

THIS CPD/CEU EXERCISE IS PRESENTED UNDER THE THISTLE QA SERVICE PROVIDER NO : MT00025. IT IS DESIGNED TO TAKE PLACE WITHIN YOUR OWN LABORATORY AS A SMALL GROUP ACTIVITY LASTING APPROXIMATELY ONE HOUR. PLEASE ENSURE THAT YOU KEEP A REGISTER OF THOSE TAKING PART IN THIS EXERCISE AND SUBMIT YOUR APPLICATION FOR 1 CEU POINT ON THE APPROPRIATE HPCSA FORM, ALONG WITH THE RELEVANT THISTLE QA PARTICIPATION CERTIFICATE SENT TO YOUR LAB WITH YOUR EQA KIT AND INSTRUCTIONS.

Cycle 19 Organism 11

The causative organism was *Morganella*.

Three genera, *Proteus*, *Providencia*, and *Morganella*, constitute a unique group of bacteria in the family Enterobacteriaceae. The characteristics that unify the group include the ability to oxidatively deaminate a wide range of amino acids. *Proteus*, *Morganella*, and some *Providencia* hydrolyze urea rapidly, a property well known as a key characteristic for their identification. The ability of organisms to swarm over surfaces of solid media is a unique feature of all *Proteus* species. In most other respects, the bacteria conform to the description of the family. They are typically Gram-negative, peritrichously flagellated rods that ferment D-glucose and grow in the presence of cyanide. Biochemical reactions are used to separate the genera and the species. Strains can be differentiated for epidemiological studies by differences in specificities of "O" antigens (lipopolysaccharides) and H antigens (flagella) or by bacteriophage and bacteriocin typing¹.

A number of species are important human pathogens. Infections caused by the organisms have increased in number with the increase in use of antimicrobials and the increase in numbers of infection-susceptible hospitalized patients. Currently, the genus *Proteus* consists of four species, *P. vulgaris*, *P. mirabilis*, *P. penneri*, and *P. myxofaciens*. Genus *Providencia* has also been expanded and now includes five species, *P. alcalifaciens*, *P. stuartii*, *P. rettgeri*, *P. rustigianii*, and *P. heimbachae*. *M. morganii* remains as the only species in the genus *Morganella*. However, the future promises further expansions of these three genera as more species are discovered through research on the ecological role of these bacteria in the natural environment and on their occurrence in species of wild life².

The Genus *Morganella*

The genus *Morganella* includes only one species, *M. morganii*. Bacteria of this species have been recognized since the organism was isolated from the intestines of infants with diarrhea³. The period between 1906 and 1978, these bacteria were subjected to a series of name changes⁴. Because of their production of urease they were included in the genus *Proteus* as a separate species⁵. As a result of an extensive study of the biochemical and serological characteristics, they be given generic status⁶. As interest in the bacteria increased, evidence from several studies supported this conclusion. In a numerical taxonomy study, strains of *morganii* formed a cluster separate from *Proteus* and *Providencia*⁷. Brenner *et al.*¹ proposed the genus *Morganella* with *M. morganii* as the type species.

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Habitats

It has been known early in this century that *M. morganii* occurs in normal stools⁸ and in low frequency in the intestines of animals examined for other bacteria. The organism was isolated from dogs, other mammals, and unspecified reptiles. Its occurrence was rare, however, and it was far outnumbered by *P. mirabilis* and *P. vulgaris*⁹.

Isolation and Identification

For primary isolation, the media for routine isolations of Enterobacteriaceae are used. Prior culturing of feces in tetrathionate or selenite broth increases the rate of isolation. Characteristics that can be used to identify and differentiate *Morganella* from *Proteus* and *Providencia* species are swarming, H₂S production, utilization of citrate, and hydrolysis of gelatin. Typical strains of *M. morganii* give positive reactions in tests for ornithine decarboxylase and acid production from mannose and negative reactions for lysine decarboxylase. Three biogroups of *M. morganii* have been described¹⁰.

Pathogenicity

The first report on the pathogenicity of *M. morganii* was by Morgan³. He isolated the bacterium from infants suffering from diarrhea and from a nurse working with these patients. The occurrence of *M. morganii* in urine, blood, sputa, pus, and feces from patients with bacteremias, wound, urinary tract, and respiratory tract infections has been noted¹¹. However, the rate of isolation of *M. morganii* is generally low ranging from 2 to 5% from non-fecal specimens¹². Most infections were hospital acquired by elderly patients often subjected to instrumentation, and therefore reflected the medical importance of *M. morganii* as an opportunistic secondary invader rather than as a primary pathogen, except for infections of the urinary tract. Two studies provide evidence for its importance as a nosocomial pathogen. Tucci and Isenberg¹³ described an outbreak in a U.S. hospital involving 11 patients and Williams *et al.*¹⁴ reported the isolation of *M. morganii* from blood specimens during a hospital outbreak in England.

Epidemiological Typing

An antigenic scheme based on an antigenic scheme based on somatic (O) and flagellar (H) antigens first described by Raus¹⁵ has been extended so that currently the number of defined serogroups is 42 and the number of serotypes is 75.

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Questions:

1. How would you differentiate between the genera *Proteus*, *Providencia* and *Morganella*?
2. How would you isolate *Morganella morganii*?
3. What characteristics are used to identify *Morganella morganii*?
4. What infections are caused by *Morganella morganii*?