



# **BACTERIAL FIMBRIAE**

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# Cell Envelope:

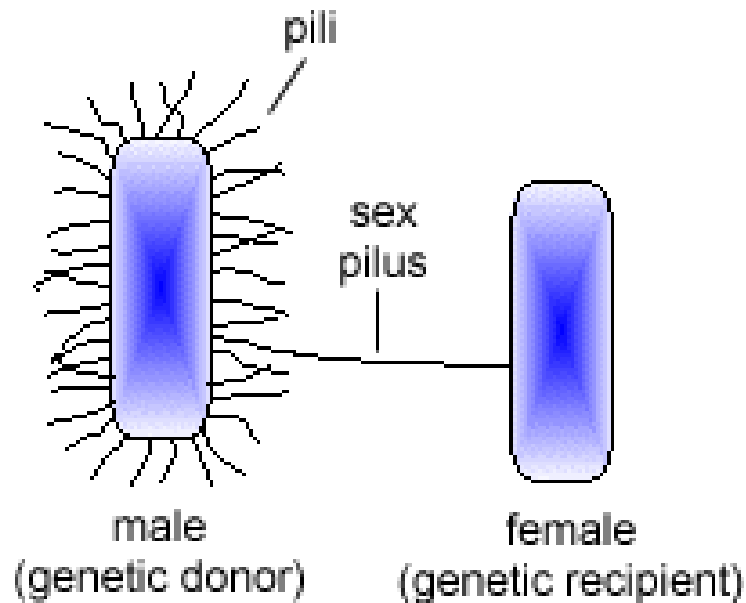
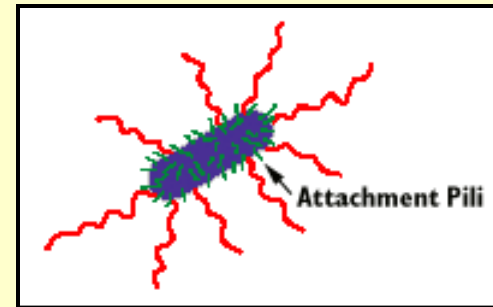
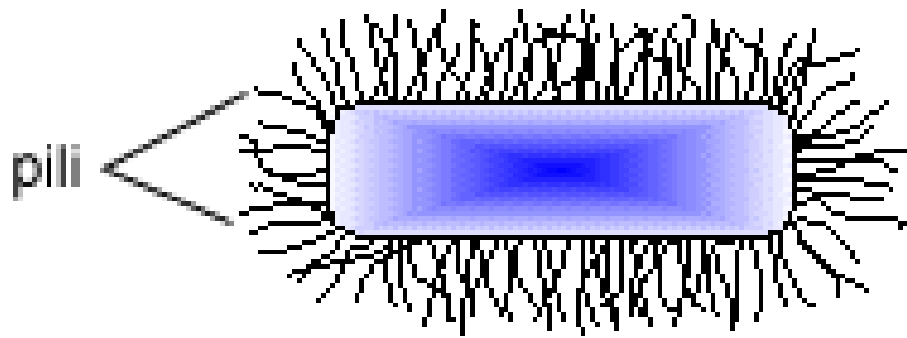
## Pili

- Pili are molecular hair-like projections found on the surface of cells
- They are composed of molecules of a protein called pilin arranged to form a tube with a minute, hollow core
- There are two types of pili
  - **Common pili** and **Sex pili**

## Cell Envelope: Pili

- **Common pili** cover the surface of the cell. They are often **adhesins**, which are responsible for the ability of bacteria to colonise surfaces and cells
- Some bacteriologists use the name **fimbriae** to refer to common pili
- The **sex pilus** is involved in exchange of genetic material between some Gram-negative bacteria.

## Bacterial Fimbriae



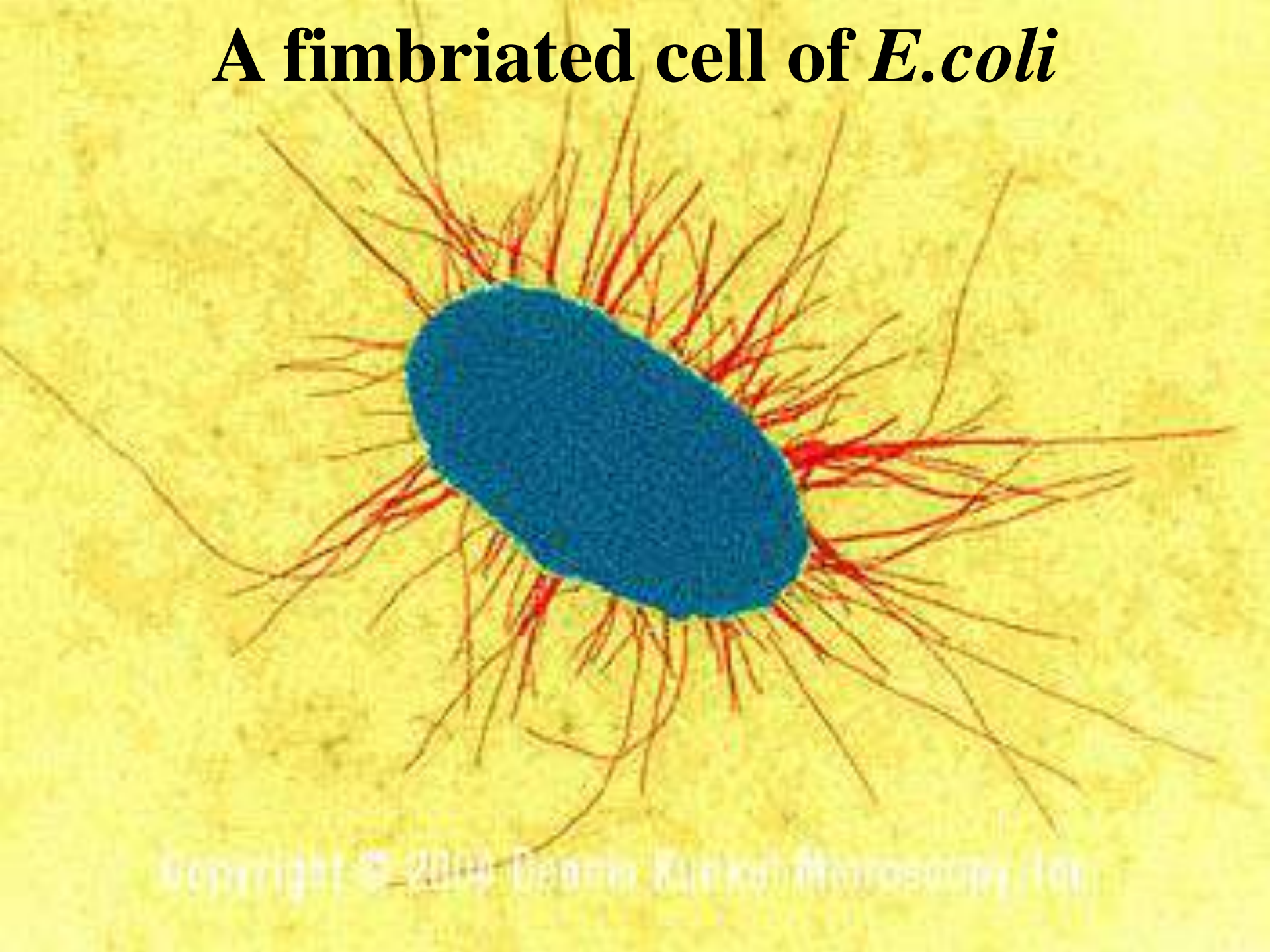
## Conjugation (Sex) Pilus

# FIMBRIAE

- hollow, non-helical, filamentous appendages
- shorter, thicker, straighter, and more numerous than flagella.
- The fimbriae are attached to the plasma membrane on the surface of Gram-negative bacteria, such as *E.coli*, *Neisseria*, *Vibrio*, *Pseudomonas aeruginosa*, *Haemophilus influenzae*, etc.
- composed of a hydrophobic protein called fimbrin or pilin

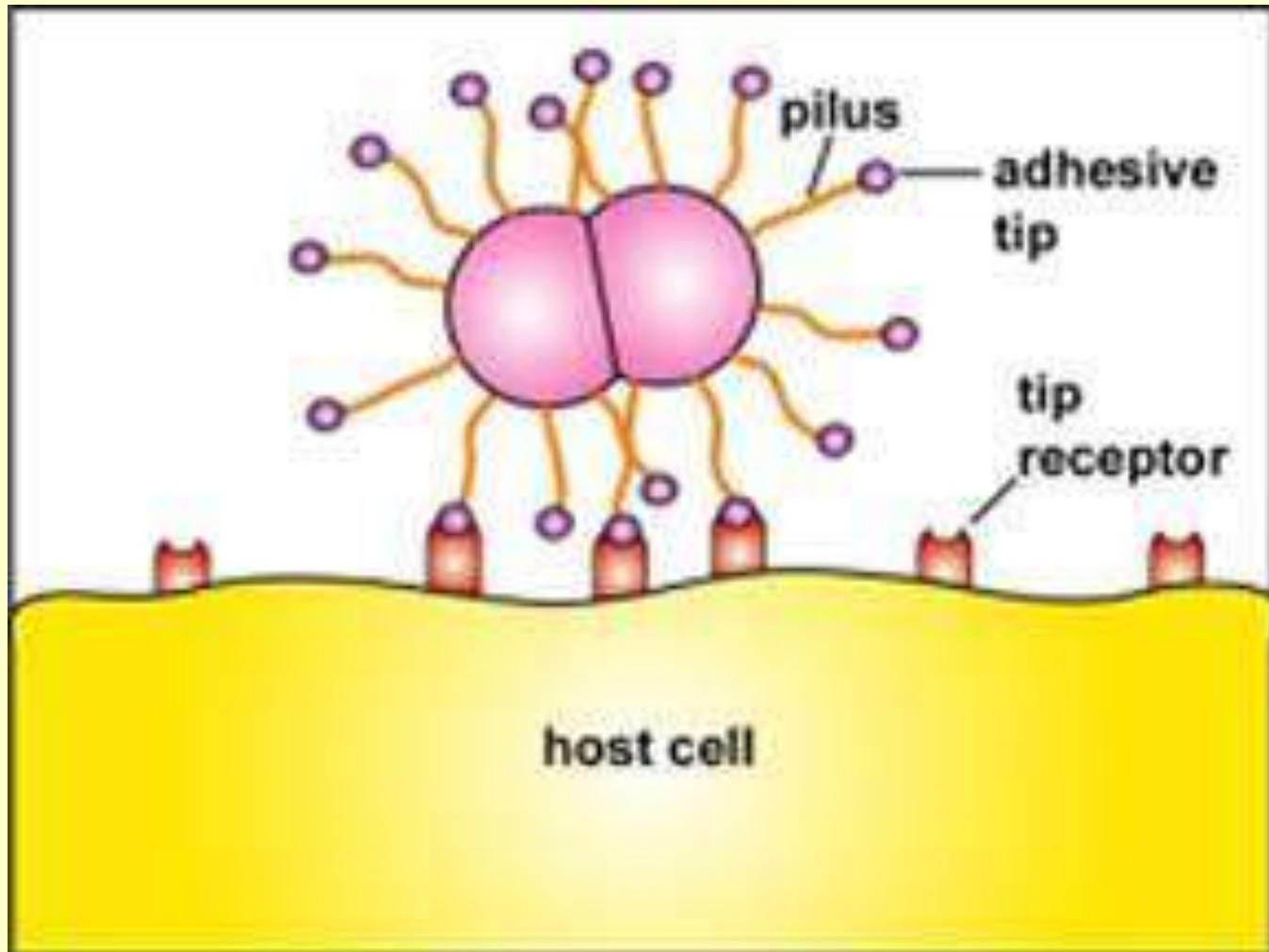


# A fimbriated cell of *E.coli*



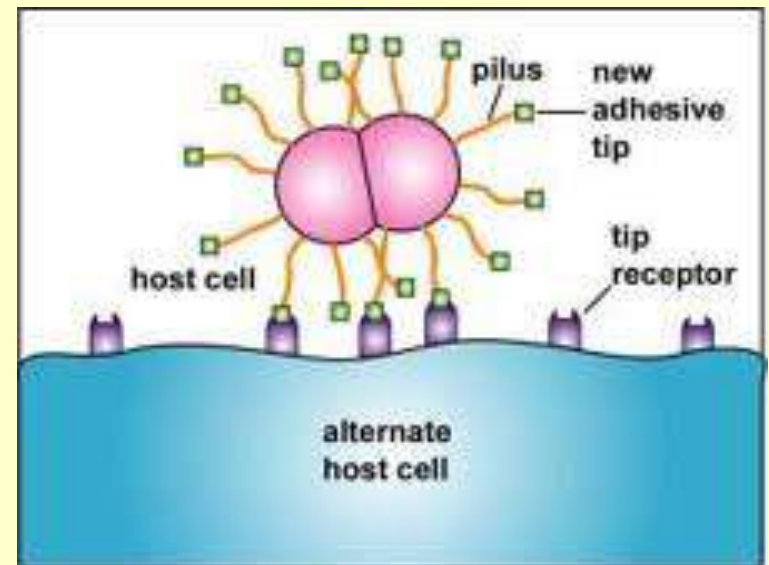
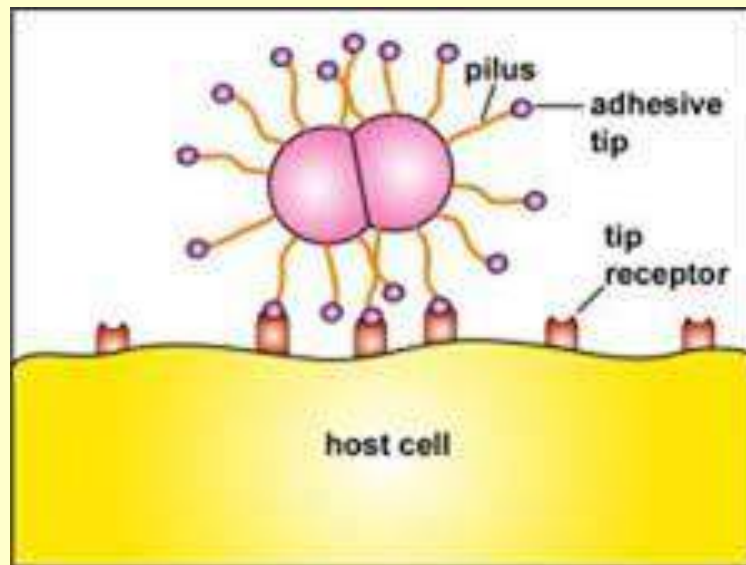
- **Fimbrin is antigenic (K or P or F antigen)**
- **fimbriae grow by addition of pilin monomers at their base.**
- **Pili (or) Fimbriae can be seen only by electron microscope.**
- **The fimbriae function as ‘adhesin’ and thus act as a virulence factor of pathogenic bacteria.**
- **A bacterial species may possess several types of fimbriae. For example, Type I or mannose sensitive (MS) and mannose resistant (MR) fimbriae in *E.coli*.**

# Adhesive Tip of Bacterial Pili Binding to Host Cell Receptors





# Bacteria Altering the Adhesive Tips of Their Pili



By genetically altering the adhesive tips of their pili, certain bacteria are able to: 1) adhere to and colonize different cell types with different receptors, and 2) evade antibodies made against the previous pili.

# SEX PILI

- First described by Crawford and Gesteland in 1964, are fewer in number and larger than Type I fimbriae.
- The sex pili are encoded by a special plasmid known as F plasmid.
- The sex pili occur in  $F^+$  cells found in the *Enterobacteriaceae* and a few other bacteria.
- They adhere to  $F^-$  cells through a tube (conjugation tube) and make possible the transfer of genetic material from  $F^+$  to  $F^-$  cells during a process known as 'conjugation'.

# Electron Micrograph of *Escherichia coli* with a Conjugation Pilus



# OTHER BACTERIAL ADHESINS

- In Gram-positive bacteria a surface layer made of protein or polysaccharides serve as adhesin, e.g. M protein along with lipoteichoic acid from adhesin in streptococci.
- Capsule and glycocalyx

# SHEATHS, PROSTHECAE AND STALKS

- These are extensions of cell wall found in marine ecosystem where bacterial cells are embedded in a chains in a hollow tube.