



The Royal College of Pathologists

Pathology: the science behind the cure

Undergraduate Essay Prize

Name

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Course

MBChB Medicine

Discuss the interactions between human and animal health

The lives of humans and animals are intimately intertwined: on a macro level, animals represent as food source, companion (as pets or aid for people with disabilities), a valued model in biomedical research and utilized as a test subject for cosmetic products. On a micro level, animals that are digested then translated into nutrients, nourishing humans and shaping the flora of biomes in humans (i.e. microbiome). The mode of interaction between the pair shifts between symbiotic and pathogenic, and this relationship has continued developing as urbanization and climate change takes place, shifting this paradigm into an unknown territory, especially in the perspective of health [1].

In recent years, zoonotic diseases have (re)emerged as a result of globalisation and climate change, threatening the health of humans and spreading in unprecedented pace; notably vector-borne diseases such as Ebola and the Lyme disease where mosquitoes penetrate the epidermis of the skin, infecting skin fibroblasts and proliferate, competing against the host immune response [2].

Interactions between terrestrial animals and humans are well established and documented: high living density and close proximity between humans and animals allowed pathogens to thrive; wide application of antibiotics in livestock animals leading to antibiotic resistance in animals which is also mirrored in human health [3]; poleward shift of zoonotic diseases as climate change takes place [4]; restricted access to staple food in certain communities leading to the bushmeat culture, endangering both human and animal health. Currently, the bushmeat trade remains a mean of livelihood and source of nutrition, with 900,000 kg sold annually as national food security and political instability facilitate the accessibility to bushmeat [5]. Consequences entail consumers experiencing typhoid fever from monkey consumption and eczema from consumption of wild fowls [5].

In indigenous communities, animals not only represent a means for food and livelihood, animal parts/ products are also used to prepare various traditional medicines. In India, gallstones in bovine gallbladders are used to treat epilepsy and gynaecological diseases in human beings. This practice is extended into veterinary health where seahorse powder is used to treat stomach ache in horses [6].

What does the future look like? A huge driver in the human-animal interaction is the climate and it can be viewed in the perspectives of global warming, urbanization and anthropogenic activities.

In order to meet the demand of increasing human population, food production will have to catch up with the demand. Agricultural practices employ masses of fertilizers and pesticides, which are recycled at some point back to soil and water, affecting animal and human health. This is demonstrated by the fact that food safety of aquatic food animals is compromised by detection of metal contamination and traces of toxic chemicals, which is further amplified by the erosion of plastics into microplastic, that is congested by aquatic food animals, which are placed on our dining tables in return [7]. Antibiotic resistance also exists in a pre-clinical environment; as study finds that surfers are more likely to be exposed to the virulent lineage of *Escherichia coli* (*E. coli*), amplifying the imminent threat of antibiotic resistance [8].

Modernisation brings urbanization of natural habitat; deforestation and urban development alters land-use, increasing the number of interfaces between humans and animals. An exemplary species that has so successfully coexisted with humans, rodents, are ubiquitous and carry deadly pathogens as their population expand with urbanization. Urban rodents act as a pathogen reservoir, carrying diseases such as rabies, salmonellosis and schistosomiasis, all posing health threats to humans [9]. Certain mitigation such as regular use of rodenticides has backfired, with urban rodents attaining anticoagulant rodenticides resistance [10]. Rodent population is advantaged by climate change, as shown by the increase in rodent population following extreme weather events (i.e. heavy rainfall) in southwest America [11].

How can pathologists be better equipped in tackling these challenges ahead? Working in multi-disciplinary teams composing of meteorologists, public health scientists, veterinarians will allow further investigation into the complex relationship between society, environment and health. Use of modern technology can allow mapping of potential hotspots of zoonotic disease outbreaks, and modelling climate data with optimal environmental variables data of parasites can predict potential outbreak of diseases.

The symbiotic and pathogenic relationship between humans and animals have been explored, each playing a vital part for the survival of the other. A common theme that has been orchestrating this relationship is the climate; climate determines the behaviour of both animals and humans and it is more difficult to be controlled, although attempts have been demonstrated by humans (e.g. some bioengineering strategies have been employed to lower air pollution in China) and by animals (e.g. livestock such as cows releasing greenhouse gases). Therefore, while focussing on the interaction between human and animal health, planetary health should also be examined critically when inspecting the interaction between human and animal health.

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