

Lecture 15 : *Proteus*

Proteus is a genus of Gram-negative .*Proteus* bacilli are widely distributed in nature as saprophytes, being found in decomposing animal matter, sewage, manure soil, the mammalian intestine, and human and animal feces. They are opportunistic pathogens, commonly responsible for urinary and septic infections, often nosocomial.

Clinical significance

Three species—*P. vulgaris*, *P. mirabilis*, and *P. penneri*—are opportunistic human pathogens. *Proteus* includes pathogens responsible for many human urinary tract infections. *P. mirabilis* causes wound and urinary tract infections. Most strains of *P. mirabilis* are sensitive to ampicillin and cephalosporins. *P. vulgaris* is not sensitive to these antibiotics. However, this organism is isolated less often in the laboratory and usually only targets immunosuppressed individuals. *P. vulgaris* occurs naturally in the intestines of humans and a wide variety of animals, and in manure, soil, and polluted waters. *P. mirabilis*, once attached to the urinary tract, infects the kidney more commonly than *E. coli*. *P. mirabilis* is often found as a free-living organism in soil and water.

About 10–15% of kidney stones are struvite stones, caused by alkalization of the urine by the action of the urease enzyme (which splits urea into ammonia and carbon dioxide) of *Proteus* (and other) bacterial species.



Proteus species do not usually ferment lactose, but have shown to be capable glucose fermenters. Since it belongs to the family Enterobacteriaceae, general characters are applied on this genus. It

is oxidase-negative but catalase- and nitrate-positive. Specific tests include positive urease .On the species level, indole is considered reliable, as it is positive for *P. vulgaris*, but negative for *P. mirabilis*. Most strains produce a powerful urease enzyme, which rapidly hydrolyzes urea to ammonia and carbon monoxide; exceptions are some *Providencia* strains. Species can be motile, and have characteristic "swarming" patterns. Underlying these behaviors are the somatic O and flagellar H antigens, Flagellated (swarming, motile) variants were therefore designated H forms nonflagellated (nonswarming, nonmotile) variants growing as isolated colonies and lacking the surface film were designated as O forms (German *ohne Hauch*, without film [i.e., without surface film of mist droplets]).

Treatment : *Proteus mirabilis* infections can be treated with broad-spectrum penicillins or cephalosporins except in severe cases. It is not susceptible to nitrofurantoin or tetracycline and has experienced increasing drug resistance of ampicillin, trimethoprim, and ciprofloxin.