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One Health Perspectives on Zoonotic Brucellosis and Effective Mitigation Strategies

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Abstract

Brucellosis, a resurging zoonotic disease with significant public health implications, necessitates applying the One Health approach, integrating human, animal, and environmental health. The One Health approach integrates human, animal, and environmental health to address the challenges of brucellosis effectively. This article highlights the importance of engagement, assessment, planning, implementation, and monitoring within the One Health framework. By involving stakeholders, mapping communication mechanisms, establishing baseline data, and fostering collaboration, comprehensive strategies can be developed for prevention, control, and treatment. The One Health approach enables holistic brucellosis management, promoting interdisciplinary collaboration and improving surveillance, vaccination, disease control programs, and community engagement.

Introduction

Brucellosis, caused by gram-negative bacteria of the genus *Brucella*, is a prevalent re-emerging bacterial zoonotic disease with bioweapon potential (Zhou et al., 2020). It poses a severe global public health threat, affecting humans and animals. The World Health Organization (WHO) has recognized brucellosis as the leading neglected non-malarial febrile zoonotic illness (WHO, 2020). To prevent and control brucellosis, focusing on risk factor management, disease transmission prevention, and surveillance is essential. Culling of infectious animals is identified as the most effective control strategy (Durrani *et al*., 2020).

The One Health approach promotes collaborative efforts across various local, national, and international disciplines, integrating the health of people, animals, plants, and ecosystems. In

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combating brucellosis using this approach, it is crucial to identify infection sources and develop targeted animal management methods accurately. Implementing a proper strategy and successful interventions can lead to a decrease in brucellosis cases. Strict surveillance, data collection, compilation, and reporting are vital in utilizing the One Health approach to navigate a developing public health crisis. Monitoring various disease strains with zoonotic potential and timely data reporting is essential. Existing surveillance programs in veterinary and medical fields, such as the Integrated Disease Surveillance Project (IDSP) and the National Animal Disease Reporting System (NADRS), can collaborate with environmental sectors by exchanging data, comparing reports, and analyzing issues. These partnerships effectively reduce the severity of disease outbreaks in humans and animals.

Additionally, evaluating the future pandemic potential of brucellosis pathogens and screening potential vectors and hosts are necessary. Understanding the environmental factors, reservoir hosts, transmission modes to humans, and the possibility of human-to-human transmission requires studies on temperature, ecological factors, and pathogen dynamics. Disease prevention through immunization, rapid and practical diagnostics, and improved laboratory infrastructure are crucial. Raising public awareness about zoonotic diseases, antibiotic resistance, and maintaining clean environments is significant.

The One Health approach recognizes the interconnectedness of human, animal, and environmental health and emphasizes interdisciplinary and multisectoral collaboration to tackle complex health challenges. In brucellosis, the One Health approach involves coordination and collaboration among veterinarians, public health officials, epidemiologists, wildlife biologists, and other experts. Several examples of how the One Health approach can be applied to brucellosis include:

1. **Improved surveillance**: One Health surveillance systems gather and analyses data from various sources, such as veterinary clinics, hospitals, laboratories, and wildlife monitoring programs. This comprehensive approach facilitates early detection and response to animal and human brucellosis outbreaks.
2. **Cross-species vaccination**: Developing cross-species vaccines that protect both animals and humans can be a solution for preventing brucellosis. Identifying shared antigens among different species of brucellosis-causing bacteria can aid in developing effective vaccines.
3. **Integrated disease control programs**: One Health-integrated disease control program for

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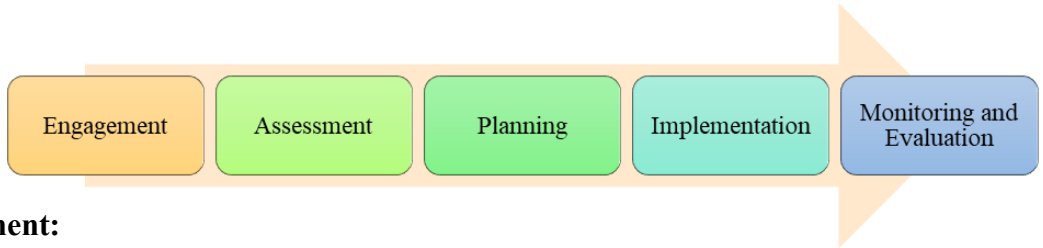
brucellosis encompasses strategies like vaccination, quarantine, testing, and culling infected animals. Coordinated implementation across sectors and jurisdictions maximizes the impact on disease control.

4. **Risk communication and community engagement**: Engaging communities and stakeholders in disease prevention and control efforts through education, awareness campaigns, and culturally appropriate interventions is vital.

Overall, the One Health approach recognizes the complexity of brucellosis and underscores the importance of collaboration and integration across sectors and disciplines to effectively prevent, control, and treat the disease.

The One Health strategy encompasses the following components:



1. **Engagement:**

- One of the key steps in the One Health initiative is to involve stakeholders. This can be achieved by conducting a scoping mission to assess the prevalence and incidence of the disease in the community. This assessment helps in understanding the specific context and challenges related to the disease in that community.

- Additionally, it is important to gain insights into the sociocultural and traditional customs of the people in the community where the disease has previously occurred. This understanding helps in tailoring interventions and communication strategies that are culturally sensitive and effective.
- To ensure the sustainability and effectiveness of the One Health program, it is crucial to establish long-term government support. This support should recognize One Health as a critical component in preventing and controlling zoonotic diseases. Government support provides the necessary resources, coordination, and policy framework to implement comprehensive and integrated approaches to disease prevention and control.

Assessment:

- The assessment involves utilizing infrastructure mapping to create network maps that illustrate the formal and informal communication, collaboration, and coordination mechanisms within and between sectors.

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- It also includes establishing baseline data on the current status of zoonotic illness burden and its epidemiological situation. This data will be used to design preventative and control plans at various levels, including local, sub-national, national, and regional.
- Another crucial step is conducting a gap analysis to identify capacity deficiencies within and between sectors responsible for managing the system or program once the baseline data is established.

3. **Planning:**
   - The planning phase focuses on developing plans and protocols that incorporate and leverage the involvement of all relevant One Health sectors.
   - It also involves establishing a global One Health alliance/network/partnership and creating a comprehensive business plan.
4. **Implementation:**
   - During the implementation stage, projects are carried out to validate concepts and address the causes of emerging diseases. This may include organizing annual or semi-annual international One Health conferences.
   - Gathering information on One Health experiences worldwide is essential to enhance knowledge and conduct human development and training initiatives.
5. **Monitoring and Evaluation:**
   - The monitoring and evaluation phase includes engaging in information exchange, knowledge management, and dissemination activities.
   - Implementing a communication strategy is crucial, which includes formal communication channels, targeted programs, and messaging to facilitate resource sharing and maximize public support.

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