

PROKARYOTIC ANATOMY I: CAPSULES, FLAGELLA, PILI

6/30/83, rvsd 8 July 1995, 25 June 99, 13 July 01, 7 July 03, 14 July 04, 11 July 05, 5 Apr 06, 9 July 07, 10July09, 9July11, 19Sept12, 5Feb14
TFC, 7th p 77-99, Alcamo, p. 87-, Atlas, pp 111-139, TFC, 8th p 76-96, Black 6th: 77-89, Bauman 2nd, 55-65, 3rd: 54-64

CELL SHAPE: coccus, bacillus, spirillum, pleomorphic (p 64)

ARRANGEMENT: depends on how cells stick together after mitosis: diplo, strepto-, tetrad, sarcinae, staphylo-

GLYCOCALYX (p 59) (sugar + cup, flower) sticky, gelatinous layer, shown by negative stain. (Not in spirillum)
Extracellular Polymeric Substance = EPS (if composed of sugars, used for attachment especially)

mucopolysaccharide: polysaccharide [dextran] cross-linked with small peptides

capsule if firmly attached to bacterial cell

slime layer if loose, unorganized (feel slimy coating on containers with aged contents...)

Function: buffers, protects fr phagocytosis, dehydration, adheres organism to substrate (biofilms)

pathogenicity: *B. anthracis* + *S. pneumoniae*: only pathogenic if encapsulated (smooth)

adherence: *Klebsiella* sticks to respiratory tract, *S. mutans* forms dental caries.

“Ropy” milk, beer due to *Alcaligenes viscolactis* capsular material, ropy bread to *B subtilis*

Quellung reaction (swelling): used to type strains capsule swells when attacked by specific antibody

FLAGELLA: element of motility, spins to move. Flagella cannot be seen unless coated with specialized dye.

(p 60) **filament** is a polymer of flagellin (**H antigen**), **hook** at proximal end, attached via **basal body** to bacterium:

Gm pos: single pair of rings in basal body

Gm neg: two pairs of rings in basal body, inner ring rotates, outer is stator

Styles of flagellar arrangement (p 61)

peritrichous “around hairs” *E. coli, Salmonella, etc*

monotrichous (single polar flagellum) *Vibrio*

lophotrichous [tuft hair] (2 or more at 1 end) *Pseudomonas*

amphitrichous (tufts at both ends) *Spirillum*

AXIAL FILAMENTS: (p 61) in spirochetes, cell wraps around axial filament, move by boring or snake-like

Ex: (*Treponema* [“boring worm”] & *Leptospira* [“weak coil”])

MOVEMENTS: Run: flagella rotate counterclockwise, for ~ a second (favorable conditions)

(p 62) **Tumble:** flagella rotate clockwise, 0.1 sec. (unfavorable conds.)

permit **chemotaxis:** **attractant:** steady runs, **repellant:** runs with many tumbles.

PILI: [hair] hollow structures of subunits pilin [antigenic]

(p 63) 1) **fimbriae** attaches to substrate, enhance pathogenicity, eg: *Neisseria gonorrhoeae*
pellicle: fuzzy or shiny layer on top of air-water interface by aerobic bacteria

2) **sex pili** aid in transfer of DNA. F factor codes for pilus and transfer

