - **Often motile (Except Shigella & Klebsiella)**

Enterobacteriaceae

- **Coliforms:** Rapid Lactose Fermentating enteric bacteria that are normal and opprtunistic (some strains of E.coli are true pathogens)
- Escherichia Coli
- Klebsiella
- Enterobacter
- Hafnia
- Serratia
- Citrobacter

Enterobacteriaceae

- **Non Coliforms:** Lactose Negative may or may not be normal flora:
- ***Opportunistic, normal gut flora***
- Proteus
- Morganella
- Providencia
- Edwardsiella
- ***Pathgenic enterics:***
- Salmonella typhi , S.cholarae – suis, S.enteritidis, Arizona hinshawii
- Shigella dysenteria , Sh. flexneri , Sh. boydii, Sh. Sonnei
- Yersinia enterocolitica
- Yersinia pseudotuberculosis
- ***Pathogenic non enteric:***
- Yersinia pestis

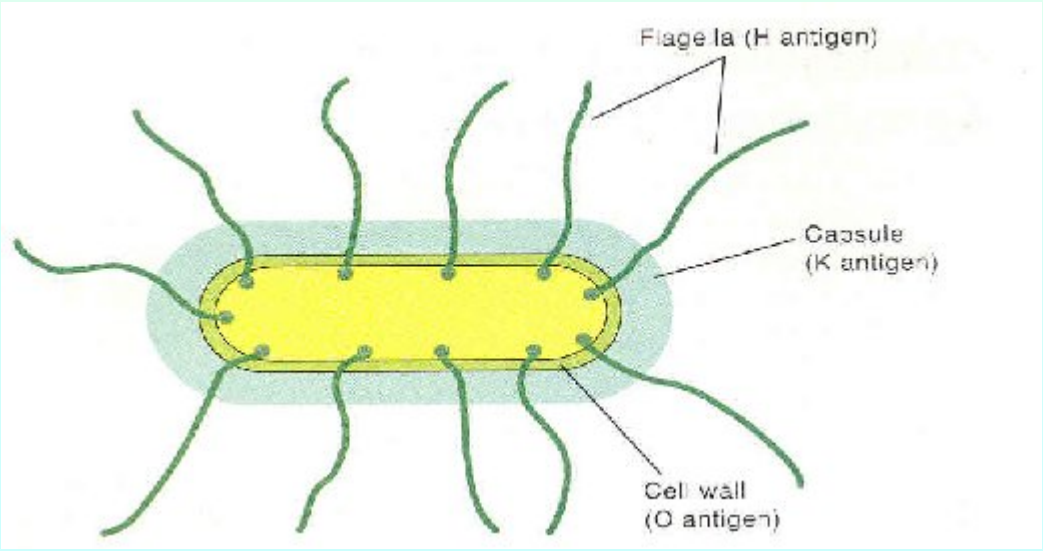
Enterobacteriaceae

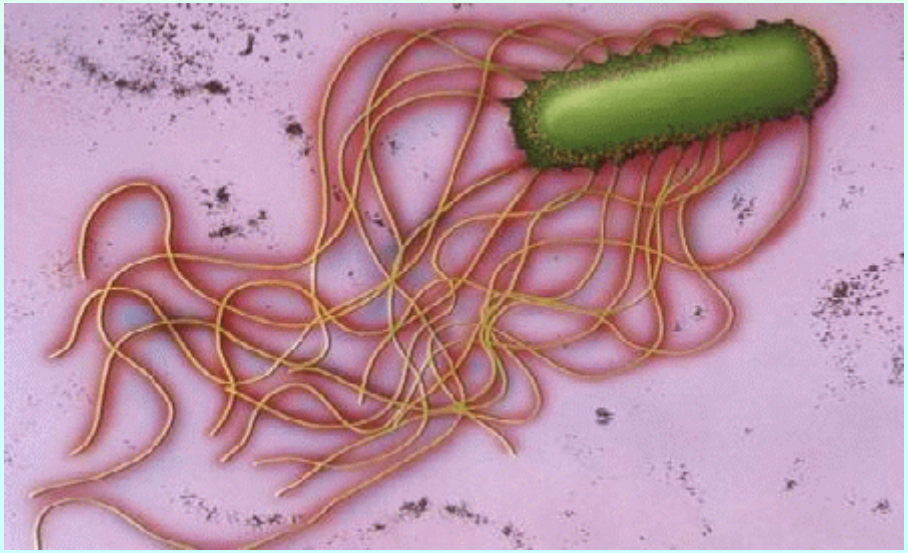
V – Antigenic structure

Somatic O antigen

Flagellar H antigen

K antigen or Vi (capsule)





Enterobacteriaceae

IV – Culture

media « ordinary »(selenite broth, MaCconky agar, SS agar, EMB, Hecktoen enteric agar,TSI agar)

facultative aero-anaerobe

types of colonies

S « Smooth »

R « Rough »

M «Mucoid »

Coliform organisms and Diseases

Escherichia coli

I – Habitat

80 % of aerobic flora of intestine

outnumbered 9 to 1 by the strictly anearobic bacteria of the gut(Bacteroides and Bifidobacterium)

more fecal contamination

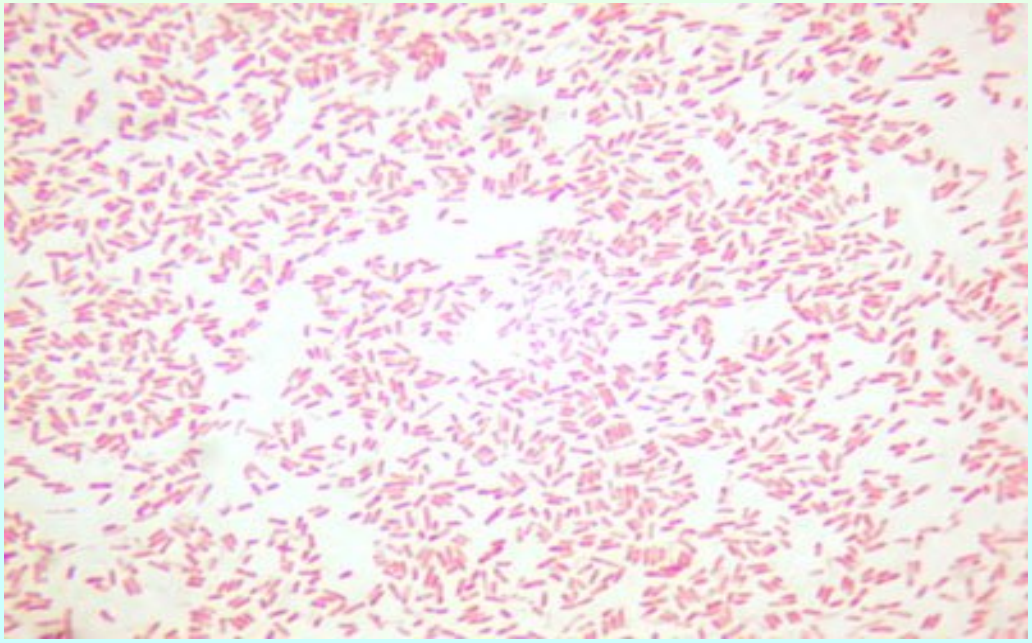
colititre (water)

Escherichia coli

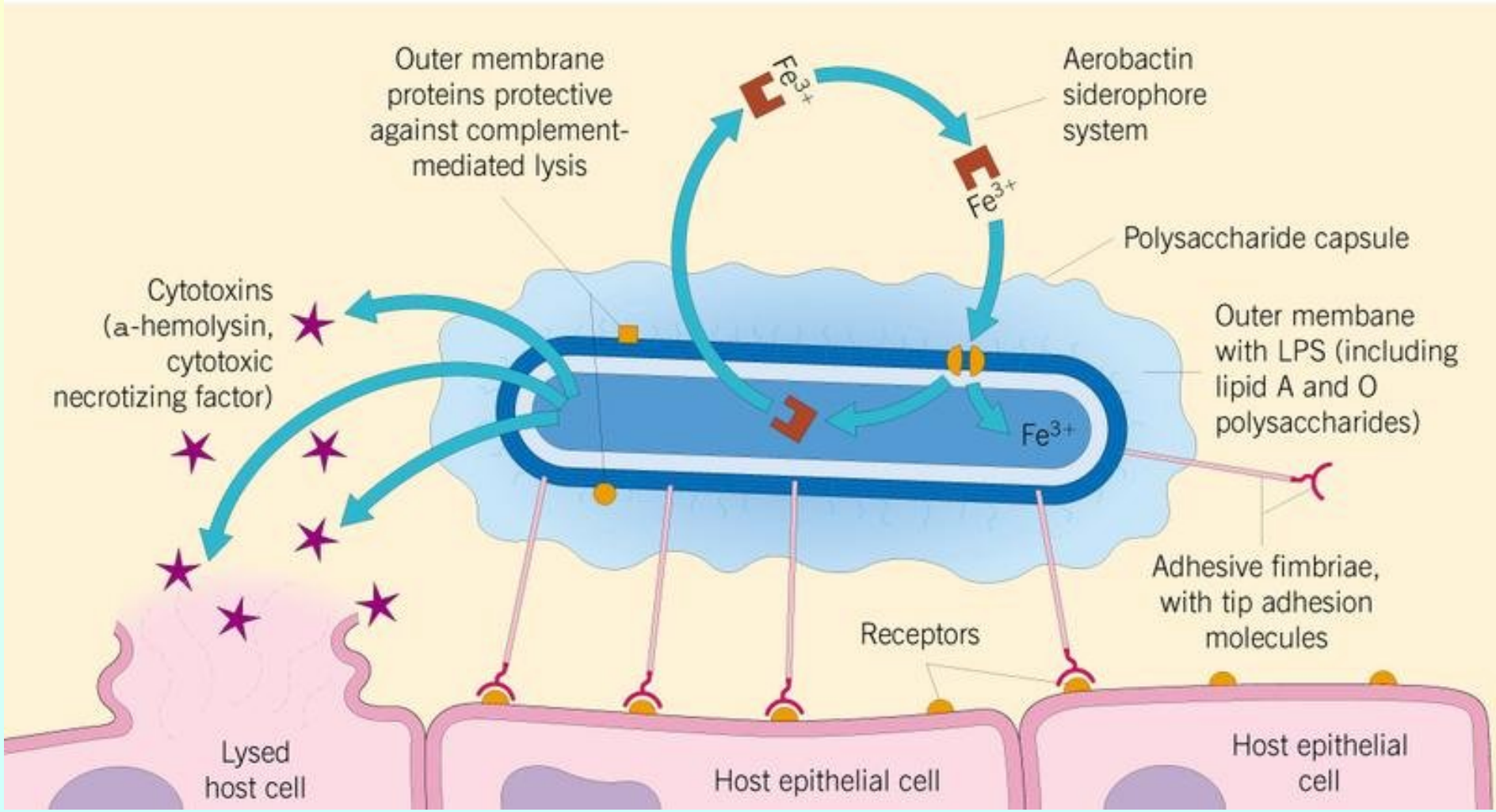
II – Morphology

Gram negative bacilli

often motile



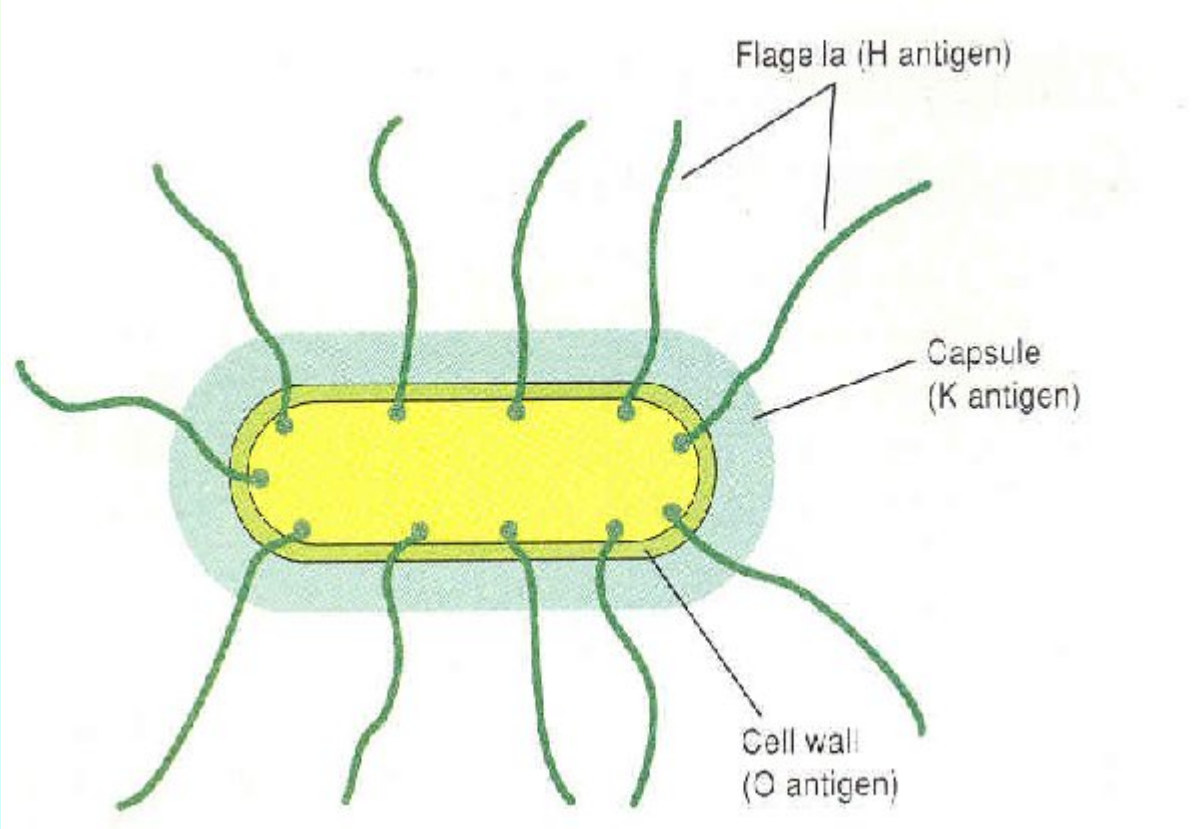
UROPATHOGENIC STRAIN OF *ESCHERICHIA COLI*



Escherichia coli

IV – Antigenic structure

O157H7 « disease of hamburger »



O111H4 (EPEC)

BACTERIAL TOXINS AND INFECTIONS BY ENTEROBACTERIACEAE		
Virulence factor	**Action**	**Organism and disease**
Exotoxins		
Hemolysins α, β	Cell destruction Cell lysis, often leading to cytokine release and inflammatory response	*Escherichia coli*: extraintestinal infection, urinary tract infections, pyelonephritis
Enterotoxins		
Heat-stable toxins (Sta; STb)	Hypersecretion of fluid and electrolytes	*E. coli* (ETEC): gastroenteritis (noninvasive, no inflammation, no fever) Watery diarrhea in infants and travelers
Heat-stable toxins (LT-I; LT-II)		
Verotoxin (VT1 and 2)	Intestinal mucosal destruction	*E. coli* (EHEC): hemorrhagic colitis, diarrhea; hemolytic–ureic syndrome
Enteroaggregative heat-stable toxin (EAST)?		*E. coli* (EAEC), diarrhea
Endotoxin		
Lipopolysaccharide	Complement activation, liberation of cytokines, leukocyte mobilization and degranulation, platelet and coagulation pathway activation	Enterobacteriaceae: fever, sepsis, shock with multiorgan failure

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Escherichia coli

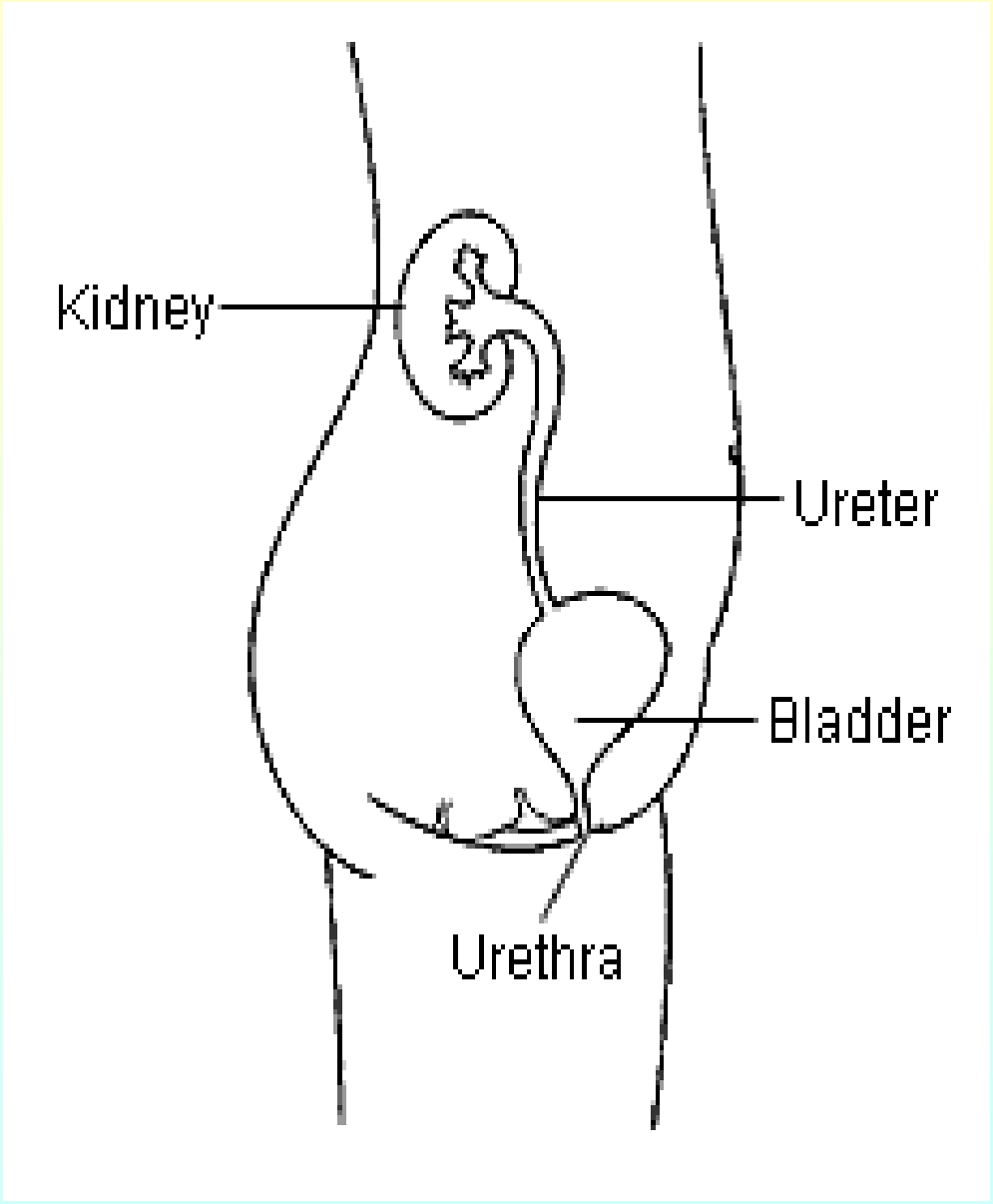
V I – Pathogenesis:

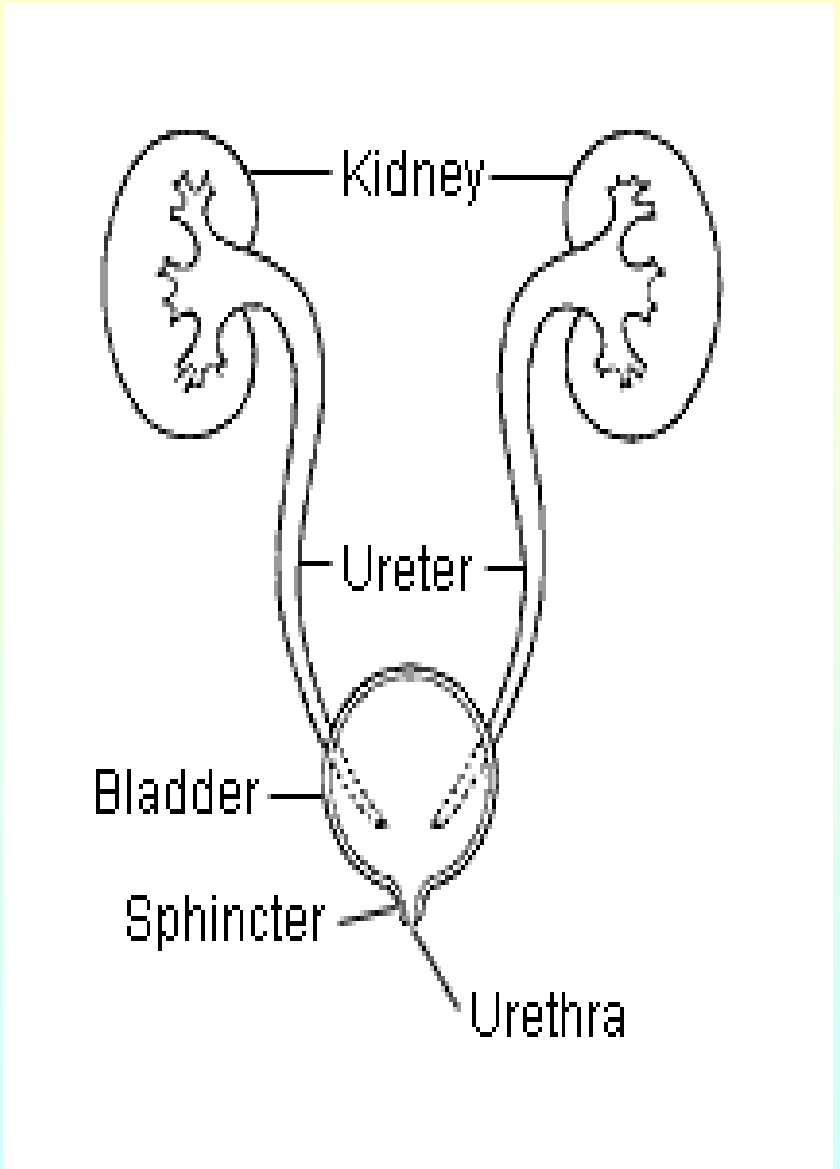
1 – Urinary Infections

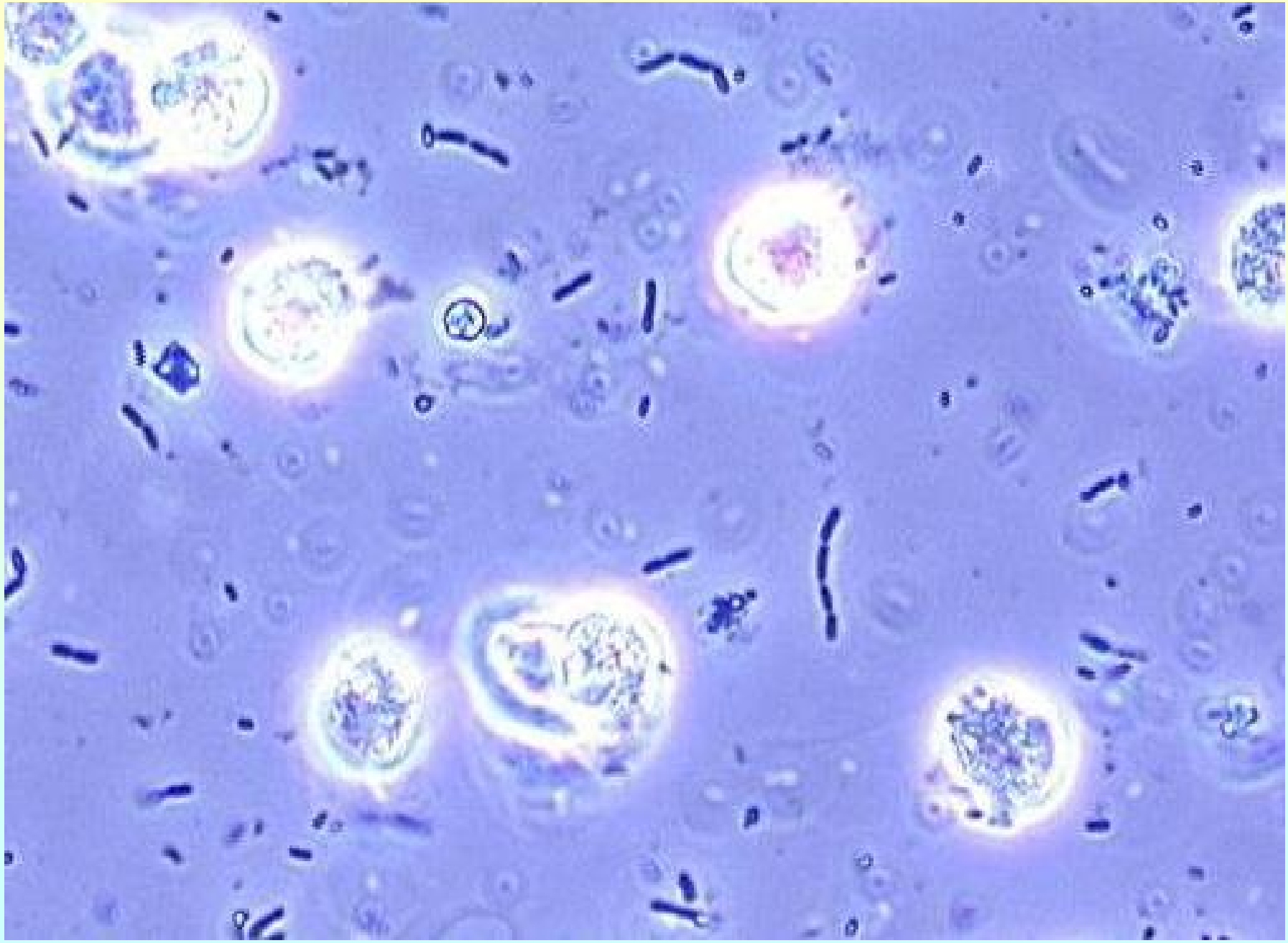
pregnant women +++

females > males

Hormones : dilation of urina


Kidney
Ureter
Bladder
Urethra


Kidney
Ureter
Bladder
Sphincter
Urethra



Urinary infections

	Polynuclaires $>= 10^4$/ml	**Bacteria** $>= 10^5$/ml	
Normal	**0**	**0**	
Infection	+	**+(monomicrobial)** **+(polymicrobial)**	**?**
Particular cases	**0**	**+**	**?**
Particular cases	**+**	**0**	**?**

Urinary infections

- Causes 50-80% UTI
- Simple urinary infection
  - More frequent
  - Young females
  - healthy
  - No clear symptoms

Urinary infections

- Complex urinary infections
  - Males
  - Pregnant womens, elderly
  - Immunocompromised (diabetes, AIDS, transplantations)
  - Urithritis, nephritis
  - Urinary catheterization ,

Urinary infections

- Treatment of simple UTI
  - Monotherapy
  - Course (single or < 3 days)
  - Quinolones II, cotrimoxazole
- Treatment of complex UTI
  - Combination therpay > 5 days
  - Aminoglycosides + quinolone II

Escherichia coli

V I – Pathogenesis

2 – Septicemia

via urinary tract(+++)

frequent

Escherichia coli

V I – Pathogenesis

3 – neonatal

Meningitis

antigen K1

wound infections

pneumonia

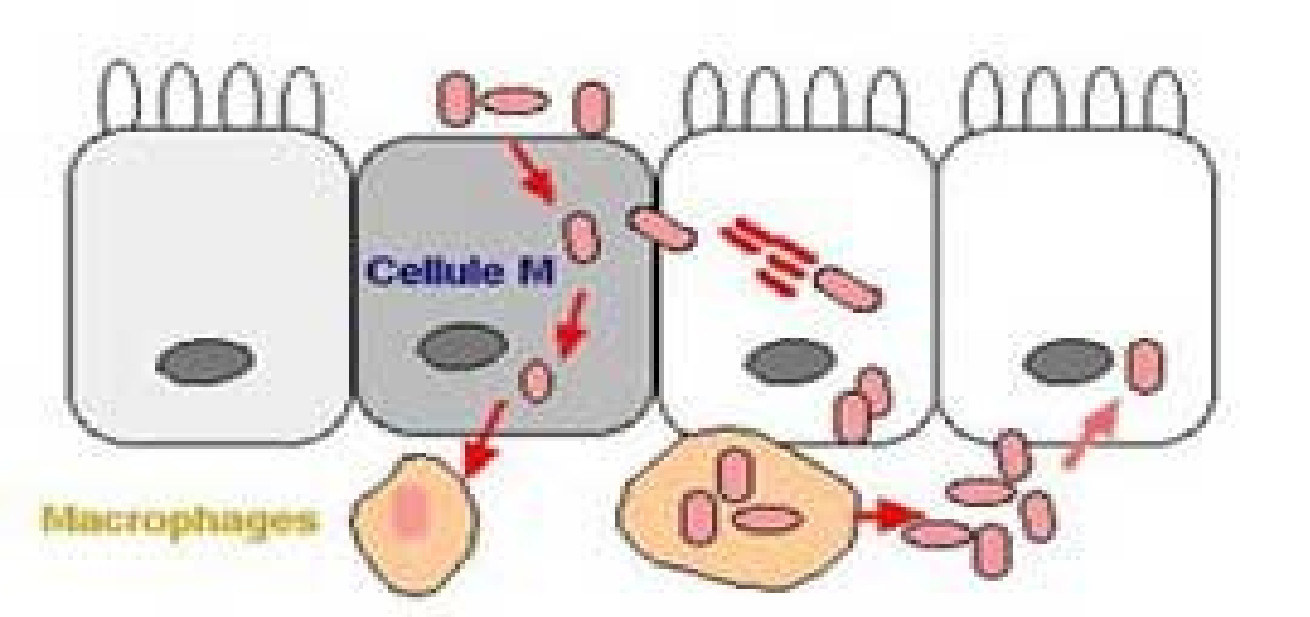
Escherichia coli

V I – Pathogenesis

4 – Intestinal infections

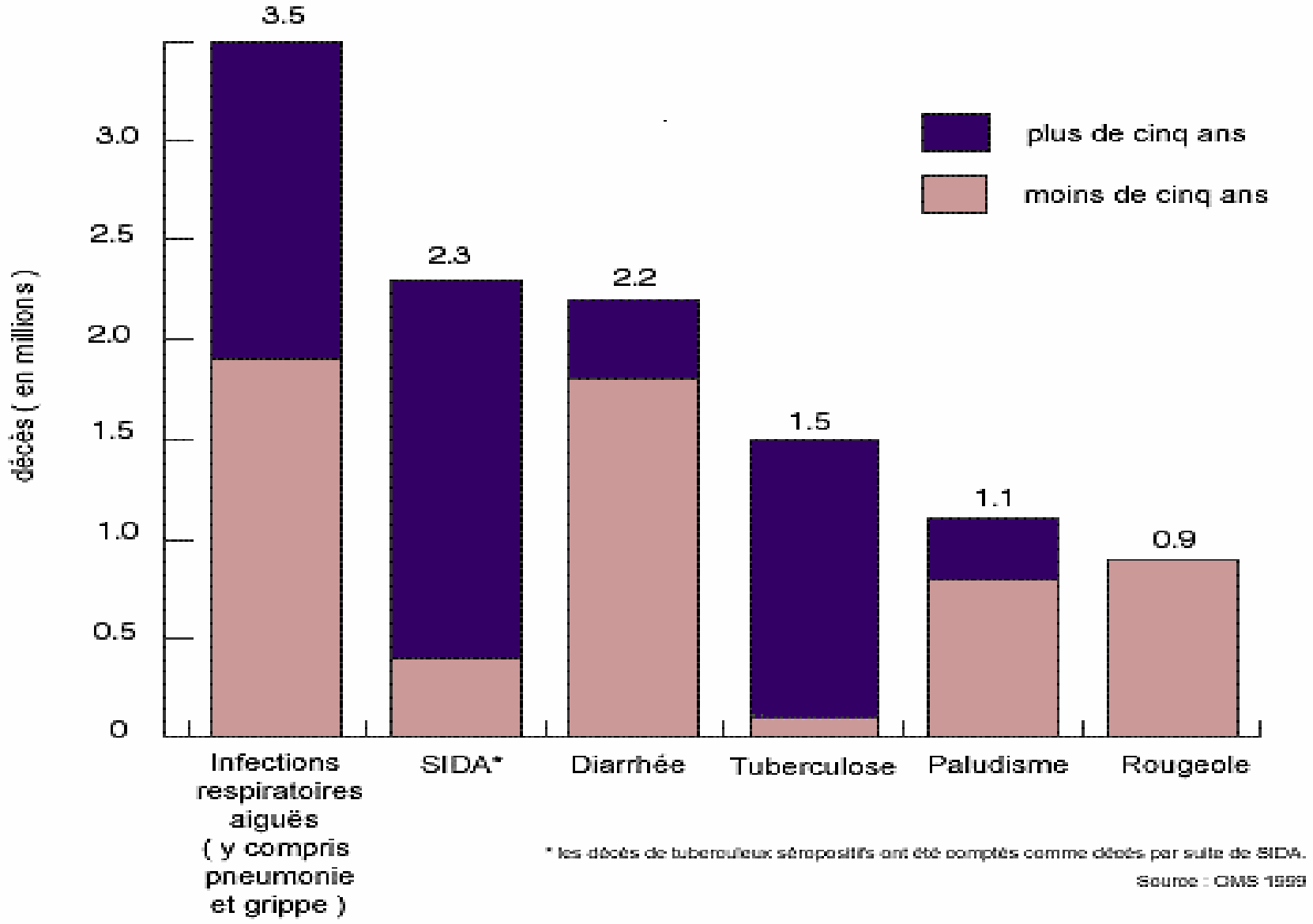
4-2 EIEC

(« Enteroinvasive *E. coli* »)(*Shigella*-like)



Les maladies infectieuses les plus meurtrières

En millions de morts dans l'ensemble du monde,
tous âges confondus, en 1998



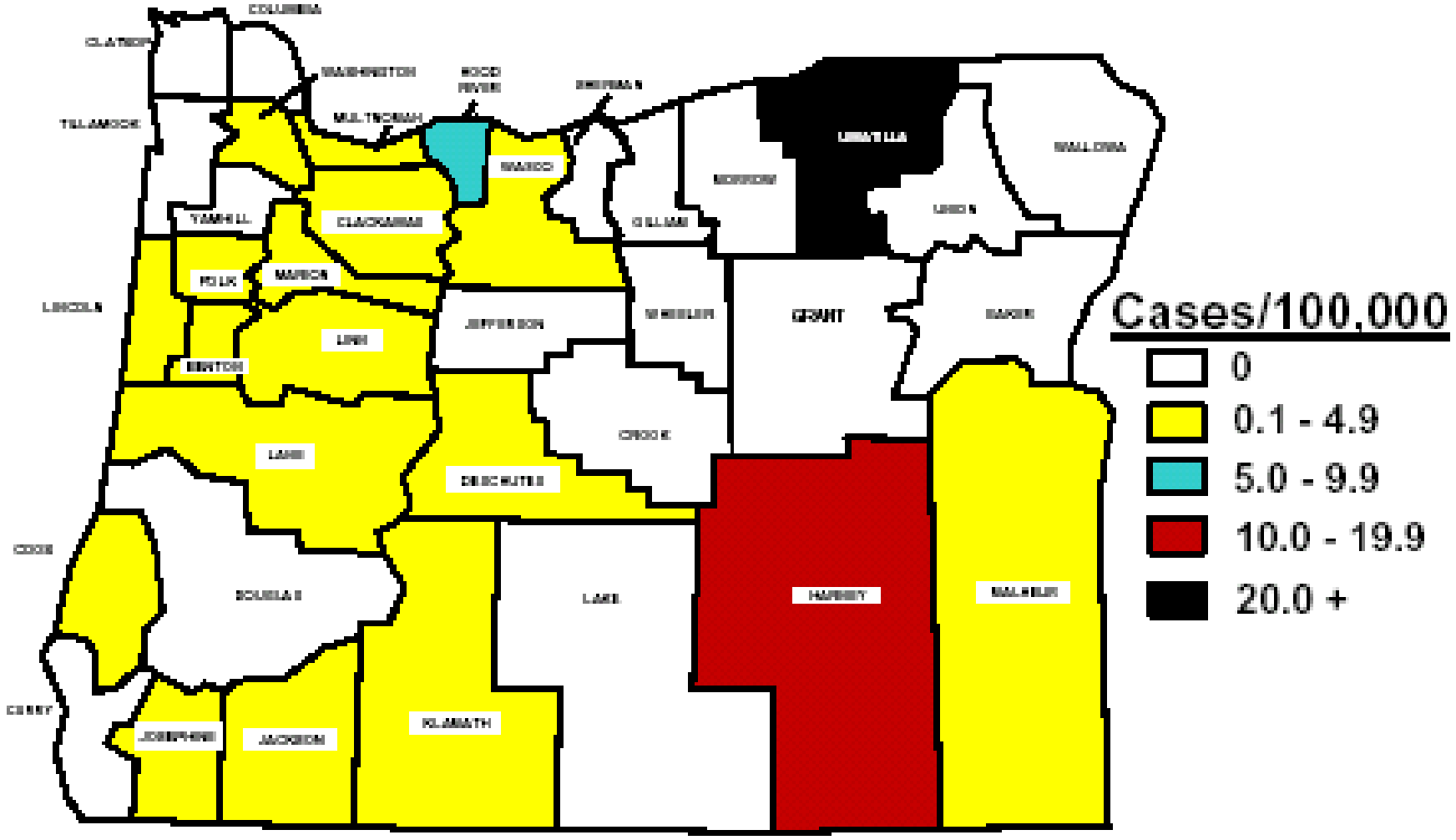
* les décès de tuberculeux séropositifs ont été comptés comme décès par suite de SIDA.

Source : OMS 1999

Incidence of E. coli O157 Infection

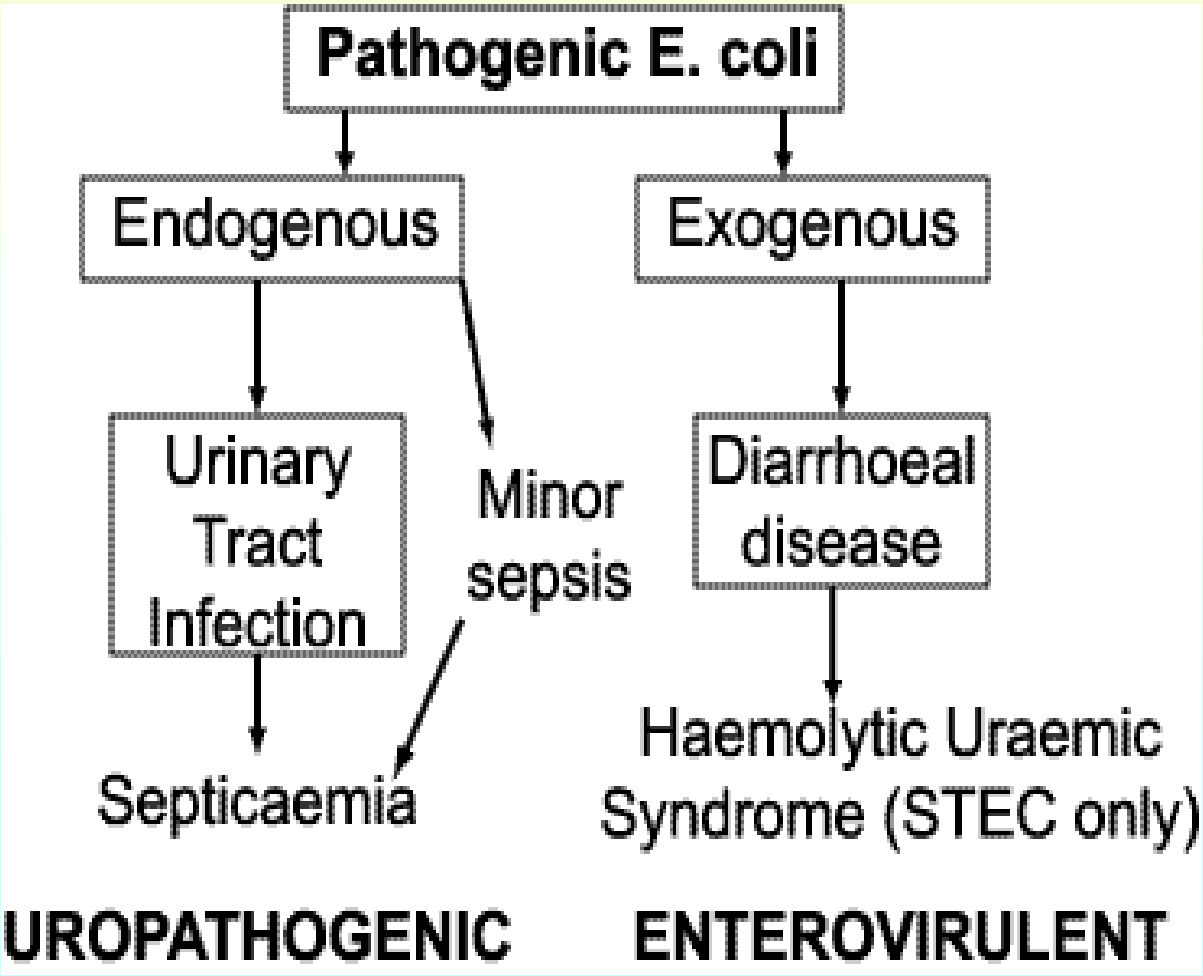
by County

Oregon, 2001



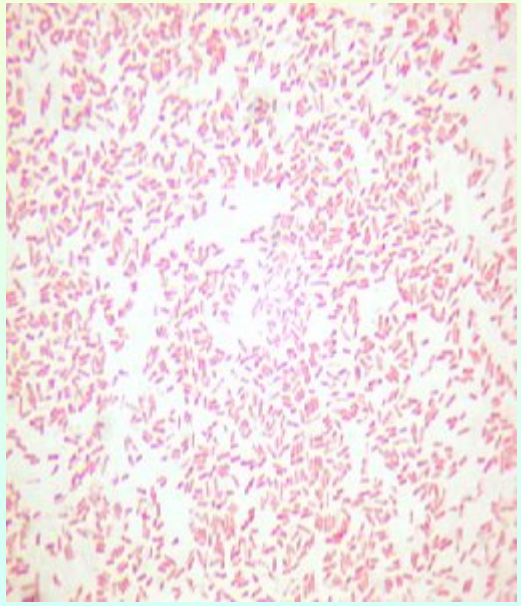
Escherichia coli

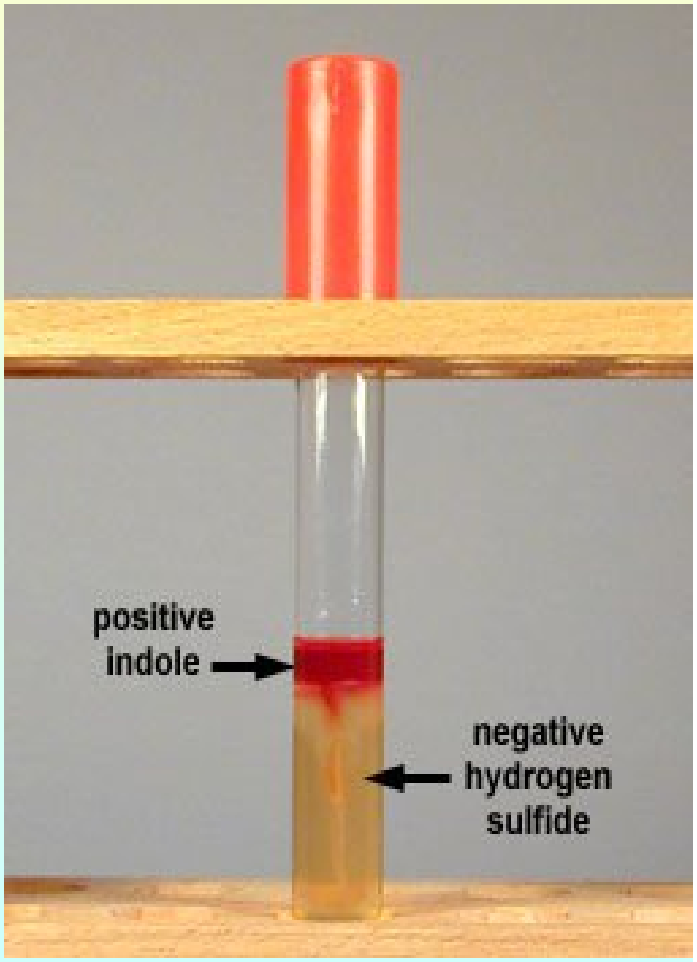
V II – Epidémiologie



Escherichia coli

V III – Diagnostic biologique





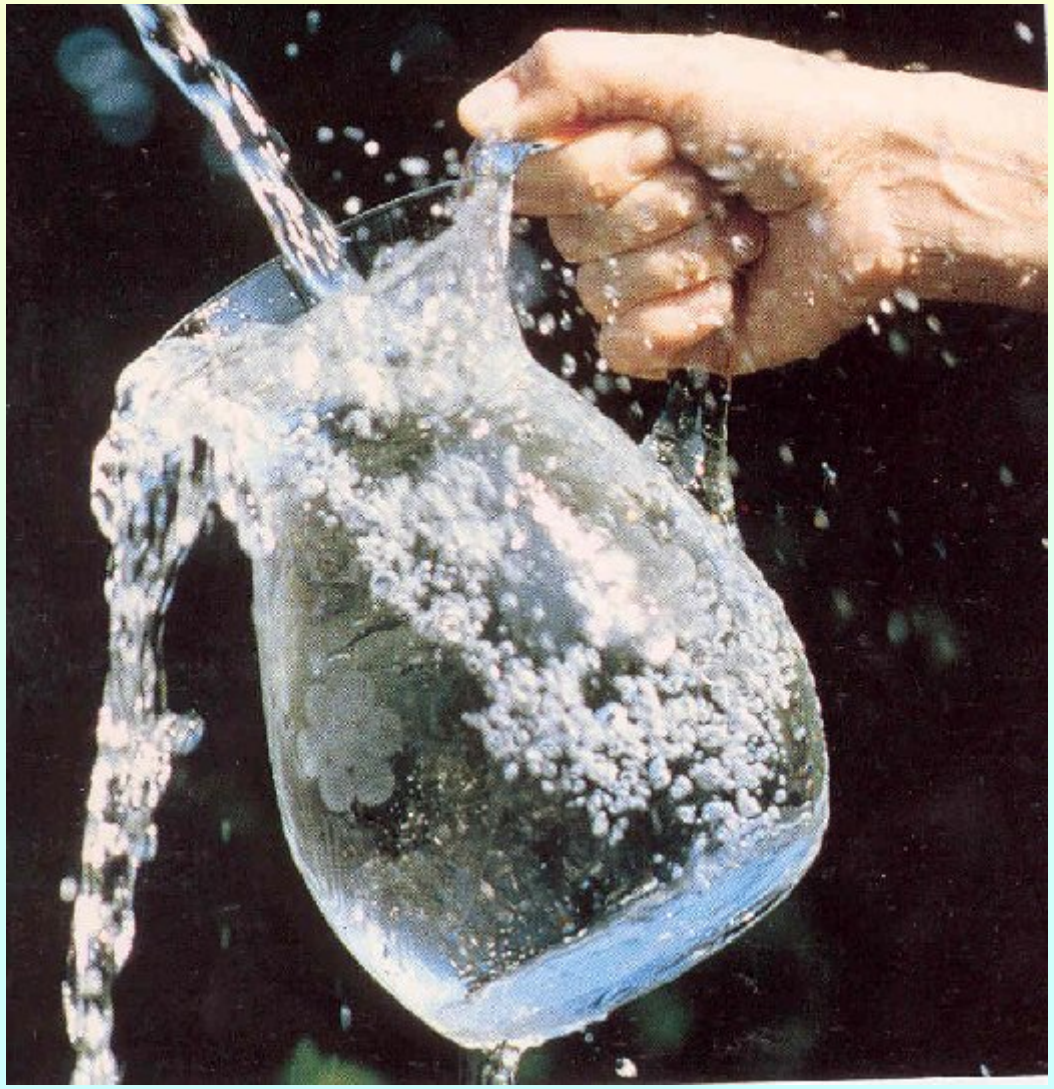
Escherichia coli

III – cultural characteristic

Escherichia coli

IX – Prophylaxie

hygiène



(NNO)

Escherichia coli

X – Treatment

UTI

Septicémies – Méningites :

flouroquinolones+/- aminoglycosides

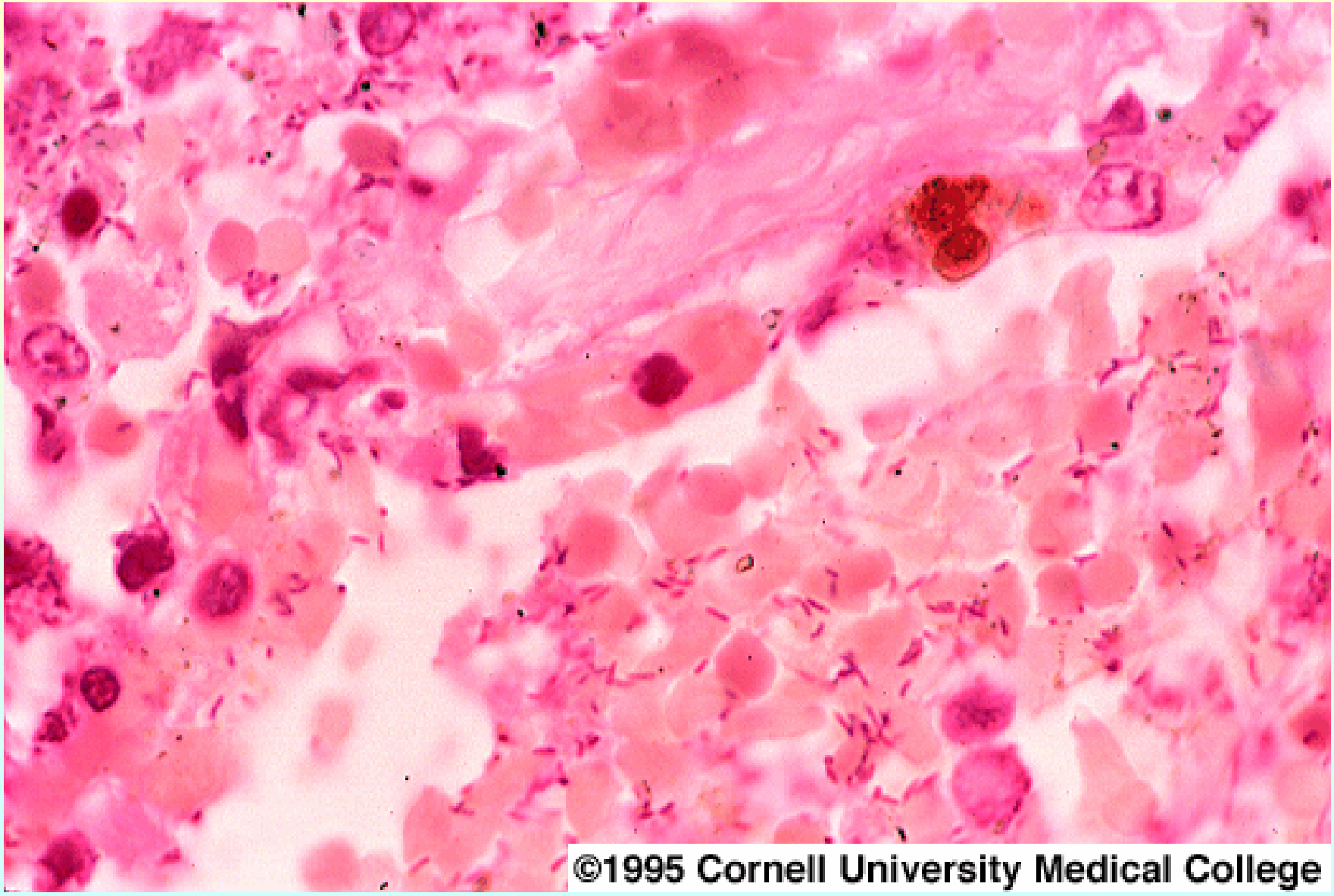
diarrhea : réhydration +/- antibiotics

ANTIBIOTHERAPIE DES DIARRHEES DE CAUSE BACTERIENNE

GERME CAUSAL	ANTIBIOTIQUE	DURÉE	ALTERNATIVE
Salmonella *Shigella*	Fluoroquinolone ou cotrimoxazole	5 jours	Aminopénicilline
Campylabacter jejuni	Macrolide	14 jours	Fluoroquinolone*
Yersinia enterocolitica	Cycline* ou fluoroquinolone*	10 jours	Cotrimoxazole
Escherichia coli	Cotrimoxazole ou fluoroquinolone* ou cycline* ou aminopénicilline	5 jours	
Clostricium difficile	Vancomycine (peros) ou métronidazole	10 jours	
Vibrio cholerae	Cycline*	3 jours	Cotrimoxazole ou fluoroquinolone*

*** Contre-indiqué chez l'enfant**

KLEBSIELLA


©1995 Cornell University Medical College

K.Pneumoniae On BA

THE GENUS *KLEBSIELLA*	
Name	**Synonym**
Klebsiella ornithinolytica	*Klebsiella oxytoca* ornithine positive
Klebsiella oxytoca	
Klebsiella planticola	*Klebsiella travisanii*
Klebsiella pneumoniae subsp. *ozaenae*	*Klebsiella ozaenae*
Klebsiella pneumoniae subsp. *pneumoniae*	*Klebsiella pneumoniae*
Klebsiella pneumoniae subsp. *rhinoscleromatis*	*Klebsiella rhinoscleromatis*
Klebsiella terrigena	

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- Producing capsule
- K.Pneumoniae RT and intestine of 5% healthy persons
- Pneumonia 2%
- UTI and bacteremia
- K.oxytoca and K.pneumonia(Nosocomial)

K.Pneumoniae on BA and MAC

- K.ozaenae

Chronic rhinitis

K.rhinoscleroma:

Nose and pharynx granuloma

Sclerosis of nasal, pharyngeal, laryngeal and tracheal mucosa

ENTEROBACTER & HAFNIA

THE GENUS *ENTEROBACTER*	
Name	**Synonym**
Enterobacter aerogenes	*Aerobacter aerogenes*
Enterobacter amnigenus	
Enterobacter asburiae	CDC enteric group 17
Enterobacter cancerogenus	*Enterobacter taylorae*
Enterobacter cloacae	
Enterobacter gergoviae	
Enterobacter hormaechei	CDC enteric group 45
Enterobacter kobei	
Enterobacter sakazakii	

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- Resident of soil, stool and milk products

- E.aerogenes:
- UTI

CITROBACTER

- Resident of soil, water, stool

- C.freundii
- UTI and bacteremia

THE GENUS *CITROBACTER*

Name	Synonym
Citrobacter amalonaticus	*Levinea amalonatica*
Citrobacter braakii	*Citrobacter freundii*
Citrobacter farmeri	*Citrobacter amalonaticus* biogroup 1
Citrobacter freundii	*Citrobacter freundii*
Citrobacter genomospecies 10	*Citrobacter freundii*
Citrobacter genomospecies 11	*Citrobacter freundii*
Citrobacter koseri	*Citrobacter diversus*
Citrobacter rodentium	*Citrobacter* genomospecies 9,
Citrobacter sedlakii	*Citrobacter freundii*
Citrobacter werkmanii	*Citrobacter freundii*
Citrobacter youngae	

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Serratia

THE GENUS *SERRATIA*	
Name	**Synonym**
Serratia ficaria	
Serratia fonticola	
Serratia grimesii	*Serratia liquefaciens*
Serratia liquefaciens	*Enterobacter liquefaciens*
Serratia marcescens	
Serratia odorifera	
Serratia plymuthica	
Serratia proteamaculans subsp. *proteamaculans*	*Serratia liquefaciens*
Serratia proteamaculans subsp. *quinovora*	*Serratia liquefaciens*
Serratia rubidaea	

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- S.marcescens:
- Nosocomial opportunist
- Pneumonia
- Bacteremia
- Endocarditis