Research & Reviews: Journal of Veterinary Sciences eISSN:2581-3897

Applied Ecology: Breeding and Reintroduction of Rare Species

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Opinion Article

Received: 01-Apr-2022, Manuscript No. JVS-22-60514; **Editor assigned:** 04-Apr-2022, Pre QC No. JVS-22-60514 (PQ); **Reviewed:** 15-Apr-2022, QC No. JVS-22-60514; **Revised:** 22-Apr-2022, Manuscript No. JVS-22-60514 (R); **Published:** 29-Apr-2022, DOI: 10.4172/2581-3897.6.S4.002

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DESCRIPTION

The study and management of animal diseases have also laid the basis for much of what we know about the dynamics and management of infectious human diseases, and the promotion of environmental quality. Defined as diseases transmitted between vertebrate animals and humans, zoonotic diseases (zoonoses) include bubonic plague, Lyme disease, salmonella, and rabies. Disease-carrying animals, called reservoirs, infect humans through several pathways: when they are eaten by humans, when they bite humans, or when arthropods that have fed on them, such as mosquitoes or ticks, then feed on a human host. It has been estimated that over 60% of infectious diseases impacting humans are zoonotic in origin and zoonosis are on the rise globally, accounting for over 75% of emerging diseases.

Many important human diseases have originated in animals, and so changes in the habitats of animals that are disease vectors or reservoirs may affect human health, sometimes positively and sometimes negatively. For example, the Nipah virus is believed to have emerged after forest clearance fires in Indonesia drove carrier bats to neighboring Malaysia, where the virus infected intensively farmed pigs, and then crossed to humans. Intensive livestock production, while providing benefits to health in terms of improved nutrition, has also created environments favorable to the emergence of diseases. Greater human contact with wild species and 'bush meat' from encroachment in forests and changes in diet also create opportunities for disease transmission. Trends ranging from forest clearance to climate-induced habitat changes also appear to have impacted certain populations of mosquitoes, ticks and midges, altering transmission patterns for diseases like malaria and lyme disease. Until recently, zoonotic diseases have not been treated as part of ecological systems. In response to the prevalence of zoonoses, the multidisciplinary field of disease ecology has emerged. It involves the study of any ecological system that includes pathogens and incorporates the complexity of multiple interactions. The research area covers basic processes underlying the linkages between climate, ecosystems, and infectious disease, particularly the different ways that climate can

influence the emergence and transmission of infectious disease agents. For example Mexican researchers adopted an ecosystem approach to better understand the complex set of factors that influenced the incidence and spread of malaria in Oaxaca. This project includes the molecular biology of the vector and the parasite, community perceptions of malaria, statistical analyses, and a geographic information-based surveillance system.

Mammals are the most common reservoirs for zoonotic diseases, with rodents leading the pack. The plague (Yersinia pestis), Lyme disease (Borrelia burgdorferi), Hantavirus pulmonary syndrome and Rocky Mountain spotted fever (Rickettsia rickettsii) all owe their spread to the presence of rodents. From an ecological perspective, rodents occupy the middle rung of the food chain. Primarily herbivores, with diets rich in plant matter, they are a food source for vertebrate predators such as foxes, and owls. Another important issue is the dangerous integration of circumstances when animals and consumers from different ecosystems come into contact. The lack of resistance to new pathogens makes humans and animals replicating reservoirs, for viruses and bacteria to adapt and rapidly mutate. Further, the staggering numbers of animals and people in contact change one-in-a-million odds of a disease transfer into almost a daily possibility. Even under the most hygienic conditions, this pool of viruses, bacteria, and other pathogens creates optimal conditions for diseases to multiply rapidly and jump between species to exploit new potential hosts; something the most "successful" diseases do all too well. Under this scenario, two problems are created. First is the high risk of new diseases spreading into human populations. Second is that this can create a "fear factor" amongst people - their concern that wildlife is unhealthy might cause them to try to remove the threat by killing the wildlife. Shooting flying foxes was proposed in Southeast Asia when they were thought to be carrying nipa virus, even though the link has not been definitively proven and the disease is rarely found in flying foxes.