



"FANGS, FUR, AND DENTAL HEALTH: EXPLORING THE INTRICATE CONNECTION BETWEEN HUMAN ORAL HEALTH AND INTERACTIONS WITH ANIMALS"

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Abstract:

The article delves into the complex interplay between human oral health and interactions with animals. While we typically associate maintaining oral health with routine practices like brushing, flossing, and dental checkups, it is vital to recognize the influence of activities involving animals on our overall well-being. Although animal bites are relatively uncommon, they can result in dental issues. Moreover, these injuries carry the risk of introducing harmful microorganisms from the animal's mouth, potentially leading to illnesses. Pasteurella species, particularly Pasteurella multocida, are frequently encountered in cases of animal bites, underscoring the importance of appropriate treatment. The microbiome of the biting animal can also impact the recipient's oral flora, affecting the wound. Dental professionals who frequently interact with animals, such as veterinarians, animal caregivers, and zookeepers, confront distinct challenges in maintaining oral hygiene due to constant exposure to animal dander, saliva, and potential infections. Neglecting oral hygiene or infrequent dental care can exacerbate these risks, potentially resulting in conditions like gum disease, tooth decay, or oral infections. Additionally, allergies and asthma related to animal exposure can indirectly influence dental health. The article also touches upon the impact of diseases such as COVID-19, mucormycosis, and Capnocytophaga gingivalis infection on oral health. For example, Bartonellosis, caused by Bartonella henselae, can lead to oral ulcers, swollen lymph nodes, and lockjaw. Similarly, rabies, typically transmitted through animal bites, can cause excessive salivation, difficulty swallowing, and muscle spasms, affecting oral health. In conclusion, this article highlights the importance of considering animal-related factors in oral health. It underscores the need for proper wound management, timely prophylactic measures, and comprehensive care when dealing with animal-related injuries or zoonotic diseases to prevent both short-term and long-term oral health complications.

Keywords : Animal bites, *Pasteurella Multocida*, *Capnocytophaga Gingivalis*, Bartonellosis, Covid-19, Oral Health

INTRODUCTION

Maintaining Oral health is often seen as a simple routine of regular brushing, flossing and dental checkups. However, it's important to consider the impact of interactions, with animals or engaging in animal related activities on our wellbeing. In this article we explore the connections between encounters with animals and human oral health.

While animal bites are occurrences they can lead to dental problems. The teeth of an animal can penetrate into our mouths potentially causing injuries to our teeth, gums and jawbones causing Maxillofacial injuries. Such incidents can result in anything from cracks or chips to complete tooth loss. Additionally, there is a risk of microorganisms, from the animal's mouth entering the wound and causing illnesses. Polymicrobial microbiology, which is a broad range of aerobic vs. anaerobic bacteria, is frequently used to characterize animal bite wound infections. Bacteria in human bite wounds are primarily obtained from the oral flora (i.e., bacteria in the bite wound) of the animal that bit the victim. (1)

The microbiome (the microorganisms present in their diet) consumed by the biting animal can likewise impact its mouth flora. Bacteria can potentially enter the body through the sufferer's skin or the environment in which the person was harmed.(2)

Pasteurella species are frequently encountered in cases of animal bites, with *Pasteurella canis* being the dominant isolate in 50% of dog bite incidents and *Pasteurella multocida* prevailing in 54% of cat bite cases. *Pasteurella multocida* is characterized by its coccobacillus morphology and is classified as a gram-negative organism. *Pasteurella* infection typically presents with a soft tissue infection at the site of the bite or scratch, and common complaints associated with this infection include cough, fever, shortness of breath, and chest pain..(3)

Veterinarians, animal carers, and zookeepers may experience special oral hygiene issues. Frequent contact with animal dander, saliva, and infections raises the likelihood of acquiring dental problems. Inadequate oral hygiene practises or a lack of frequent dental treatment might amplify these risks, potentially leading to gum disease, tooth decay, or oral infections. Many people suffer from animal-related allergies and asthma, and these disorders can have an indirect impact on dental health. Allergic responses to pet dander and saliva can include swelling lips, tongue, and palate, as well as a painful throat. Individuals with severe allergies may also feel mouth itching, redness, or trouble breathing in rare situations, resulting in oral pain and possibly dental complications.(4)

Zoonotic diseases, which are infections that can be transmitted between animals and humans, can also lead to dental problems. Within the oral cavities of both humans and dogs, there are fusiform, fastidious, gram-negative bacilli known as *Capnocytophaga* species. These bacteria have the potential to lead to issues such as *Capnocytophaga gingivalis* infection, which can result in severe periodontal problems in humans. (5)

A noteworthy contrast emerges: while Multiple Invasive Cervical Resorption (mICR) is an uncommon occurrence in humans, a parallel ailment, Feline Odontoclastic Resorptive Lesions (FORL), is prevalent among domestic, captive, and wild feline populations. Both conditions share a common enigma—their etiology remains largely shrouded in mystery. Recent associations between FORL and feline viruses have led researchers to examine the intriguing possibility of a connection. In this context these individuals had encountered cats, either directly or indirectly. (6)

Some zoonotic diseases, which can be transmitted from animals to humans, may manifest oral symptoms. Take, for instance, Bartonellosis, which is caused by the bacterium *Bartonella henselae*. This ailment can give rise to swollen lymph nodes, lockjaw and oral ulcers.(7)

Similarly, rabies, a viral infection typically transmitted through animal bites, can have implications for oral health. It can lead to symptoms such as excessive salivation, difficulty swallowing, and painful muscle spasms.(8)

Human bites from domestic animals, particularly dogs, are unfortunately a common source of injury. These incidents often result in significant pain and suffering and can potentially lead to disability or even fatalities. Bites typically occur on the upper and lower limbs, with the face being the third most frequent site for such injuries. Among facial injuries, the nose and lips are the most frequently affected areas. A 'core target zone' made up of the nose, lips, and cheeks in which 75% of instances, the cheeks are affected.(9)

It's also essential to acknowledge that various other animal species, including different bat species, have been implicated in affecting oral and overall health of humans. The definitive identification of Ebola virus's natural reservoir remains elusive. Nevertheless, extensive research conducted in Africa, encompassing field studies, laboratory investigations, and epidemiological assessments, provides compelling evidence supporting the hypothesis that fruit bats may serve as credible natural hosts for the Ebola virus (EBOV). These bats are currently considered the primary animal reservoir for the virus. Notably, research findings suggest that certain bat species may harbor the virus without displaying any clinical signs of illness. In the context of Ebola Virus Disease (EVD), oral manifestations include gingival bleeding and odynophagia, characterized by painful swallowing. Additionally, nonspecific oral lesions on the mucous membranes may manifest as either whitish or reddish patches and ulcerations resembling aphthous ulcers. It's important to note that gingival bleeding tends to be more prevalent in the later stages of EVD.(10)

The primary link between COVID-19 and bats is the virus's putative origin. COVID-19, caused by the new coronavirus SARS-CoV-2, is thought to have zoonotic origins, which means it likely began in animals before spreading to humans.(11)

(12)COVID-19 and mucormycosis (also known as "black fungus") have been linked in some cases, particularly among individuals who have recovered from COVID-19 and subsequently developed mucormycosis. This connection has raised concerns in several countries, including India, where a significant number of mucormycosis cases have been reported in COVID-19 patients.(13) (Figure 1)

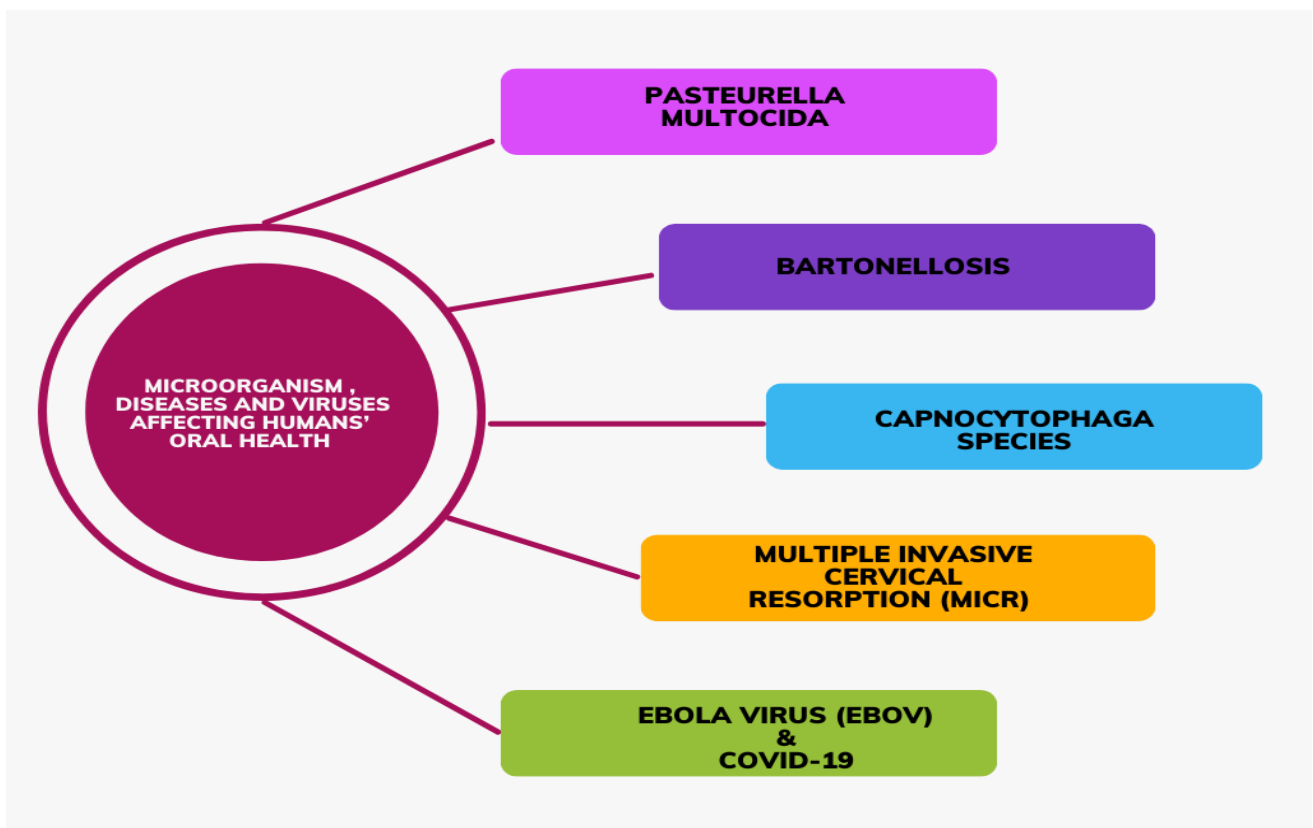


Figure 1: Microorganism, Diseases and Viruses affecting Humans' Oral Health

METHODS

We conducted an extensive literature search from December 2018 to September 2023 using prominent databases such as PubMed, Elsevier, and Google Scholar. Our search employed specific keywords including "Animal Bites," "Microorganisms," "COVID-19," and "Oral Health" within the abstracts or titles of the publications. Additionally, we thoroughly examined the reference lists of the identified articles to discover related research. Following a rigorous screening process that involved excluding non-English literature and opinion articles, we ultimately selected 20 articles for inclusion in our study.

DISCUSSION

When an animal's teeth penetrate into our mouths, it can lead to potential injuries to our teeth, gums, and jawbones, resulting in Maxillofacial injuries. These incidents can range from minor cracks or chips to complete tooth loss, and they should be addressed with appropriate care. Considering the use of prophylactic antibiotics for patients with heightened infection risk due to animal bites is crucial, as such bites can lead to severe consequences. Equally important is checking the patient's tetanus immunization status and evaluating the potential risk of rabies, with the administration of appropriate immunoprophylaxis when necessary. Additionally, it's imperative not to neglect hepatitis prophylaxis for individuals bitten by confirmed carriers of hepatitis B. In summary, the primary goal of treatment is to cleanse the wound properly and ensure proper wound management to prevent both short-term and long-term complications, ultimately safeguarding against morbidity and mortality. (1)

Pasteurella multocida is commonly found in the upper respiratory tracts of healthy canines, felines and mice. When dealing with infections caused by this bacterium, treatment approaches can vary depending on factors such as the seriousness of the infection and the patient's medical background. Treatment options encompass intravenous penicillin G, administered every 4 hours at doses of 2–4 million units, or oral penicillin V, taken every 6 hours with doses ranging from 500–750 mg. For patients allergic to penicillin, alternatives like amoxicillin, doxycycline, chloramphenicol, and trimethoprim-sulfamethoxazole (co-trimoxazole) are considered. Fourth-generation cephalosporins are also effective, and in some cases, a combination of antibiotics, such as oral clindamycin and a fluoroquinolone, may be necessary. The choice of antibiotic and dosage should be determined by a healthcare provider, and it's essential to complete the full course of antibiotics to prevent antibiotic resistance while closely monitoring the treatment's effectiveness. (14)

Multiple Invasive Cervical Resorption (mICR) is an uncommon occurrence in humans and the tooth affected is replaced by Implants , Bridges or Removable Partial Dentures .(6)

Antibiotics found to be effective in treating *Bartonella henselae* infections include rifampin, ciprofloxacin, gentamicin, and trimethoprim/sulfamethoxazole. Notably, *Bartonella henselae* tends to be resistant to penicillin, amoxicillin, and nafcillin. For the treatment of neuroretinitis associated with *Bartonella henselae*, the preferred medication regimen consists of a combination of doxycycline and rifampin.(7)

Excessive salivation, also known as hypersalivation or sialorrhea, is a symptom of rabies and can be difficult to manage. Unfortunately, once clinical symptoms of rabies appear, the disease is almost always fatal, and there is no known cure. The treatment of rabies in humans primarily focuses on preventing the virus from reaching the central nervous system by administering rabies post-exposure prophylaxis (PEP) immediately after a potential exposure, such as a bite from a rabid animal. (15)

Patients who are symptomatic with Ebola virus disease or who exhibit early, non-specific symptoms may seek dental or surgical treatment. However, it is crucial to consider safety measures in such cases. For individuals who may have had contact with Ebola virus or who are confirmed to be infected, it is advisable to delay non-essential dental or surgical procedures for a minimum of 21 days following potential exposure. This precautionary period helps reduce the risk of transmitting the virus to healthcare workers and other patients during medical procedures. The safety and health of both

patients and healthcare providers should be the top priority when dealing with potential Ebola cases in healthcare settings.(16)

Mucormycosis is a severe fungal infection that requires treatment with prescription antifungal medications, including amphotericin B, posaconazole, or isavuconazole. These medications can be administered intravenously or by mouth, depending on the specific circumstances and the patient's health. The choice of medication and method of administration are determined by the healthcare provider to ensure effective treatment of this serious infection.(13)

CONCLUSION

In conclusion, this article has explored the intricate relationship between human oral health and interactions with animals. While the maintenance of oral hygiene is typically associated with daily practices like brushing, flossing, and dental checkups, it is crucial to acknowledge the significant influence of activities involving animals on our overall well-being. Animal bites incidents also carry the risk of introducing harmful microorganisms from the animal's mouth, potentially leading to various illnesses. The presence of *Pasteurella* species, especially *Pasteurella multocida*, in animal bite cases underscores the importance of appropriate and timely treatment. Moreover, the microbiome of the biting animal can impact the recipient's oral flora, affecting the wound's healing process. Dental professionals who frequently interact with animals, such as veterinarians, animal caregivers, and zookeepers, face distinct challenges in maintaining oral hygiene due to constant exposure to animal-related factors. Neglecting oral hygiene or infrequent dental care can exacerbate these risks, potentially resulting in conditions like gum disease, tooth decay, or oral infections. Additionally, allergies and asthma related to animal exposure can indirectly affect dental health. Furthermore, this article briefly touched upon the influence of diseases such as COVID-19, mucormycosis, and *Campylobacter* infection on oral health. For instance, Bartonellosis, caused by *Bartonella henselae*, can lead to oral ulcers, swollen lymph nodes, and lockjaw. Similarly, rabies, typically transmitted through animal bites, can cause excessive salivation, difficulty swallowing, and muscle spasms, significantly impacting oral health. In summary, the importance of considering animal-related factors in the context of oral health. It underscores the need for proper wound management, timely prophylactic measures, and comprehensive care when dealing with animal-related injuries or zoonotic diseases. By addressing these issues proactively, we can mitigate both short-term and long-term oral health complications and ensure the well-being of individuals who interact with animals.

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