

BIODIS

DISENTANGLING THE LINKAGES BETWEEN BIODIVERSITY AND EMERGING INFECTIOUS DISEASES

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Zoonotic diseases (diseases that are transmitted between humans and animals) represent 75% of emerging infectious diseases. As a component of biodiversity, the diversity of pathogens is *a priori* greater in more diverse ecosystems, as is the case in sub-Saharan Africa. Two hypotheses have been proposed to explain the recent changes in the distribution and propagation of these pathogens. The first stipulates that on-going climatic changes induce a shift of some of these pathogens toward more temperate areas. The second hypothesis postulates that increased pressure on natural habitats from human activity leads to the introduction and development of these pathogens within human populations. However, a third hypothesis can be proposed, linking the emergence and increasing impact of infectious diseases to biodiversity loss: biodiversity would have a protective effect that could prevent the transmission and spread of pathogenic agents.

Current research on this topic is mostly theoretical and the available data are sparse. The mechanisms involved, their generalization, and even the possible relationships between biodiversity and infectious diseases remain poorly known. The aim of BIODIS is to analyze and homogenize multiple databases to address a central question with strong societal implications: how can we prevent the emergence and spread of infectious diseases originating from animal or environmental sources? This project will also foster closer relations between scientists and (inter)national public health authorities.

Focus

*Biodiversity and infectious diseases: the Yin and the Yang!

Biodiversity could be a barrier against infectious agents or, in contrast, a source for new infections. We might call *Yang* the natural barrier resulting from the multiple dynamic equilibria that exist not only among the hosts, but also between these and the many microorganisms that they host. These equilibria prevent the spread of some microorganisms, in particular those that could become pathogens.

Alternatively, new environmental disturbances or exposures of healthy individuals can modify the equilibrium between organisms, inducing the emergence of new, unexpected infectious agents. The *Yin* might then describe the potential of certain microorganisms to evolve virulent forms and generate new infections.

The FRB was launched in 2008 at the initiative of the ministry of research and the ministry for the environment of France, and was founded by 8 public research institutions (BRGM, CIRAD, CNRS, IFREMER, INRA, IRD, IRSTEA, MNHN). The FRB is a science-society platform and it supports and promotes scientific projects and expertise on biodiversity.

The CESAB is a centre for the synthesis and analysis of biodiversity created and developed by the FRB to foster knowledge on biodiversity through data and theoretical synthesis activities. CESAB provides researchers with the means to conduct these activities in a dedicated place over sustained periods of time.

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At CESAB, BIODIS will be the first project to gather an international group of experts addressing all the areas involved in this topic. Expected advances will derive from:

- a) interactions among experts from different disciplines: ecologists, biogeographers, veterinarians, modellers, epidemiologists, and public health scientists, and
- b) a strong international dimension, with participants that have worked throughout the world and who have access to databases from multiple regions and institutes.

STEPS

- Identify characteristics of host species that are potential candidates for the transmission of pathogens to humans
- Identify pathogens that can cross boundaries between potential host species
- Identify the role of biodiversity and consider conservation as a strategy for public health policy
- Capacity building: diffusion to policy makers at national, European, and international levels; training of students, scientific diffusion

