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The functions of veterinary epidemiology in public health

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Abstract

This paper aims to describe the core functions of veterinary epidemiology in public health to understand the ultimate objective of preventing, mitigating, or eliminating zoonotic diseases in susceptible populations. However, the ideas came from a variety of sources. The field of veterinary medicine has significantly contributed to many aspects of public health, including human and environmental wellness, animal welfare, comparative and basic medical study, and the mitigation of zoonotic illness. Veterinary epidemiology, one of the disciplines that make up veterinary public health, is particularly concerned with disease surveillance, response, and prevention. In the veterinary study, epidemiological methods examine diseases' dynamics, prevalence, and causes in populations of interest. The ability to better comprehend hazards and how to prevent widespread sickness is now possible for veterinary epidemiologists. Veterinarians can help advance public health studies and policies by employing various methodological approaches and collaborating with networks of expert epidemiologists in the field.

Keywords: Veterinary epidemiology; Public health; Functions; Zoonosis

1. Introduction

The field of epidemiology has emerged in recent decades due to shifting social norms and the emergence of novel diseases. Epidemiological advancements have ensured that the area remains a useful and up-to-date resource for detecting and analysing patterns in disease and other health-related phenomena. Ancient Egyptian healer priests could not distinguish between treating human patients and caring for animals when they practiced veterinary public health, which is where the idea first emerged. Animal anatomy and diseases gave them a wealth of knowledge they used to treat people. Through the end of the 19th century, this "one medicine" strategy was prevalent. Since then, rather than because of advancements in scientific reasoning, the gap between public health researchers has widened, primarily due to changes in political and cultural norms.

2. Veterinary Epidemiology and Public Health

The term ‘epidemiology’ comes from the Greek *epi*, which means ‘upon’ and demos, ' peoples or populace.’ So, it is the study of ‘which is upon the people’ [1]. Epidemiology refers to the scientific study of disease in communities. Epidemiological methods, including disease monitoring, outbreak investigation, and observational research, are used by veterinarians, other preventive medicine professionals, and public health specialists to discover risk factors for zoonotic infection in human and animal populations [2]. The information gleaned from this process is subsequently utilized to inspire more research and guide the development of disease prevention methods. From the birth of epidemiology more than a century ago, numerous definitions have been offered [3].

A significant overlap exists between human and animal health, making veterinary epidemiology a crucial discipline. There are consequences for people from many of the issues threatening other animals. According to the Centers for

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Disease Control and Prevention (CDC), almost 60% of infectious diseases infecting people may be traced back to animals. Two instances that come to mind are the West Nile virus and Lyme illness [4].

The two fields of study were closely related for a long time because most veterinary schools' epidemiologists also served as public health experts. Despite occasionally researching nonzoonotic animal diseases, veterinary epidemiologists typically have a strong background in veterinary public health. Veterinary epidemiologists have recently undergone a significant evolution [2]. With no history in public health, this breed looks into the production of food animals using epidemiological methods. After experimenting with several designations, including "population medicine," "herd health," "production medicine," and "preventive medicine," it is now generally acknowledged that the statistical, population-oriented approach, not the species of host animal being examined, is what distinguishes the discipline. Hence, regardless of the host species or illness under investigation, veterinary epidemiology is one discipline [5].

A complicated research/practice endeavor, protecting and improving public health, involves knowledge discovery and application to enhance population health. Almost half of the human pathogens known to exist, and around 75% of those emerging, are caused by zoonotic disease agents [2]. It is common knowledge and worry that zoonotic disease agents are linked to illness epidemics [6].

3. Functions of Veterinary Epidemiological Studies

Epidemiology is a key discipline of veterinary medicine to contribute to public health. In addition to a set of procedures, the study of veterinary epidemiology also involves thinking about big challenges and a methodological strategy centered on population health [7]. From a researcher's perspective, veterinary epidemiology provides a rich toolbox of options for study design and sample tactics. Reduced exposure to dangers connected with animals, animal products, and their environment is one-way veterinary public health affects human health [5]. Toxins, drugs given to animals, envenomation, bites, and other wounds acquired from contact with animals are all part of the package regarding the risks associated with working with animals. As our knowledge and computational power have advanced, these have changed over time. Disease risk factors, disease transmission routes, and population clustering are a few areas where various multivariate methods can be applied. Effects at the individual, group/community, and societal levels and their possible interactions can be assessed using multilevel models. Several methods can be used, such as quantitative risk assessment, models of time and space, and computer simulations. There are many ways in which the study of veterinary epidemiology contributes to the field of public health [8] [9].

Public health is improved thanks to the work of veterinary epidemiologists. A good example is the test-and-slaughter strategy used to eradicate *M. bovis* from cattle populations. The current predicament in the Americas is a good example of this [8]. As different strategies and tactics proved effective, many other ideas and methodologies from the field of epidemiology were employed. Finding infected cattle within herds was the original method of discovering *M. bovis* infection in cattle when it was still common. Effective testing programs require knowledge of the sensitivity and specificity of current tests for detecting the presence of disease in individual animals and, in the case of *M. bovis*, in different species of animals. Effective eradication efforts led to a fall in the prevalence of *M. bovis*. At that point, testing strategies shifted to identify infected herds, often by retracing from positive animals found during surveillance at slaughter [8] [7].

Epidemiologists study disease in populations rather than individual organisms (as a doctor would), individual cells (as a histologist or microbiological would), or individual molecules (as a chemist or biologist would) (the geneticist or molecular biologist). In that they learn about the world by concentrating on the specifics of narrow fields of interest, many veterinary specializations are reductionistic [10]. Some people will change to a higher power to observe an unknown object in greater detail when using a microscope. Information like this is useful in determining how best to deal with possible public health issues. Most epidemiologists would probably choose a lower magnification to view more of the thing concerning its surroundings. To comprehend disease, epidemiologists go beyond the individual molecule, cell, or host organism and instead focus on the condition as a whole in the population. The other benefit of phylogenetic analysis is that it can help pinpoint regions where ecological factors promote spillover, where viruses with the genetic criteria for human infection are most likely to be found. As was previously said, it is unfortunate that the public health system has difficulty centralizing the combination of veterinary (including virologists and epidemiologists) and human medicine [7].

3.1. Methods & Tools

Some detecting methods and equipment call for practice and instruction in natural and field settings. Understanding the nature of highly contagious animal diseases and implementing scientifically sound approaches are essential for efficient detection and control [9]. As applied to public health, the field of veterinary epidemiology primarily performs the following five functions:

3.1.1. Public Health Surveillance

Surveillance in public health is constantly gathering, processing, and sharing health-related data to inform policy and practice. Monitoring the administration is like keeping an eye on the heartbeat of the neighborhood. The goal of public health surveillance also referred to as "information for action," is to identify, contain, and stop the spread of diseases. [4] The transmission of statistics and their interpretation to those involved in disease control and public health decision-making, as well as the systematic collection and analysis of morbidity and mortality data and other essential health information, enable this to be accomplished. State and local health departments commonly use morbidity and mortality data for surveillance purposes. To comply with regulations, medical professionals, infection control specialists, and testing facilities must report cases of infectious diseases to the appropriate government agency. Surveillance information is compiled from various sources, including reports from individual case and illness cluster investigations, data from public health programs like data from immunization programs, and health surveys [9].

Simple monitoring approaches that collect basic data on each case are the norm. Nonetheless, health officials routinely review the information they receive and look for trends, as not all illness cases are reported. Methods like these have been invaluable for illuminating problems, gauging program success, and guiding public health policy. Public health monitoring has historically focused on infectious diseases. Still, newer systems keep tabs on injuries, chronic conditions, genetic and congenital disabilities, occupational and perhaps environmental disorders, and unhealthy lifestyle choices [7].

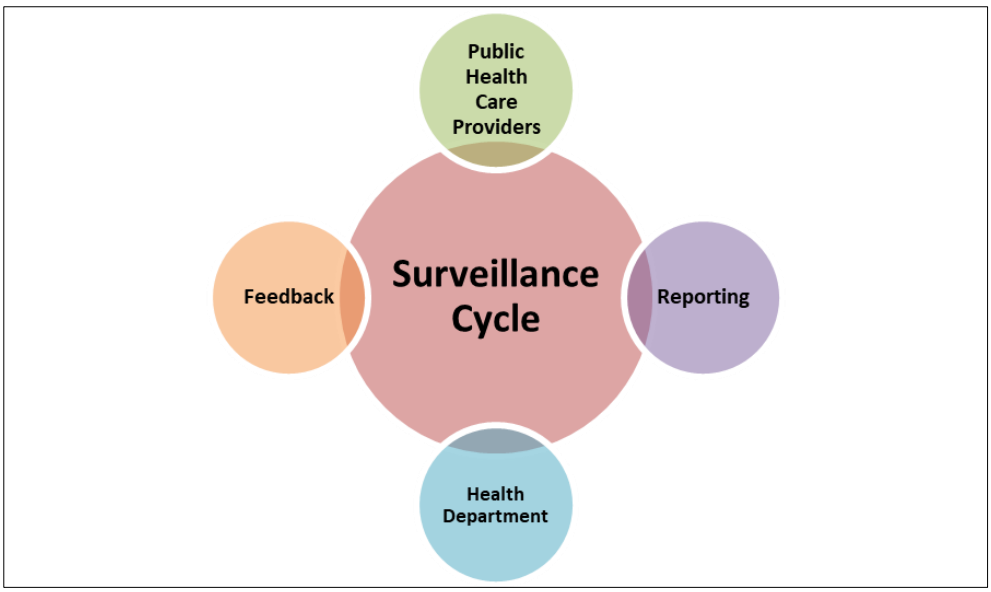

Figure 1 Surveillance Cycle approach is used gather, process, and share public health related data

3.1.2. Field Investigation

It is common for investigators to find more cases of illness that had previously gone unreported or unidentified, which means that the disease is not allowed to spread further [11]. Research on those infected with sexually transmitted diseases (STDs) is distinguished by several factors, including the ability to track down patients' sexual partners and other contacts [4]. After being interviewed, many of these contacts learn they are infected and get the care they desperately need. The sickness will not spread further if these people can be located and treated. Finding the vehicle will help authorities determine how many people were exposed and are at risk. Commercial product recalls, and public statements can help stop further accidents [10].

3.1.3. Analytics

When surveillance and investigations are sufficient to highlight the origin of zoonotic disease, its mechanisms of transmission, and the best course of action for management and prevention, however, there are situations when analytical analyses with more exacting techniques are required. Surveillance and field research provide hypotheses about transmission routes, whereas analytical studies assess the integrity of such theories. These methods are frequently employed in tandem [4].

Further categorized into

- Design

It entails selecting an appropriate study design, methodology, justifications & protocols, determining sample sizes, picking the right control group, articulating case definitions, and developing questionnaires [7].

- Conduct

Tasks include requesting and receiving permissions, ethical guidelines, records abstracting, locating and questioning participants, and assembling and storing samplings to manage successful data [11].

- Analysis

The report opens with a character sketch of the statistical analysis. The next step is to compute rates, make comparison tables (such as two-by-two tables), and calculate measures (like risk ratios or odds ratios), significance (like the chi-square test), and confidence intervals. Statistical methods, including stratified analysis, regression, and modeling, are often necessary for epidemiological research [6].

- Interpretation

It entails providing context for the study's findings, drawing out the most important takeaways, and offering sensible suggestions. To do so, the epidemiologist must have a firm grasp of the topic at hand and the study's limitations [4].

3.1.4. Evaluation

The evaluation of epidemiology and public health activities has expanded to include the expertise of epidemiologists trained to use systematic and quantitative methodologies. When anything is evaluated, its usefulness, efficiency, and influence concerning predetermined goals are calculated as methodically and objectively as feasible [4]. Planning (informative evaluation), implementation (process evaluation), impact (summative evaluation), and results (summary evaluation) are just a few of the possible areas of attention of the assessment. To evaluate an immunization program, one could look at how well it runs, how many people in the target demographic get immunized, and whether or not the program seems to have reduced the prevalence of diseases that are preventable by vaccination [9].

3.1.5. Linkages

Scientists who study disease transmission in the name of public health work alone. Epidemiological research in the field is often called a "team sport." An epidemiologist is frequently involved in investigations as either a team member or team leader [4]. Computer information specialists are becoming an increasingly common addition to healthcare teams, including laboratories, sanitizers, infection control workers, nurses, and other medical professionals. Since many epidemics' cross jurisdictional boundaries, co-investigators may come from various institutions and organizations, such as local, state, and federal governments, academic institutions, healthcare facilities, and private businesses [10].

4. Conclusion

This research shows that veterinary epidemiologists play an important role in promoting and maintaining population health. After all, the results of this research will pave the way for a broader application of quantitative methodologies to enhance the health of human and animal populations globally. Epidemiologists investigate hypotheses about the spread of disease utilizing veterinarian epidemiological functions or techniques. Epidemiological methods will be used to study zoonoses, and advice will be offered on preventing the disease from spreading further or returning. Veterinary epidemiology is its subfield of public health because of its focus on population health and analytical methodologies. The contributions of veterinary epidemiologists to the fields of public health research and practice are increasingly

recognized. Yet, there are successful examples of cooperation under the One Health umbrella, facilitated by informatic pipelines for exchanging integrated data on the health of people, animals, and the environment and providing fact-based resources to decision-makers and risk analysis studies.

Compliance with ethical standards

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Disclosure of conflict of interest

The author declares no conflict of interest.

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