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Inactivation by Ionizing Radiation of *Salmonella enteritidis* Serotype montevideo Grown in Composed Sewage Sludge

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S. enteritidis ser. montevideo were grown in composted sewage sludge to levels of approximately 10^9/g. These bacteria were found to be inactivated by ionizing radiation at approximately the same rate (30 krads/log) as *Salmonella* species in liquid digested sludge.

The use of ionizing radiation has been suggested in the past as an effective means of reducing the numbers of pathogens in liquid sewage sludge (3). Only recently, however, have we demonstrated that such a treatment process may be cost-effective for composted sewage sludge. Although composting is effective in reducing pathogenic bacteria to very low levels, regrowth of *Salmonella* species can occur, even in material that consists of as much as 60% solids (M. Selna, personal communication, and W. D. Burge, unpublished data). A possible application of ionizing radiation is as an economical "polishing" process for bagged compost. It is important, then, to measure the effectiveness of ionizing radiation in eliminating viruses, parasite ova, and pathogenic bacteria in compost (or dried sludge) in order to be able to ascertain the feasibility of such a process.

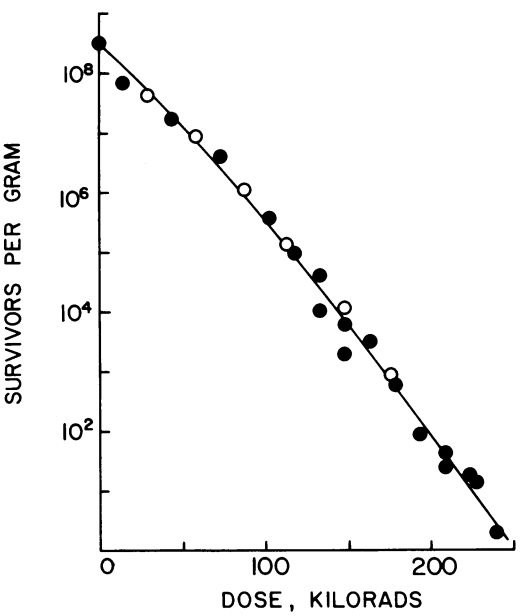

FIG. 1. *Inactivation of S. enteritidis ser. montevideo in composted sewage sludge. Symbols:* (○) *and* (●) *Two independent sets of data. Dose rate was approximately 15 krads/min.*

The U.S. Department of Agriculture composting operation at Beltsville, Md., has been adequately described (2). *S. enteritidis* ser. montevideo were inoculated into sterile composted sewage sludge (raw), consisting of approximately 60% solid material, such that initial counts of 10^3/g were measured. After a 2-day incubation, the bacterial counts were found to be greater than 10^9/g. This material was then irradiated to various levels at a dose rate of approximately 15 krads/min, using ^{60}Co. After treatment, the samples were individually suspended in physiological saline (4:1, saline to compost) by blending for 30 s in a Waring blender at high speed. Appropriate dilutions of the resulting mixture were spread onto Hektoen enteric agar plates (moderately selective for *Salmonella* species). No differences in counts were seen when Salmonella Shigella or eosin methylene blue agar plates were used.

Figure 1 shows the inactivation data for *S. enteritidis* in the compost material. It is seen that the radiation "D-value," i.e., the absorbed dose required per 90% reduction (1 log) in population, is approximately 30 krads. This is essentially the same as the rate at which *Salmonella* species appear to be inactivated in liquid sludge systems (1). It was anticipated that the resistance of these bacteria to ionizing radiation might have been greater in the drier material; such is not the case. Since the expected treatment parameters include a dose of 1 to 2 M rads,

we conclude that the process will be very effective in eliminating pathogenic bacteria in the sludge compost.

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