The interaction between human and animal health is not a new phenomenon, but the impact that zoonoses have today worldwide on human populations is an unprecedented phenomenon. Three quarters of emerging infectious diseases that affect people have their origin in animals. With more studies carried out and more information available, it is evident that the wildlife plays a key role in emerging zoonotic diseases. There are some good examples in SARS, Ebola, Chikungunya, MERS, rabies and Zika. The structure and functionality of ecosystems are changing at an unprecedented rate and can modify the interactions between humans and infected animals. Land modification, changes in vegetation patterns, changes in dynamics of reservoirs or vector species and microclimates changes can increase the contact between reservoirs and vectors and species and humans, livestock or pets. Understanding infectious diseases beyond the scale of individual clinical cases requires an assessment of ecological and evolutionary perspectives.

To address the problem originated by the zoonosis a multidisciplinary approach is needed: the sanitary work done in the health centers, the viruses molecular studies, but also the eco-epidemiological works.

Jordi Serra-Cobo leads a team that over 25 years carries eco-epidemiological studies to understand the dynamic of species reservoirs and her zoonotic viruses. He works in Barcelona University in the Department of Evolutionary Biology, Ecology and Environmental Sciences of Biology Faculty. He is member of Research Institute of the Biodiversity. In 2008, he founded and directed the Research Centre of Viral Infectious Balearic Islands. Main works of the team are done in Catalonia, Balearic Islands and North of Africa and are about different reservoirs species. He also works with some hospitals from Mallorca and Tunisia. The team is working in a complementary approach to our works would be key, in order to address the problem originated by zoonosis. Mainly hospitals or research centers that are doing molecular studies of the viruses as well as protected areas and zoos.

Environmental health of natural spaces is related with the quality of its natural resources, but also with microorganisms that circulate on their biotic resources. In this context, we work in different protected areas of Catalonia. The National Park Aguestortes and Estany de Sant Maurici is part of a network of eco-epidemiological stations distributed in a transect running from the Pyrenees to the Balearic Islands. This National Park, located in the Pyrenees, provides data about high mountain environment. We have organized this network to analyse the possible variations at large-scale of the viruses dynamics in populations reservoirs.

Q: Why the eco-epidemiological studies are necessary?
Currently a lot of people work on the sanitary and molecular areas, but we need to complement these works with the eco-epidemiological research that allows knowing which are the reservoirs, the vector species and the key factors driving the spread of viruses. These factors must be taken into account in eco-epidemiological studies and are very important in order to find preventive measures that reduce the risk of transmission to the human population, livestock and pets. The emergence of a viral epidemic depends on the dynamics of the virus, which in turn will be influenced by reservoir dynamic and external environmental factors such as temperature, rainfall, degree of habitat conservation, the situation of stress affecting the reservoir species, ... The humans are part of an extremely complex biosphere, with the multitude relationships between living organisms and the environment. For the understanding of the zoonotic diseases is also necessary the eco-epidemiological approach that consider these complex relationships and provides relevant information in terms of public health, because it allows assessing the epidemiological risk and take preventive measures.

Q: Which are the projects you are working on?
We are working on different international projects. The “Preparedness, Prediction and Prevention of Emerging Zoonotic Viruses with Pandemic Potential using Multidisciplinary Approaches (PREDEMIC)“ is a European inter-disciplinary project that generates valuable data on patterns of crossing the species barrier, transmission and disease emergence, including ecological and anthropological factors, which determine virus availability and opportunities for exposure and infection. In this project, we analyse different vertebrate species. We have been working in Catalonia, Balearic Islands and North Africa and have obtained data about the dynamic of lyssaviruses, flavivirus and hepatitis E virus. Recently we are starting European project about the Zika virus, “A Global Alliance for Zika virus control and prevention (ZIKAlliance)“, in which our task is to analyse the possible reservoir for the Zika virus in bats from Brazil and Bolivia by an eco-epidemiological approach.

Moreover, I’m included as expert in a French project of ANR “Eco-epidemiology of Coronavirus, from wildlife to Human: Emergence that is assessable (EPICOREM)”. It is a multidisciplinary project that has brought together researchers from a wide range of disciplines: human virology, animal virology, evolutionary biology, phylogenetics, zoology, ecology, epidemiology, and immunology.

I also take part in the network “Prevention of human rabies transmitted for wildlife animals from Americas REDIPRA (PAHO-WHO)“. In this context, I collaborate with Zoonosis Control Center of Sao Paulo doing ecological analysis.

We are developing a “One Health” research in Barcelona Zoo Foundation and we work in the project “Zoonotic pathogens (bacteria, parasites and viruses) in Santa Cruz de Tenerife” (Canaries Islands, Spain).

Q: Why the eco-epidemiological studies are necessary?
Q: More specifically, what is the team working out?
The team analyses the ecological and epidemiological factors that might be associated with the infection dynamics of zoonotic viruses. Many of our works are longitudinal studies on reservoirs populations. In these works we obtain the population size, structure of the population, migratory and gregarious behaviour, degree of contact with wild or domestic species or human population, turnover rate of population, survival and mortality rates, habitat, characteristics, relationship with other populations of the same or different species, incidence of possible environmental changes in the habitat, etc. Also, we analyse the inter-annual cycles of infection, the innate and lifespan immunity, the co-infection, processes, and we estimate the basic reproductive rate of virus and threshold population for infection. The data provided by population ecology, epidemiology works and environmental factors is analysed altogether to obtain an eco-epidemiological interpretation.

Q: What can be the relationship between health and biodiversity?
The environmental changes and ecological disturbances, due to natural phenomena and human activities, can exert a strong influence on emerging diseases. These phenomena are important to consider because disease emergence frequently results from a change in hosts, or in vector, in pathogen ecology or in all of them. The loss or diminish of one or more species in a concrete area, can modify the dynamic of pathogen and change the sanitary risk. In summary, the equilibrium of wild populations and the biodiversity preservation can contribute to protect us from the emerging diseases. In the last years we have been working in this way, modelling how the disturbances can affect the reservoir populations and in turn can modify the epidemiological risk of viruses spread.

Q: What are your expectations?
Although today we already collaborate with a great number of research centers, to further expand this collaboration with other teams that are working in a complementary approach to our works would be key, in order to address the problem originated by zoonosis. Mainly hospitals or research centers that are doing molecular studies of the viruses as well as protected areas and zoos.

Q: What can be the relationship between health and biodiversity?
Q: Why the eco-epidemiological studies are necessary?
Q: Which are the projects you are working on?
Q: More specifically, what is the team working out?
Q: What can be the relationship between health and biodiversity?
Q: What are your expectations?