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BACTERIOLOGICAL STUDIES OF LAND DISPOSAL OF PIGGERY EFFLUENT

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In Australia, most piggery effluent is discharged to land with little or no treatment. The maximum safe loading level for soils has not been established and the work reported in this paper is part of an evaluation of the extent to which the microorganisms in effluent limit the amount of effluent that can be spread on a given area. Effluent contains a number of organisms that have the ability to cause disease in animals and man. The persistence of some of these organisms has been studied at a number of sites at Werribee and elsewhere in Victoria. *Escherichia coli* is widely used as an indicator organism in water pollution studies and much of the present investigation has concentrated on the behaviour of this organism.

Analysis of fifty partially treated or raw effluents showed ***E. coli*** numbers in the effluents ranged from 2×10^3 to 2×10^6 per ml (mean 5×10^5 per ml). The total number of aerobic mesophiles ranged from 5×10^7 to 10^9 bacteria per ml. *Salmonella spp* were isolated from one effluent sample and *Erysipelothrixrhusiopathiae* was present in 17 of 40 samples examined.

Soils and pastures sampled 24 hours after effluent preparation have yielded 10^4 to 10^6 ***E. coli***/g d.m. in soil and 10^3 to 10^5/g of pasture cut 30mm above ground level. Numbers in the surface soil generally declined to 10^2/g d.m. three to six weeks after application. ***E. coli*** numbers on pasture declined faster than in soil, and were often not detectable on pasture cut 30mm above the ground when sampled two weeks after effluent application. Profile studies on the grass sward have shown persistence on grass to be greatest near the soil surface.

Persistence of *E. coli* on both grass and surface soil was found to be enhanced in the late summer and autumn applications of 1976 (eight months survival on surface soil, 'six months on pasture). The autumn and winter of 1976 was a period of exceptionally low rainfall. Profiles dug in the clay loam soil of the plots during this period showed large numbers of *E. coli* in the subsoil (10^4/g six months after application at 20-30cm, 10^2/g at 45-55cm). Subsequent profile studies have indicated (i) lower persistence in sub soils as the soil dried in late spring, with few *E. coli* surviving in subsoils by 'mid summer (ii) little evidence of lateral movement in the Werribee Deutgam clay-loam soil with a surface slope less than 1% (iii) rapid downwards movement of ***E. coli*** through the soil after application, particularly in late summer when soil cracking enabled unrestricted downward movement to depths of over one metre.

Preliminary studies of runoff waters from plots with low surface slope indicate that although only a small percentage of applied ***E. coli*** cells may be retrieved in surface runoff waters, the numbers of cells eluted could pollute large volumes of water to beyond acceptable *E. coli* counts. It is possible that the ability to control runoff water from disposal areas, at least in the period immediately following spreading, may be an important consideration in planning land disposal systems.

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