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NOTE

Pseudomonads as Health Hazard in Home Industrial Houses, Hospitals and Private Clinics; Herbal Aerosols and 1,4,-Naphthaquinones as Effective Inhibitors

B.N. POUL* and J.R. VAKIL
Department of Chemistry
Maharashtra College of Pharmacy, Nilanga-413 521, India

Pseudomonads are ubiquitous bacteria, found on plants, animals, men and women and their surrounding environment. In the recent years it has been found that, air conditioning units are responsible for *Pseudomonas* causing serious contaminating problems in home, hospitals, industrial houses, food processing plants and cold storage, poultry, meat and fish cold storages and primary clinics. The present study is a brief report of their isolation, purification, identification and characterisation by microbiological screening and standard identification by available biochemical immunological methods.

Pseudomonads consist of a large number of ubiquitous, aerobic gram-negative rods, mobile with (usually) the polar flagella (mono- or multi-trichous); oxidase positive and catalase positive. Typically the breakdown of carbohydrates is oxidative. Many species produce water-soluble pigments. Members of this large genus (*Pseudomonas*), consisting of over 200 species, are saprophytes and plant pathogens. Only a few species, among which *Pseudomonas aeruginosa*, *Ps. fluorescens*, are pre-eminent, cause diseases in man. These species flourish in warm moist situation in the human environment including sink and bath drains, respirator humidifiers and disinfectant solutions; can be found in the faeces and up to 40 per cent of hospital-acquired infections. Derangement of local or general defence mechanisms often precedes infection, for this reason, the species is often isolated from infected burns, bed-sores, surgical wounds, the *Otitis media* (middle ear), and the urinary tract (4%). Deep infections; *e.g.*, of the lung, or septicaemia can occur in patients where immunological defence has been upset by the disease or immunosuppressive drugs, and may be fatal. Diseases caused by either *Pseudomonas aeruginosa* and/or *Ps. fluorescens* is difficult to treat because this bacteria is remarkebly resistant to most antibiotics. The organism has often been transferred from inanimate sources to susceptible human tissues in contaminated disinfectant solutions.

Ps. aeruginosa causes approximately four per cent of urinary infections[1,2]; most cases of 'swimmer's ear' (an infection of the outer ear canal), infections following extensive burns, and phenepnias, particularly in patients with genetic disease, cystic fibrosis.[3,4]

The present study is a report of our findings since 1976–78, that *Pseudomonas* are spread through the air-conditioning units, in hospitals, private clinics, industrial houses and laboratories.

Using standard available microbiological methods for screening *Pseudomonads*, using King's medium and acetamide enrichment methods respectively. About six different species of *Pseudomonas* were isolated among which *Ps. aeruginosa*, *Ps. fluorescens*, *Ps. putida* were the most dominant. *Ps. Mallei*, *Ps. Maltophila* and *Ps. pseudomallei* were not often encountered. They were identified by normal bacteriological, biochemical and serological techniques and pathogenicity was determined either by mice or frog inoculation techniques. We have found the 'frog' specially the 'bull-frog' as the most ideal animal-model for the pathogenicity and pigment determinations. Thus, *Ps. aeruginosa* and *Ps. fluorescens* were two of the mostly encountered species of *Pseudomonads*.

The *Pseudomonads* were found to be resistant to most of the antibiotics tried; however, the most suitable antibiotics were colimycin, acidophilin and several herbal antibiotics such as plumbagins, juglone and manjistha, respectively. Using regular disc assay and dilution tube techniques, the minimum inhibitory doses (MID) of these antibiotics were determined and so also, *in vivo* animal tests were carried out in frogs and mice, respectively.

Pseudomonas aeruginosa and *Ps. fluorescens* were found to be the most dominant *Pseudomonads*. The incidental occurrence was 2–4% for *Ps. aeruginosa* and 1–2% for *Ps. fluorescens*, respectively. Very rarely *Ps. putida* and/or *Ps. maltophila* (0.01 to 0.05%), were found and only once or twice *Ps. pseudomallei* were encountered.

Frogs were the most susceptible and suitable animals for *in vivo* testing for pathogenicity, pigmentation and antibiotic sensitivity and/or resistance, respectively. Similarly white mice (Swiss strain) were found to be suitable for *Ps. patida* or *Ps. maltophila* only. Thus *Ps. aeruginosa*, *Ps. fluorescens* and *Ps. pseudomallei* were the most suitable in frog as animal model.

It seems that combination(s) of 1.4.-napthaquinone, *viz.*, juglone, plumbagin, lawsone, phthiocol, essential medicinal oils (citronella, pine oil, neem oil), and Indian Madder (English), or Manjistha when used as 'Incense' can inhibit these *Pseudomonads* to an extent or 85–99% respectively. This was tried *in vitro* exposing the cultures for 10–12 minutes and *in vivo* using frog and /or mice as animal models.

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