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STUDY THE LIFE CYCLE AND SOME OTHER CHARACTERIZED OF BLASTOCYSTIS HOMINIS: (SUBJECT REVIEW)

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Abstract:

With an incidence that often exceeds 5% among all people in wealthy countries and that can reach 3060% in developing countries, Blastocystis sp. is one of the few gastrointestinal parasites. Interestingly, the only stramenopile capable of infecting people is Blastocystis sp. Blastocystis sp. has four main morphological forms that have been identified in stool samples or in vitro cultures: vacuolar, granular, amoeboid, and cyst forms. Numerous instances of B. hominis from feces and the human gut suggest that the organism can take on other forms. This genus is widespread around the world and is frequently the most frequently reported normal gastrointestinal protozoan in children, adults, and even infants.

Keywords: Blastocystis hominis, Intestinal parasites, Vacuolar form, Blastocystosis

INTRODUCTION

Anaerobic intestinal parasite Blastocystis sp. affects both humans and a variety of other animals [1-3]. This parasite is a member of the stramenopiles, an intricate and diverse group of heterotrophic and photosynthetic protozoa [4-6]. Interestingly, the only stramenopile known to infect people is Blastocystis sp. The vacuolar (Figure 1), granular (Figure 1), amoeboid (Figure 1), and cyst forms of Blastocystis sp. were the four main morphological forms identified in feces or in vitro cultures [1, 7]. The two earlier variants are the easiest to distinguish and are regularly found in stool samples and laboratory cultures. The irregular amoeboid form was thought to be involved in pathogenesis despite being infrequently reported [8–9], however this theory was later disproved [10]. Experimental infectivity tests on animals with the cyst form proved that the transmissible stage of the parasite was represented by water- and environment-resistant infective cysts [11–13]. A life cycle for Blastocystis sp. was proposed, with the cyst serving as the infectious stage [3], taking into consideration these data and those from in vitro encystation experiments [14–15]. The parasite undergoes encystations and transforms into vacuolar forms in the large intestine after ingesting cysts. These binary fission-dividing vacuolar forms can transform into amoeboid or granular forms. Before cyst excretion in the feces, encystation may then take place as the colon crosses [3]. As a result, Blastocystis sp. inhabits oxygen-poor conditions and is distinguished by the presence of some mitochondria-like organelles (MLOs), which are double membrane surrounding organelles (Figure 1) [16]. The MLO of these parasites underwent comprehensive circular DNA sequencing by various authors, which revealed that the cellular compartments have both aerobic and anaerobic mitochondrial metabolisms. Recent nuclear genome sequencing of Blastocystis sp. reveals an unusual structure with a compact topology. [20]. Due to its high prevalence in healthy individuals, previous investigations suggest that Blastocystis is a common and diverse component of the human host's microbiota [21–22].

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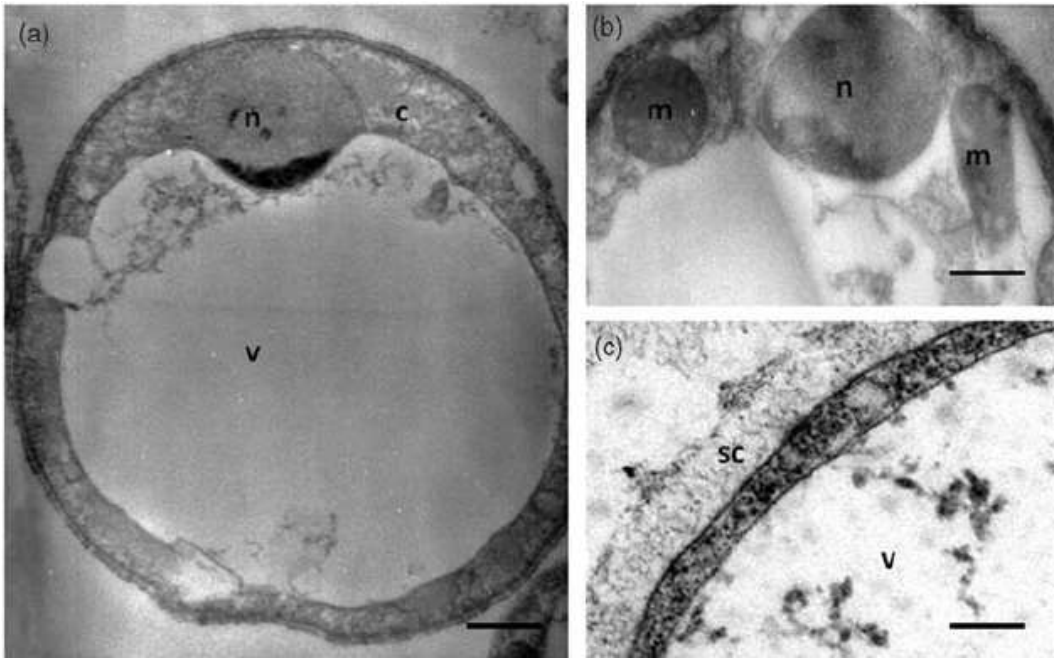

Figure 1: Transmission electron microscopy image of the vacuolar form of the in vitro cultured Blastocystis sp (a). This form is spherical and has a thick peripheral band of cytoplasm (c) surrounding the large central vacuole (v). (b) The cytoplasm houses the nucleus (n) and organelles that resemble mitochondria (m). (c) The cell of Blastocystis sp. is encased in a surface coat (sc). 500 nm bars for (b) and 2 mm bars for (a) (c).

MORPHOLOGY

Three main forms of the organism—vacuolar, granular, and ameboid—have frequently been mentioned in reports of the morphology of B. hominis from culture specimens [23–24]. Additional forms of the organism may exist, according to a number of studies of B. hominis from feces and the human gut [25–27], albeit these forms have not yet been mentioned in diagnostic texts. Light microscopy continues to provide a rapid method for recognizing Blastocystis spp. in samples, despite the fact that almost all new data on the biology and cycle of life of B. hominis has been generated by transmission electron microscopy. B. hominis has a range of morphological shapes, and how an organism looks will depend on its surroundings, according to recent ultrastructural investigations [28–29]. Physical elements can affect an organism's morphology both in vivo and in vitro, including osmotic shifts, the presence of specific medications, and metabolic condition. Because B. hominis in stool specimens is typically characterized by the presence of forms measuring 10 to 15 mm diameter with a large central vacuole, this variation in morphology has significant diagnostic significance. Recent research, however, suggests that this form of B. hominis is not the most prevalent form seen in fresh stool specimens [29]. Smaller forms, such as multivacuolar and cyst forms (about 5 mm in diameter), have been found in fecal samples [26–27], which raises the possibility that many B. hominis infections go undiagnosed in lab tests. Even for seasoned laboratory staff, recognizing B. Due to the paucity of information on forms other the vacuolar form, the small size of other forms, and the organism's distinctive look in some specimens, studying hominis could be difficult.

VACUOLAR AND GRANULAR FORMS

The "central-body" or vacuolated form of B is also known as the vacuolar form. According to some researchers, hominis [24] represents the normal Blastocystis cell shape. This form is typically used to diagnose B. anthropoid [30–32]. It can be discovered in fecal samples and is the main form of the organism in culture [33]. B in granular form. Aside from having differing core vacuole contents in terms of morphology and cytochemistry, hominis shares an ultrastructure with the vacuolar form [34].

AMEBOID FORM

There are numerous conflicting reports on the morphology of B. hominis' ameboid form, which has only been reported infrequently [35]. Standardization of the nomenclature is necessary because this form has been referred to as the ameba-like form and other forms [36].

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CYST FORM

A tiny, resistant form of B. hominis was mentioned in a number of early investigations [37–38], but until recently, the existence of a cyst form was unclear. It is necessary to change the modern definition of the species [24], which still states that B. hominis does not have a cyst form. Mehlhorn [40] discovered cyst-like forms in the fresh feces of an AIDS patient, but it wasn't until Stenzel and Boreham's work [27] that a thorough A description of the cyst form's morphology was provided.The cyst forms were occasionally identified in laboratory cultures as well as in fecal matter that had been held for a few days before being fixed.

OTHER FORMS

Although it cannot be ruled out, the existence of more B. hominis species is still uncertain. Although Zierdt's study [24] observed the occurrence of a variety of other cell types in culture, but no proper descriptions were given, and further study has not supplied evidence for their existence. However, the influences of osmotic pressure, pH, the temperature, and chemical content of the culture media have not yet been thoroughly evaluated. the impact of growing circumstances on B's form. Recently, the topic of humans has been discussed [27]. It has been hypothesized that B. hominis's morphology is also influenced by the metabolic status of its cells. Therefore, it is crucial to distinguish between morphological changes caused by the microenvironment, cell physiology, and different life cycle stages before identifying new forms of B. hominis [34].

LIFE CYCLE AND TRANSMISSION

Numerous morphological variants of Blastocystis, including vacuolar, granular, amoeboid, and cyst form, have been identified through microscopic investigations of the organism [41]. These forms' roles are mainly unknown, while different life cycles have been suggested [41–42]. Each of these life cycles have, however, been demonstrably proven. It is assumed that faecal-oral transmission is how blastocystis spreads [41]. Studies from Thailand and China [43–44] have identified untreated water consumption as a source of transmission. Although the subject of foodborne transmission has not received much research, Blastocystis has been found in leafy vegetables in Saudi Arabia [45] and a Chinese study linked Blastocystis ST1 to intake of raw water plants [44]. Uncertainty surrounds the occurrence of person-to-person transfer. All of the household members of 11 symptomatic Blastocystis carriers in an Australian research also had the infection, indicating either person-to-person transmission or a shared source of transmission [46]. A US epidemiological investigation of 50 families discovered 10 people with Blastocystis, but no instances of two or more carriers in the same family [47]. In contrast. Although it is challenging to pinpoint the direction of zoonotic transmission between humans and animals, subtyping investigations have discovered suggestive evidence of it, particularly among animal workers [48–52]. The B. hominis life cycle was depicted in Figure 2.

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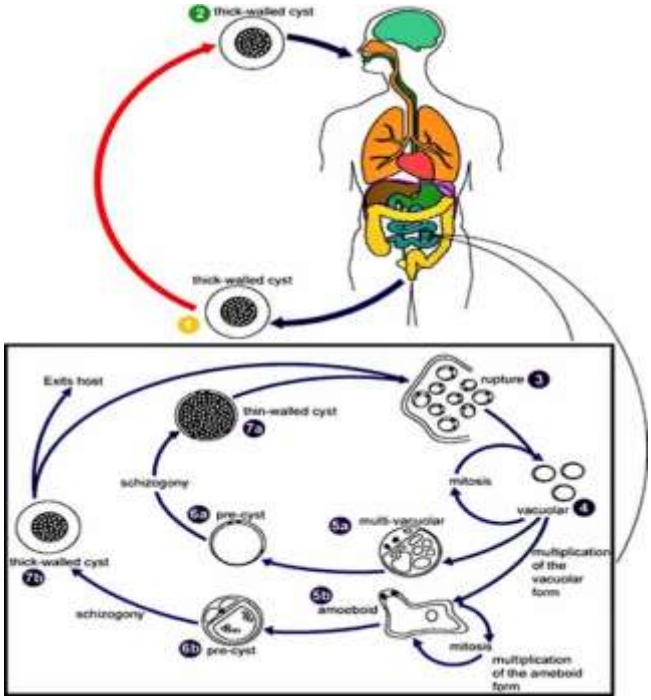

Figure (2): life cycle of *B. hominis*

SIGNS AND SYMPTOMS

Constipation, anorexia, bloating, stomachache, interchanging diarrhea, watery diarrhea, mucus diarrhea type, vomiting condition, electrolyte imbalance, loss of the body weight, lassitude, condition of dizziness, flatulence, purities [53], chronic urticaria [54] as shown in figure (3), ulcerative colitis [55], and the advancement of iron deficiency anemia [56] are the most common complaints of blastocystosis patients. According to research, this parasite is a significant contributor to the cause of irritable bowel syndrome (IBS) [57].

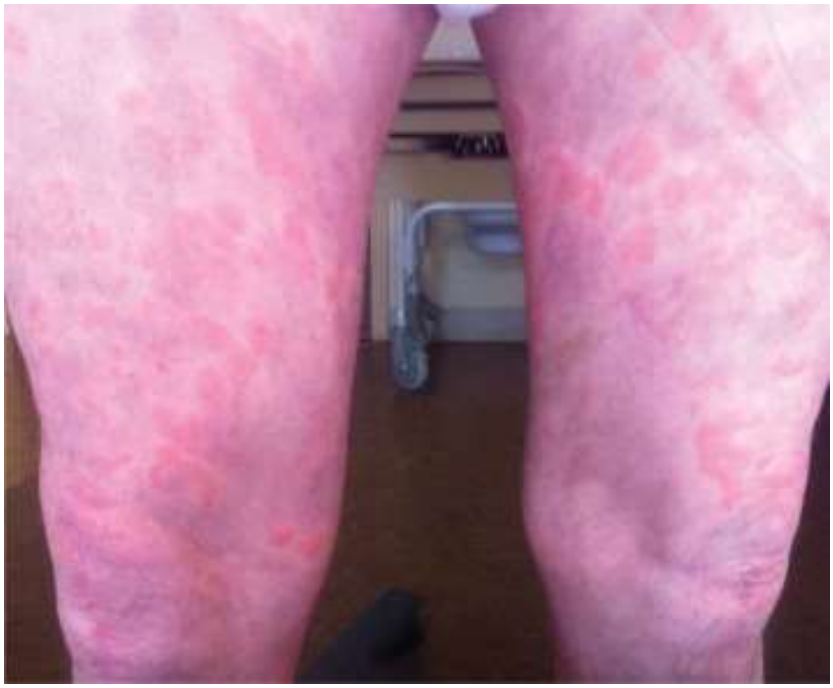

Figure (3): Chronic urticaria caused by Blastocystis hominis.

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DIAGNOSIS TOOLS

Direct smear analysis under a light microscope or xenic in vitro cultivation are the two most used methods for finding Blastocystis sp. [3]. This method appears to have significantly underestimated Blastocystis sp. in the context of diagnosing enteric parasites, given the presence of several forms of this parasite (especially the little perceptible cystic form), decline brought on by environmental variables or medication, and the fact that Blastocystis sp. can be mistaken for other microorganisms. Due to the many ways isolates might develop in selective medium, cultivating this parasite takes time and may skew subsequent genotyping [58]. Therefore, Numerous PCR-based diagnostic methods that use feces either directly or after faecal samples have been cultured have been described [58-59]. These approaches aim to address these constraints. The PCR strategy was equally sensitive as the culture approach, according to studies [60–61] comparing the product of higher quality of these numerous diagnostic approaches. More recently, Blastocystis sp. was detected in stool samples using a highly sensitive real-time quantitative PCR (qPCR) technique, according to Poirier and colleagues [62]. The small subunit rRNA gene is the target of this assay, which enabled subtyping of isolates through direct sequencing of qPCR results. Additionally, utilizing the SSU-rDNA marker and stool samples, Stensvold and associates created a qPCR that included an internal process control that allowed for the assessment of probable PCR inhibitors. This method had the benefit of improving specificity while preventing the amplifying of false positives. As a result, SSU-rDNA genotyping is currently the preferred diagnostic technique [63].

PATHOPHYSIOLOGY OF BLASTOCYSTOSIS

One of the major obstacles to comprehending the pathogenesis of Blastocystis sp. is the lack of animal models to test Koch's premise. However, a number of recorded tests were carried involving different animals [3]. Due to these, it was determined that laboratory mice were not suitable animal models. Even though some mice did lose weight and become lethargic, the majority of illnesses were self-limiting. A histopathological finding of the colon and cecum, however, uncovered mucosal sloughing, oedematous lamina propria, and significant inflammatory cell infiltration [12]. Additionally, these authors demonstrated that mice's sensitivity to Blastocystis sp. varied with their age.

TREATMENT OF BLASTOCYSTOSIS

When diarrhea is persistent and only Blastocystis sp. is found in fecal samples, this treatment is typically explored [64]. Metronidazole is regarded as the first-line treatment in this instance for Blastocystis sp. infection [65–66]. In a preliminary analysis of this medication's effectiveness, Infected individuals with Blastocystis sp. who are immunocompetent, according to Nigro et al., as the only readily apparent causative agent of diarrhoea responded to metronidazole therapy, leading them to hypothesize that intestinal parasites cause disease [66].

CONCLUSIONS

fresh data on pathogeny, epidemiological studies, and most recent times the first full genome sequence of Blastocystis sp. have all contributed to the growing interest of the medical and scientific communities in this organism.

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