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PUBLIC HEALTH CONTROL MEASURES AND CASE MANAGEMENT IN THE TREATMENT OF RABIES IN DOGS

MEDIDAS DE CONTROLE DE SAÚDE PÚBLICA E MANEJO DE CASOS NO TRATAMENTO DA RAIVA EM CÃES

MEDIDAS DE CONTROL DE SALUD PÚBLICA Y MANEJO DE CASOS EN EL TRATAMIENTO DE LA RABIA EN PERROS

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ABSTRACT

Canine rabies remains a lethal threat to global public health, being responsible for approximately 60,000 deaths annually, with infected dogs acting as the main reservoir of the virus. With no reliable treatment after the onset of symptoms, primary prevention through mass immunization is the central public health strategy. This study, characterized as a narrative literature review, analyzed the most recent scientific evidence related to canine rabies control measures. The persistence of the disease is sustained by low vaccination coverage in canine populations (observed in 73.14% of aggressor dogs in one study). Eradication requires sustained annual vaccination coverage of at least 70% of the population. Oral Vaccination (ORV) emerges as an indispensable and cost-effective tool to complement parenteral vaccination, reaching free-roaming dogs and contributing to critical levels of herd immunity. While pharmacovigilance surveillance reinforces the global safety of immunobiologicals, prevention remains the central axis. It is concluded that effective rabies control depends on interrupting transmission in the canine reservoir through mass vaccination, aligned with the One Health concept.

Keywords: Rabies. Dogs. Vaccination. Public Health. Oral Vaccination.

RESUMO

A raiva canina permanece como uma ameaça letal à saúde pública global, sendo responsável pela morte de aproximadamente 60.000 pessoas anualmente, com cães infectados atuando como o principal reservatório do vírus. Sem tratamento confiável após o aparecimento dos sintomas, a prevenção primária através da imunização em massa é a estratégia central de saúde pública. Este estudo, caracterizado como uma revisão bibliográfica narrativa, analisou as evidências científicas mais recentes relacionadas às medidas de controle da raiva canina. A persistência da doença é sustentada pela baixa cobertura vacinal em populações caninas (observada em 73,14% dos cães agressores em um estudo). A erradicação exige uma cobertura vacinal anual

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sustentada de pelo menos 70% da população. A Vacinação Oral (ORV) emerge como uma ferramenta indispensável e custo-efetiva para complementar a vacinação parenteral, alcançando cães de vida livre e contribuindo para os níveis críticos de imunidade coletiva. Enquanto a vigilância farmacovigilante reforça a segurança global dos imunizantes, a prevenção continua sendo o eixo central. Conclui-se que o controle efetivo da raiva depende da interrupção da transmissão no reservatório canino por meio da vacinação em massa, alinhada com o conceito de "Saúde Única" (One Health).

Palavras-chave: Raiva. Cães. Vacinação. Saúde Pública. Vacinação Oral.

RESUMEN
La rabia canina sigue siendo una amenaza letal para la salud pública global, siendo responsable de aproximadamente 60.000 muertes anuales, con los perros infectados actuando como el principal reservorio del virus. Sin tratamiento confiable tras la aparición de los síntomas, la prevención primaria mediante la inmunización masiva es la estrategia central de salud pública. Este estudio, caracterizado como una revisión bibliográfica narrativa, analizó la evidencia científica más reciente relacionada con las medidas de control de la rabia canina. La persistencia de la enfermedad está sostenida por la baja cobertura de vacunación en las poblaciones caninas (observada en el 73,14% de los perros agresores en un estudio). La erradicación requiere una cobertura de vacunación anual sostenida de al menos el 70% de la población. La Vacunación Oral (ORV) surge como una herramienta indispensable y costo-efectiva para complementar la vacunación parenteral, alcanzando a perros de vida libre y contribuyendo a niveles críticos de inmunidad colectiva. Mientras que la farmacovigilancia refuerza la seguridad global de los inmunobiológicos, la prevención sigue siendo el eje central. Se concluye que el control efectivo de la rabia depende de la interrupción de la transmisión en el reservorio canino mediante la vacunación masiva, alineada con el concepto de "Una Salud" (One Health).

Palabras clave: Rabia. Perros. Vacunación. Salud Pública. Vacunación Oral.

1 INTRODUCTION

Rabies remains one of the most lethal viral infections known to science, being responsible for the deaths of approximately 60,000 people annually on a global scale (Baker et al., 2022; Abdella et al., 2022). In the vast majority of human cases, transmission occurs through the bite of infected dogs, which act as the main reservoir of the virus in endemic areas (Abdella et al., 2022; Yale et al., 2022). If post-exposure prophylaxis is given quickly and adequately it saves lives, but there is no reliable treatment for rabies from the onset of symptoms. Weeks or months after being bitten by a rabid animal, patients can develop progressive, severe, and lethal encephalitis Baker et. al, 2022). In addition, the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), and the World Organization for Animal Health (WOAH) prioritize rabies as a model disease for the One Health approach (Cuddington and McAuliffe, 2023). Although it is an entirely preventable disease through vaccination, the persistence of rabies in developing countries reflects critical gaps in canine vaccination coverage and access to public health control measures (Baker et al., 2022; Yale et al., 2022).

The management of canine rabies is a complex challenge, since, after the appearance of clinical signs, the disease is virtually fatal and does not have an established effective curative treatment (Baker et al., 2022). In light of this, public health strategies focus primarily on primary prevention through mass immunization and active surveillance of offending animals (Abdella et al., 2022; Freuling et al., 2022). However, stray or free-living dog populations represent a significant obstacle to conventional parenteral vaccination methods, requiring the implementation of innovative approaches, such as oral vaccination (ORV), to achieve the herd immunity levels needed to interrupt the transmission cycle (Freuling et al., 2022; Cuddington and McAuliffe, 2023).

2 METHODOLOGY

The present study is characterized as a narrative literature review, developed with the objective of synthesizing and analyzing the most recent scientific evidence related to public health control measures and case management in the context of canine rabies. The search was carried out in the PubMed database, using the descriptors "Rabies", "Dogs" and "Therapeutics", combined through the Boolean operators AND and OR, according to the terminology of Medical Subject Headings (MeSH). Articles published in

the last five years, available in full and written in English, that directly addressed the topic were included. Studies that did not have a direct relationship with the central theme, duplicate publications, narrative reviews with low methodological rigor, and articles not indexed in the database used were excluded. The selection of studies was conducted in two stages: screening of titles and abstracts, followed by the evaluation of full texts to confirm relevance. The information extracted was organized in a descriptive manner.

3 RESULTS

Contemporary scientific literature highlights that the low vaccination rate in aggressive dogs is one of the main factors perpetuating rabies in urban areas. In a study conducted in Addis Ababa, it was observed that 73.14% of dogs involved in bite incidents had not been vaccinated, evidencing a dangerous gap in local canine immunization (Abdella et al., 2022). In addition, laboratory surveillance is critical; fluorescent antibody tests on brain samples from suspected dogs confirm high viral circulation even in areas under monitoring (Abdella et al., 2022).

In the field of preventive interventions, according to Cuddington and McAuliffe (2023), annual vaccination of about 70% of a dog population can stop transmission and eventually lead to rabies elimination if repeated for years in a row, and oral vaccination (ORV) has emerged as an indispensable tool to reach dogs that are not easily contained for parenteral injection (Yale et al., 2022). Field experiences in Namibia have demonstrated that the distribution of vaccine baits is safe and effective, enabling the immunization of free-living dogs in rural and urban communities (Freuling et al., 2022). Optimization models in cities in India indicate that the use of oral baits, even at a higher unit cost than the parenteral vaccine, can reduce the total cost per vaccinated animal by dramatically increasing coverage in dog populations that are never confined (Cuddington and McAuliffe, 2023).

As for the safety of parenteral vaccines, pharmacovigilant monitoring is essential. A study in Japan identified that the rate of anaphylaxis after rabies vaccination is low (0.058%), occurring predominantly in young dogs and males, which reinforces the overall safety of the immunizer, although it requires immediate clinical caution after administration (Yoshida et al., 2021). On the therapeutic level, although postsymptomatic treatment remains non-existent, research in gene therapy with antibodies and extracellular vesicles for siRNA delivery represent promising frontiers for future

neurological interventions, although still far from routine clinical practice (Baker et al., 2022).

4 DISCUSSION

The discussion on rabies control emphasizes that eradication of the dog-mediated disease requires sustained vaccination coverage of at least 70% of the canine population (Freuling et al., 2022; Cuddington and McAuliffe, 2023). The integration between parenteral and oral vaccination is pointed out as the most efficient way to reach this level, especially in regions with a high density of stray animals (Yale et al., 2022; Freuling et al., 2022). The cost-benefit analysis shows that the investment in canine vaccination is infinitely lower than the cost of human post-exposure treatment and loss of life (Cuddington and McAuliffe, 2023).

The disparity in rabies management between developed and developing nations is striking. While countries such as Japan focus on refining vaccine safety and monitoring adverse reactions (Yoshida et al., 2021), African and Asian countries struggle to implement basic registration systems and mandatory immunization (Abdella et al., 2022; Yale et al., 2022). The concept of "*One Health*" is central to this debate, suggesting that rabies case management should not be viewed solely as a veterinary issue, but as a public health emergency that requires multisectoral cooperation (Baker et al., 2022; Abdella et al., 2022). The failure to vaccinate the reservoir dog reflects directly on human mortality, making mass canine vaccination the most effective public health "therapeutic" against rabies (Freuling et al., 2022; Yale et al., 2022).

5 CONCLUSION

Canine rabies remains a relevant threat to global public health, mainly supported by low vaccination coverage in canine populations, especially in contexts of socioeconomic vulnerability (Baker et al., 2022; Abdella et al., 2022). Effective control of the disease depends on interrupting transmission in the canine reservoir, with mass vaccination being the most effective and cost-effective strategy (Freuling et al., 2022; Yale et al., 2022).

In this scenario, oral vaccination emerges as a promising complementary approach, expanding coverage in hard-to-reach populations and contributing to the achievement of critical levels of herd immunity (Freuling et al., 2022; Cuddington and

McAuliffe, 2023). Although vaccines have a high safety profile, the occurrence of rare adverse events reinforces the need for continuous surveillance (Yoshida et al., 2021).

In the absence of effective therapies after the onset of clinical signs, prevention remains the central axis in the control of the disease. Thus, the implementation of integrated strategies, based on the concept of One Health, is crucial for the sustained reduction of transmission and for the advance towards the elimination of rabies.

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