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PROCEEDINGS

DETECTION OF *TRICHOMONAS TENAX* IN PATIENTS WITH POOR ORAL HYGIENE AND PARADONTOSIS

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ABSTRACT

As an initial compartment of the digestive system communicating with the environment, the oral cavity is populated by a large number and diverse species of microorganisms, such as bacteria, viruses, fungi, and protozoa. They adhere to various surfaces, thus forming the so-called biofilms that are included in the composition of dental plaques. Plaques are a risk factor for the development of periodontitis because of the abundance of bacteria in them. The flagellate protozoan *Trichomonas tenax* has been isolated more frequently from the oral cavity of individuals with poor oral hygiene and periodontitis. The aim of our study was to assess the distribution of *Trichomonas tenax* worldwide based on the already published scientific literature. We performed a systematic review of 26 articles abstracted in several databases during the period between 1970 and August 2022. We proved a correlation between *Trichomonas tenax* and its presence in patients with periodontal disease. Different methods for its detection were established, such as microscopy, culture, polymerase chain reaction and loop-mediated isothermal amplification. The answers of many questions still remain unclear and, therefore, further epidemiological and clinical studies are needed to focus on the virulence and pathogenicity properties of this potential periodontal pathogen.

Keywords: *Trichomonas tenax, periodontitis, oral microflora, poor oral hygiene*

INTRODUCTION

The human oral cavity is a habitat for over 700 different species of microorganisms that make up its microbiome (1). It was first identified by Anthony Van Leeuwenhoek, who in 1674 observed his own dental plaque and found in it "little animals that move beautifully" (2,3). The oral microflora consists of bacteria, viruses, protozoa, and fungi. Many of these co-operate and, using glycoproteins from saliva, attach to different surfaces in the oral cavity and form biofilms. The latter are constituents of dental plaque (4). Most of these microorganisms are harmless and live as commensals.

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Any qualitative or quantitative changes in the oral microbiome can lead to dysbiosis, which is responsible for the development of oral diseases (5). Periodontal disease is a leading cause of tooth loss in adults. The retention of dental biofilm due to poor oral hygiene can provoke the development of an inflammatory process that leads to the destruction of the tissues surrounding the tooth (6). Periodontitis is considered to be a chronic bacterial infection, but a viral etiology (HSV-1, EBV and CMV) and the involvement of eukaryotes in the inflammatory process have also been discussed. The most prevalent protists in the human oral cavity are *Trichomonas tenax* and *Entamoeba gingivalis* (7–9).

Trichomonas tenax (*Trichomonas buccalis*) is one of three species of trichomonas found in humans (the other two are *Trichomonas vaginalis* and *Trichomonas hominis*). They differ from each other according to localization in the body, certain morphological features and pathogenic properties. *Trichomonas tenax* is a unicellular protozoon with a pear-shaped body and a size of about 5–10 μm (10). It is thought that it may be a genetic variant of *Trichomonas vag-*

inalis (11). It moves by means of flagella—four free and a fifth that sprinkles an undulating membrane. It exists only as a trophozoite, i.e., it does not form cysts. It is distributed between teeth, tonsillar crypts, gingiva, and saliva. It is transmitted between people by kissing and by the small drops of saliva emitted when speaking and coughing. Its incidence is higher in persons with poor oral hygiene and periodontal disease (12). Its presence in smokers and patients with diabetes mellitus is most likely due to a compromised oral microbiome (13). Other localizations of *Trichomonas tenax* have been described in the cerebrospinal fluid (CSF) of patients with polymicrobial meningitis (14), respiratory tract (15), lymph nodes (16), and mammary glands of women with fibrotic cystopathy (17). The presence of this flagellated unicellular has also been demonstrated in the oral cavity of horses, cats, and dogs (18,19).

The pathogenic properties of *Trichomonas tenax* have not been studied sufficiently. It has been shown to cause damage to various mammalian cells under in vitro conditions (20). It produces numerous enzymes that could be involved in the degradation of the periodontium (21). *Trichomonas tenax* lysates stimulate the synthesis of interleukin-8, which is one of the mediators of inflammation and is secreted by macrophages (22).

To identify *Trichomonas tenax*, conventional techniques such as microscopy (with or without staining) and culturing are used by taking samples from saliva, dental plaque, and periodontal pockets (Fig. 1). Molecular diagnostic methods (polymerase chain reaction, PCR) are more reliable. They can identify the 18S rRNA gene and the beta-tubulin gene (23,24). Loop-mediated isothermal amplification is a relatively new method for the diagnosis of *Trichomonas tenax* (25). It is more sensitive, less expensive, faster, and more reliable than PCR.

MATERIALS AND METHODS

We conducted a systematic review of 26 articles referenced in several databases (ResearchGate, PubMed, Scopus, ScienceDirect, Web of Science, and Google Scholar) between 1970 and August 2022 to determine whether there was a correlation between the presence of *Trichomonas tenax* in individuals with poor oral hygiene, on the one hand, and the development of periodontitis, on the other.

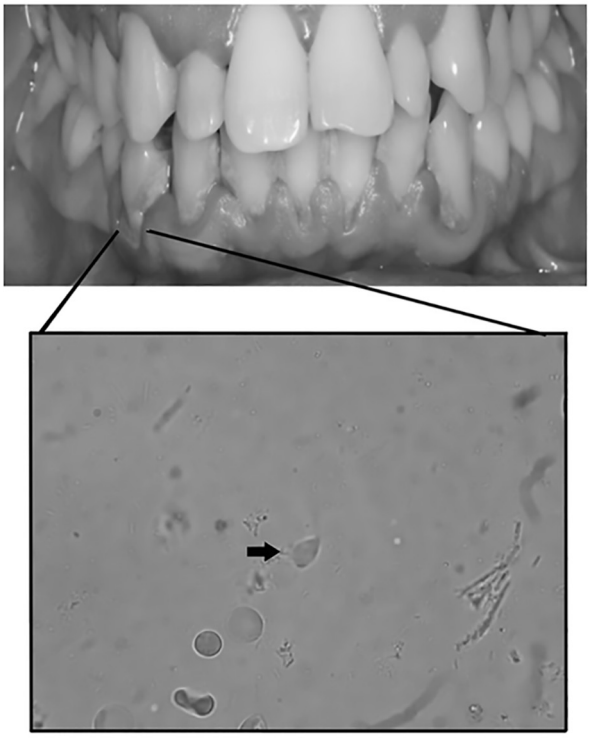

Fig. 1. Panoramic oral radiograph of a patient with periodontitis (top) and Trichomonas tenax isolated from dental plaque (bottom). 400x magnification (C. Brecamonte-Wolf et al., 2019).

RESULTS

The presence of *Trichomonas tenax* in periodontal disease was reported as early as the 1960s, with increasing research interest since 1980 (23). The results of the analysis of these 26 articles are presented in Table 1.

In these studies, only individuals with poor oral hygiene and periodontitis were selected and the samples represented dental plaque, calculus, or saliva material. Data are presented on the number of samples tested, the number of samples positive for *Trichomonas tenax*, and the specific methods used to detect the protozoon.

DISCUSSION

Our systematic review demonstrates the association between *Trichomonas tenax* and its presence in patients with periodontal disease. However, further studies are needed to highlight its pathogenic properties. On the one hand, on the basis of its presence in the oral cavity of healthy individuals, commensalism may be suggested. On the other hand, its secreted

Table 1. Systematized data from publications

First author	Year	Country	Number of Samples	Number of Positive Samples	Detection Methods
Wantland	1970	USA	1036	301	cultivation
Brooks	1984	USA	38	6	cultivation
Palmieri	1984	Indonesia	373	19	scanning and transmission electron microscopy
Sato	1985	Japan	307	96	light microscopy
Kurnatowska	1990	Poland	452	69	cultivation
Nocito-Mendoza	2003	Argentina	50	16	light microscopy
Ozumba	2004	Nigeria	203	10	light microscopy, cultivation
Athari	2007	Iran	160	33	light microscopy
Fuentes Cuevas	2008	Mexico	150	21	light microscopy
El-Sayed	2008	Egypt	50	15	light microscopy
Acurero Osorio	2009	Venezuela	25	1	light microscopy, cultivation, PCR
Yang	2009	China	492	46	light microscopy
Ghabanchi	2010	Iran	50	3	light microscopy
Özçelık	2010	Turkey	220	10	light microscopy
Onyido	2011	Nigeria	120	21	light microscopy
Albuquerque Jr	2011	Brazil	42	12	light microscopy
Bernaola-Paredes	2012	Brazil	53	9	light microscopy
Sumaiah & Rasha	2012	Iraq	60	39	cultivation
K. Mehr	2015	Iran	52	14	light microscopy
Yazar	2016	Turkey	175	8	PCR
Ibrahim	2018	Iraq	60	28	light microscopy, cultivation
Derikvand	2018	Iran	76	11	light microscopy
Bracamonte-Wolf	2019	Chile	50	28	light microscopy
Sharifi	2020	Iran	315	7	PCR
Yasen	2021	Jordan	237	23	PCR
MA Matthew	2022	Australia	44	8	PCR, LAMP

enzymes and its ability to attach to mammalian cells and induce cytotoxicity support the hypothesis that it may be a parasite.

CONCLUSION

Our results allow us to conclude that there is a high probability that *Trichomonas tenax* represents a potential periodontal pathogen. This will necessitate the screening of patients with diseases of the tooth-supporting apparatus and contribute to the improvement of a comprehensive individualized treatment approach in these patients.

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