University of Basel

One Health: Connecting Humans, Animals and the Environment
Video Transcript

Jumping barriers: a case study

[Jakob Zinsstag]: A very important field of One Health is transmissible diseases between humans and animals. Over two third of the infectious diseases are transmitted from animals to humans or have animal origins. For example, the late abortion of this sheep in north Mali is suspected for brucellosis, a highly contagious disease that can be transmitted to humans by direct contact or by milk and milk products. Here, you see a picture of a study in which we could show that a large part of the milk that is produced in peri-urban dairies in Bamako, Mali, was contaminated with brucella.

And this meat inspector checks the lungs and liver of a slaughtered cow for bovine tuberculosis in the Gambia. My colleague, Bassirou Bonfoh, will tell you more about One Health and food safety and food chains later on in this course. To gain a widespread, quantitative assessment of the added value of One Health, it's very important to understand the biology behind it. This means that we need an in-depth understanding of how zoonoses are transmitted in a given context. From a theoretical point of view, we state that the understanding of the animal-human interaction is a necessary but not sufficient requirement of a One Health study.

A sufficient requirement for our conceptual understanding is that we show an added value of the closer cooperation between human and animal health. This sounds very theoretical. But it is important to understand that we need a stringent theoretical foundation of One Health to be convincing to stakeholders and decision makers. The quantitative argument, especially in terms of financial savings, is very crucial. Following, we present the key elements for this step by step. As mentioned, we need to understand the biology. What does this mean? Let us take the pig tapeworm taenia solium. Infected humans carrying the adult stage excrete eggs. If these eggs are going into a closed sanitation system, nothing happens.

However, in many places of the world, this is not a standard and pigs feed on human excrement. Pigs infect themselves and develop cystic stages called cysticerci. If pig meat is not sufficiently heated before consumed, these cysticerci are not destroyed. They develop into the adult stage and close the cycle. This is well known and by far not the only cycle of transmission. The wildlife may also be involved. For example, the wild pigs in Africa, if people hunt and eat them, they may relaunch the cycle.

The role of animals in transmission of zoonoses depends highly on the context. For example, what is the role of these dromedaries in the transmission of Q fever in north Mali? Or what kind of zoonoses does this dog in Laos transmit? Or are these South African cheetah also suffering from bovine tuberculosis?

We can generalise transmission cycles of zoonoses as depicted here. There can be willdlife reservoirs spilling over to domestic animals. But also, domestic animals can be reservoirs spilling over to wildlife. Humans can get infected from wildlife. But more often from domestic animals. A very important point is if transmission leads to ongoing human to human transmission.

To quantify transmission between wildlife, domestic animals, and humans, we need to study how to measure transmission between animals and from animals to humans. Such studies can include several animal species and allow establishing a most likely animal origin of human infection. For sure, a statistical relationship can not always be established in every scale. The geospatial scale plays an important role.

Often, the animal human linkage is blurred at household or district level. But it becomes clear at the provincial or national scale. Next to this, a statistical animal human relationship should always be confirmed with molecular typing of the transmitted pathogens.