

Science for Environment Policy

Environmentally-harmful fungal diseases on the rise

Scientists have called for tighter biosecurity measures to reduce the growing threat to biodiversity, food security and ecosystems from fungal infections. Their study reveals that fungal disease outbreaks are on the rise around the world, and will cause further damage unless urgent steps are taken to restrict their unintentional spread through international trade and transport.

In recent decades, newly discovered harmful fungi have caused some of the worst die-offs and extinctions ever witnessed in wildlife. Notable examples include *Batrachochytrium dendrobatidis*, which has led to severe population declines and extinctions for many amphibian species around the world. The origin of the infection is unknown, but is known to have been widely spread between continents through trade in amphibian species, including the North American bullfrog and African clawed frogs. 'White nose syndrome' is another high-profile example of an emerging fungal infection. Affecting bats, numbers in many North American colonies have declined by over 70%, with extinction looming for some. It is possible that it was introduced to North America from Europe in soil, where the fungus is also found on bats, but does not cause harm.

The researchers, partly-funded through the EU BiodivERSA project¹, demonstrate that there has been an increase in reported fungal infections in recent decades. These are promoted by human activity, particularly trade and transport. They analysed reports of fungal disease outbreak using data from the global monitoring programmes, ProMED² and HealthMap³. The percentage of outbreaks affecting both animals and plants in the ProMED database increased from 1% to 7% of all records between 1995 and 2010. HealthMap data also suggested an increase, with the proportion of fungal outbreak records increasing from 0.1% to 0.3% between 2007 and 2011 for animals, and 0.1% to 0.2% for plants.

Furthermore, the researchers found that 72% of reported animal extinctions caused by infectious disease since 1900 have specifically been caused by fungi, when they evaluated previous scientific studies on the topic.

The global spread of fungi can also cause them to become more damaging by enabling the exchange of genes between different strains, which can lead to rapid evolution. This has been witnessed with *B. dendrobatidis*, among others, and it is predicted that other fungi could also become more destructive as result of global movement.

Uncontained, the consequences of fungal disease may become increasingly severe. Crop infections have serious effects on food security and the researchers calculate that low-level, persistent fungal disease in rice, wheat, potatoes, maize and soybean – five of the world's most important crops – could lead to losses that would be sufficient to feed 8.5% of the global population.

There are further implications for ecosystems services. As an example, the devastating tree disease Dutch Elm is calculated to have led to the release of up to 1 megatonne of stored CO₂ in the UK and the USA, by causing the death of 102 million trees.

Intensive monitoring of fungal disease is needed, says the study, and biosecurity efforts to contain fungi must be stepped up, particularly for animal-associated fungi. Thanks to the commercial value of crops, plant-associated fungi have tended to receive more attention, but the researchers suggest that wildlife has been economically undervalued.



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1. See: www.promedmail.org
2. See: <http://healthmap.org>
3. BiodivERSA is supported by the European Commission under the Seventh Framework Programme. See: www.biodiversa.org