Potential transfers of organic contaminants to the human foodchain from the use of organic waste materials as fertilizers and soil improvers

S.R. Smith and H. Rigby

Imperial College Consultants Ltd., Imperial College London,
South Kensington, London, SW7 2AZ;

Recycling waste-derived materials in agriculture as soil amendments and fertiliser replacements has the benefits of reducing waste sent to landfill or incineration, reducing the use of virgin materials and improving the economics of food production, but may potentially be associated with some risks to human health or the environment. This paper presents the outcomes of a research programme to determine the transfer of organic contaminants to the consumer foodchain arising from the use of recycled wastes in agriculture. The transfer route reported here is the uptake of organic contaminants from land applied waste-derived materials to milk via controlled feeding studies to simulate the ingestion of contaminated soil and foliage by grazing dairy cattle.

Organic contaminants were transferred to the milk of dairy cattle from biosolids (treated sewage sludge) ingested at 5% of their total dry matter intake simulating direct ingestion of biosolids from foliage or the soil surface by grazing cattle, and accumulation of persistent compounds in soil from long-term repeated applications. This is potentially a 'worst case' in that the use of biosolids on grassland should normally avoid the risk of direct ingestion by cattle, and even in this case, organic contaminant levels in milk fat remained below EU limits (where available). However, in general no additional transfers of organic contaminants to the milk of cattle were detected when waste-derived materials were blended with soil at agronomic rates and added to the feed at 5% of their total dry matter intake simulating ingestion of amended soil, and potentially representing a more realistic transfer route to grazing livestock. The exception was polychlorinated alkanes which were transferred to milk from biosolids- and CLO-amended soil in increased concentrations reflecting their relatively greater presence in these materials due to their significant, and in some cases unrestricted, use in a wide variety of industrial applications.

The findings of this study can be used to estimate potential dietary intakes of organic contaminants and compared with relevant toxicological guidelines. No immediate risks to health for consumers were identified from the milk of grazing dairy cattle exposed to biosolids from foliage or the soil surface or from ingestion of amended soil following a single application of biosolids or other waste-derived materials.