



Regulating Services – Biological
Population Control
Part 1

Soils are also home to organisms that can cause disease in animals, humans and plants. However, that the vast majority of organisms found in the soil do not cause diseases but rather provide a myriad of ecosystem services that are vital for the maintenance of life on Earth, including the regulation of pathogens and pests. Furthermore, disease-causing organisms are often not efficient competitors in the soil and, as such, increased soil biodiversity is usually correlated with reduced numbers of disease-causing organisms. Here we discuss some of the organisms found in the soil that can cause diseases in humans, livestock and crops. We also present the ability of the soil biota to regulate the spread and incidence of pathogens and pests.

Human and animal diseases

There is considerable overlap between human and animal diseases caused by soil organisms with a few notable exceptions, which are discussed in more detail below. There is no general consensus on what constitutes a soil-borne disease, but are generally defined as: ‘resulting from any pathogen or parasite, transmission of which can occur from the soil, even in the absence of other infectious individuals’.

It is important to note that the disease can be spread even in the absence of infectious individuals. Many diseases could be passed through the soil in quite contrived circumstances. For example, many viruses can only survive on the soil surface for a very short period of time. It is unlikely that such diseases would infect a new host if the infectious individual is no longer present – transmission through the air when in close contact with an infected person is much more likely. If all such diseases were included, it could potentially ‘cloud the water’ in terms of identifying soil-borne diseases and potential mechanisms by which their incidence may be reduced.

Euedaphic pathogenic organisms (EPO) and soil-transmitted pathogens (STP)

Human and animal pathogens and parasites can be divided into two groups. Euedaphic pathogenic organisms, which are true soil organisms. These include most of the bacterial pathogens and all of the fungal pathogens, some of which have important implications for human health. For example, *Clostridium tetani* is an EPO with a worldwide distribution in soil and is the causative agent of tetanus. In 2006, 290 000 people died of tetanus, of which 250 000 were neonatal deaths.

The other group consists of soil-transmitted pathogens. These organisms must infect a host in order to complete their lifecycles, but are able to survive for extended periods of time in the soil. This group includes viruses and parasites. The utility of such a distinction is that EPO are likely to provide or contribute toward ecosystem services provided by the soil biota. For example, many of the disease-causing fungi (which are EPO) are hyphal and play an important role in soil structure maintenance, as well as in stabilising the soil surface by binding soil aggregates together. In deserts, for example, which have low species richness, removal of disease-causing fungi, through the application of fungicide, may have a negative impact on soil surface stability, leading to an increase in the risk of soil erosion.

STP will often be in a dormant form within the soil and are likely to contribute much less to the provision of ecosystem services. As such, treatments or land management practices that reduce the numbers of such organisms within the soil are likely to have much more limited impacts on the provision of ecosystem services.

To be continued...

Soil Lovers say: A Healthy Soil Will Include Pathogens

Ref: A Global Atlas of Soil Biodiversity p108