

A diet of dirt

The benefits and dangers of eating soil

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Children and young adults the world over may be exposed to chemical elements in soils through either accidental or deliberate ingestion of soil, or dusts derived from soils. In Europe and North America such exposure probably originates principally from accidental ingestion during hand-to-mouth contact. However, in many ancient and rural societies exposure occurs principally through the deliberate ingestion of soil, or soil-derived 'medical' preparations. Such behaviour is medically known as either pica (the eating of unusual objects, cf. *Pica pica* the magpie) or more specifically as geophagia. Geophagia is common among traditional societies and has been recognised since the time of Aristotle. Soil may be eaten from the ground as a paste, but in many situations there is a cultural preference for soil from 'special sources', such as termitaria, or from traditional herbal-soil mixes. These preparations may be taken as a 'special remedy' during pregnancy and by children. It remains a matter of conjecture whether the soil itself is an active component of the preparation or simply a binder.

Geophagia is considered by many nutritionists to be a in-built response to nutritional deficiencies resulting from a poor diet often rich in fibre but deficient in magnesium, iron and zinc (essential nutrients during motherhood, early childhood and adolescence). Such diets are common in tropical countries, particularly where the diet is dominated by starchy fibre-rich foods such as sweet potatoes and cassava. The theory of geophagia as a subconscious response to dietary stress must be balanced against the habitual eating of soil that has been reported to develop into extreme, often

obsessive, cravings immediately after rain. For example one woman interviewed during our studies said 'You can neither sleep nor have appetite for food, until you taste some soil' whilst another stated that the urge for soil consumption was particularly strong after rain 'The soil smells nice wherever you go, either in kitchen, the latrine, and in the field'. Typical quantities of soil eaten by geophagics in Kenya were about 20 grammes per day. Whilst eating such large quantities of soil increases exposure to essential trace nutrients, it also significantly increases exposure to potentially toxic trace elements especially in areas associated with mineral extraction, or polluted urban environments and biological pathogens.

Similarly, inadvertent ingestion of soils increases exposure to toxins associated with contaminated land sites within the United Kingdom and Europe. Analysis of exposure scenarios indicates that the direct ingestion of even minimal quantities of soil by the young can account for more than 50% of their total exposure to a given pollutant from all other sources. This is due to the much higher concentration of contaminants in soils compared to foods and drinking water sources.



Mine waste: a potential source of toxic trace elements.

The BGS has been undertaking research to investigate the potential bioavailability of major and trace elements within soils commonly used by practising geophagics in Uganda. It is also investigating the bioavailability of potentially toxic trace elements such as arsenic and lead in UK soils associated with a range of contaminant sources (e.g. mine wastes, mineralisation, industrial sites). The objectives of these projects are: (a) to increase our understanding of the risks and benefits associated with geophagia and; (b) to enable the bioavailability of a particular contaminative source to be accurately taken into account during site-specific risk assessment. Whilst the latter is unlikely to reduce significantly the remediation requirements for grossly contaminated sites, it is likely to reduce the need for remediation of marginally contaminated soils such as those associated with diffuse pollution and the periphery of pollution plumes.



Herbal remedy Pregnancy: Uganda