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OPEN LETTER

Advancing research on *Blastocystis* through a One Health approach

[version 1; peer review: 3 approved]

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Abstract

Blastocystis is the most prevalent intestinal eukaryotic microorganism with significant impacts on both human and animal health. Despite extensive research, its pathogenicity remains controversial. The COST Action CA21105, "*Blastocystis* under One Health" (OneHealthBlastocystis), aims to bridge gaps in our understanding by fostering a multidisciplinary network. This initiative focuses on developing standardised diagnostic methodologies, establishing a comprehensive subtype and microbiome databank, and promoting capacity building through education and collaboration. The Action is structured into five working groups, each targeting specific aspects of *Blastocystis* research, including epidemiology, diagnostics, 'omics technologies, *in vivo* and *in vitro* investigations, and data dissemination. By integrating advances across medical, veterinary, public, and environmental health, this initiative seeks to harmonise diagnostics, improve public health policies, and foster innovative research, ultimately enhancing our understanding of *Blastocystis* and its role in health and disease. This collaborative effort is expected to lead to significant advancements and practical applications, benefiting the scientific community and public health.

Plain Language Summary

Blastocystis is a common microorganism found in the intestines of humans and animals. Its role in causing disease is still debated among scientists. The "*Blastocystis* under One Health" initiative aims to unite experts from human medicine, veterinary science, and environmental science to better understand this microorganism and its health effects.

The project focuses on improving diagnostic methods, creating a comprehensive database of *Blastocystis* samples, and analysing its

Open Peer Review

Approval Status ✓ ✓ ✓

	1	2	3
version 1 12 Jul 2024	✓ view	✓ view	✓ view

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3. **Arutchelvan Rajamanikam**, University Malaya, Kuala Lumpur, Malaysia

Any reports and responses or comments on the article can be found at the end of the article.

genetic and molecular makeup. Researchers will also study how *Blastocystis* interacts with other gut microbes and impacts gut health. Additionally, the initiative aims to educate healthcare professionals and the public about *Blastocystis*.

By working together, scientists hope to develop better ways to diagnose, treat (if necessary), and/or prevent *Blastocystis* infections, ultimately protecting both human and animal health and enhancing our understanding of this widespread microorganism.

Keywords
Blastocystis, One Health, Epidemiology, Diagnostics, Microbiome, 'Omics data, in vivo studies, Public Health

This article is included in the COST Actions gateway.

This article is included in the Blastocystis collection.

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Author roles: Tsaousis AD: Conceptualization, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Gentekaki E**: Writing – Review & Editing; **Stensvold CR**: Conceptualization, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

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The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Introduction

We are writing to emphasise the importance of comprehensive research on *Blastocystis* using a One Health approach. Integrating medical, veterinary, public, and environmental health research is essential to understanding the role of *Blastocystis* in health and disease. Despite its prevalence in over one billion people[1] and numerous animal species, the role of *Blastocystis* in health and disease remains controversial[2]. Current studies offer conflicting views, necessitating a unified approach to unravelling its true impact on health[3].

Background and importance

Blastocystis (Figure 1) is a ubiquitous intestinal eukaryotic microbe found in both humans and animals. Emerging data suggest that its prevalence in herbivorous animals is higher than previously thought[4,5]. Despite numerous studies, there is still significant debate regarding its pathogenicity. While some researchers consider *Blastocystis* to be a harmless commensal organism, others consider it as a cause of gastrointestinal symptoms[3,6]. This ambiguity highlights the need for a comprehensive and integrated research approach under the One Health perspective[7].

The European Cooperation in Science and Technology (COST) Action CA21105, titled "*Blastocystis* under One Health" (OneHealthBlastocystis), seeks to address these challenges by fostering a multidisciplinary network of researchers and professionals[8,9]. This initiative aims to harmonise diagnostic methodologies, establish a comprehensive databank and biobank, and promote information sharing and capacity building among stakeholders. By integrating advances across medical, veterinary, public, and environmental health domains, we can develop a more nuanced understanding of *Blastocystis* and its implications for health and disease.

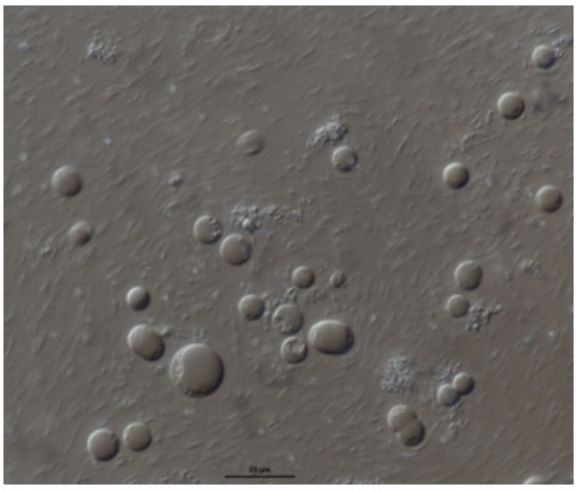

Figure 1. Overview of *Blastocystis* cells in xenic culture. Microscopy picture provided by Dr Vasana Jinatham (Mae Fah Lunag University, Thailand).

Objectives and goals

The primary objective of the COST Action CA21105 (8 see MoU) is to create a multidisciplinary network to enhance research on *Blastocystis*. The specific goals of this initiative include:

- Developing standardised methodologies for the detection and subtyping of *Blastocystis* to ensure consistency and reliability in research findings.

- Establishing a comprehensive *Blastocystis* subtype databank and biobank and microbiome databank to consolidate existing data and facilitate new research.

- Promoting capacity building through training schools, workshops, and short-term scientific missions (STSM) to expand expertise and foster collaboration among researchers, clinicians, and public health professionals.

- Disseminating knowledge and fostering communication with veterinarians, physicians, and the general public to increase awareness and understanding of *Blastocystis*.

Working groups and their aims

The initiative is structured into several working groups (Figure 2), each with specific aims and tasks to address different aspects of *Blastocystis* research:

WG1: Mapping *Blastocystis* epidemiology and diagnostics

- Objective: Harmonise diagnostic methodologies and interpretive criteria across Europe.

- Tasks: Review current practices, introduce quality assurance mechanisms, and assess microbiological practices. This group aims to create a common understanding of *Blastocystis* under the One Health umbrella by identifying and addressing gaps in current diagnostic approaches.

WG2: *Blastocystis* collection and database

- Objective: Establish and maintain both a databank and biobank of *Blastocystis* subtypes and microbiome data.

- Tasks: Develop material and data transfer agreements, create a comprehensive database including epidemiological and 'omics data along with a subtypes database. The databank, subtypes database, along with a subtype's biobank, will be crucial resources for researchers, providing access to standardised data and facilitating collaborative studies.

WG3: *Blastocystis* 'omics generation and analyses

- Objective: Analyse genomic, proteomic, and metabolomic data to better understand *Blastocystis*.

- Tasks: Organise and analyse existing genomic data, generate new 'omics data, and integrate findings into the database. This group will focus on understanding the molecular and genetic aspects of *Blastocystis*, contributing to a deeper knowledge of its biology and potential pathogenicity.

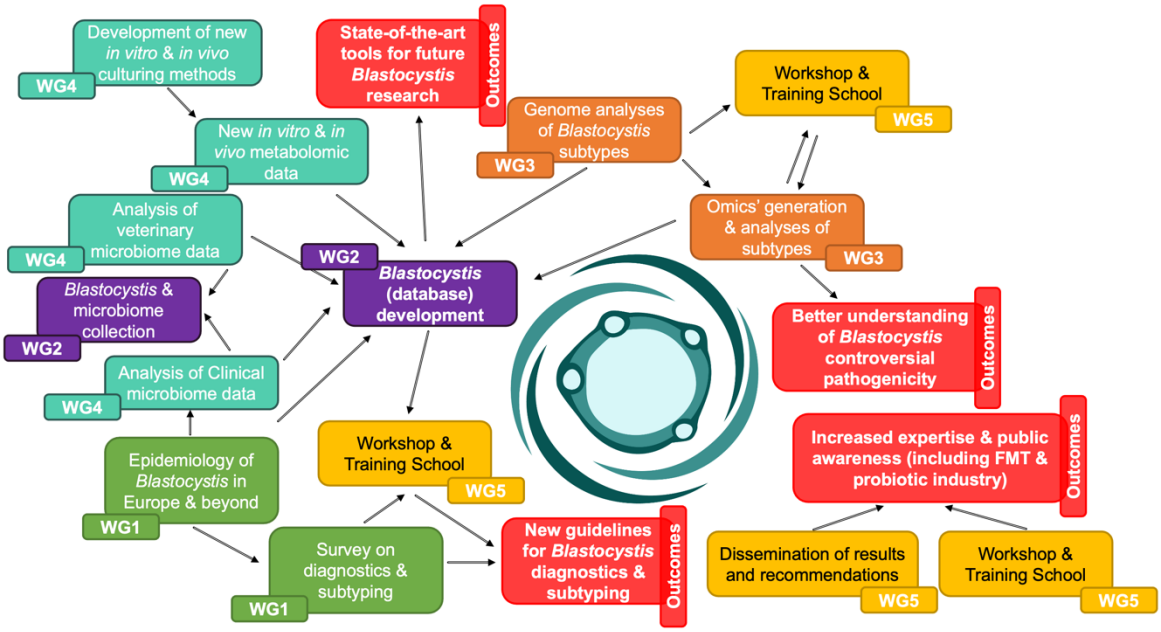

Figure 2. PERT chart summarising the holistic approach of the *Blastocystis* under One Health COST Action.

WG4: *Blastocystis* in vivo and in vitro investigations

- Objective: Investigate the role of *Blastocystis* in the gut microbiome and develop culturing methods.

- Tasks: Analyse microbiome data from humans and animals, develop protocols for culturing *Blastocystis*, and compare metabolomic data. This group aims to explore the interactions between *Blastocystis* and other gut microbes, providing insights into its ecological role and potential health effects.

WG5: Dissemination and education

- Objective: Promote knowledge dissemination and educational activities.

- Tasks: Develop an Action website, produce teaching materials, coordinate training schools and workshops, and publish an open-access book on *Blastocystis* research. This group will ensure that the findings and methodologies developed during the project are widely shared and accessible to both the scientific community and the public.

Capacity building

The CA21105 COST Action aims to build a sustainable network of stakeholders from various disciplines and countries. Focus areas include:

- Facilitating training schools, workshops and STSMs to expand expertise. By organising training schools and workshops, the Action will provide opportunities for researchers, clinicians, and other stakeholders to enhance their skills and knowledge in *Blastocystis* research.

- Encouraging involvement of young researchers and innovators, especially from countries with limited resources. This initiative places a strong emphasis on supporting early-career researchers and ensuring that expertise is built across a wide geographical area, including regions with fewer resources.

Future prospects

The Action outlines future research initiatives to understand *Blastocystis* better and support the development of potential market applications (e.g. inclusion of *Blastocystis* in faecal microbiota transplantations or as probiotic formulations in both humans and other animals). The comprehensive databank and standardised methodologies developed by this initiative will serve as valuable resources for future studies. By harmonising diagnostics and fostering collaboration, the Action aims to improve public health policies and advance our understanding of *Blastocystis*.

Specific future prospects include:

- Developing novel hypotheses to test the role of *Blastocystis* in the gut ecosystem, health, and disease. This could lead to ground-breaking discoveries about its interactions with other microorganisms and its impact on gut health.

- Expanding knowledge on the prevalence and subtype distribution of *Blastocystis* in humans and animals. This information is crucial for understanding transmission dynamics and identifying potential zoonotic and environmental sources of infection.

- Generating new insights into the biology and ecology of *Blastocystis*. Researchers can gain a deeper understanding of its role in health and disease by studying its interactions with the gut microbiome and its responses to different environmental conditions.

- Developing new diagnostic tools and treatment guidelines. The standardised methodologies and comprehensive databank will enable the development of more accurate and efficient diagnostic tools and evidence-based treatment guidelines.

- Promoting the use of *Blastocystis* as a model organism and potential probiotic. The initiative will explore the potential of *Blastocystis* to be used as a model organism for studying gut microbiota and as a probiotic for promoting gut health.

Conclusion

By adopting a One Health approach, this initiative will significantly advance our understanding of *Blastocystis*. We call on the global research community to collaborate in this multidisciplinary effort to improve health outcomes. The COST Action CA21105, "*Blastocystis* under One Health" (OneHealthBlastocystis), represents a unique opportunity to bridge gaps in current knowledge, harmonise diagnostic methodologies, and promote innovative research. Through the collaborative efforts of researchers, clinicians, public health professionals, and other stakeholders, we can develop a more comprehensive understanding of *Blastocystis* and its role in health and disease. This initiative will not only contribute to scientific knowledge and development but also have practical applications in public health, diagnostics, and treatment.

We urge readers to support this crucial initiative and encourage researchers from diverse fields to join this collaborative effort. Together, we can achieve significant advancements in *Blastocystis* research and improve health outcomes for people and animals worldwide.

Disclaimer

The views expressed in this article are those of the authors. Publication in *Open Research Europe* does not imply endorsement by COST Actions.

Ethics and consent

Ethical approval and written consent were not required.

Data availability statement

No data are associated with this article.

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Open Peer Review

Current Peer Review Status: ✔ ✔ ✔

Version 1

Reviewer Report 05 August 2024

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✔ **Arutchelvan Rajamanikam**
University Malaya, Kuala Lumpur, Malaysia

The open letter clearly describes and explains the purpose of studying Blastocystis in One Health context while also addressing the different aspects of Blastocystis.

It would be a good idea to include the current awareness & understanding of Blastocystis in participating countries as this will clearly show the gaps in research that this action purports to fulfil.

The authors may also consider expanding a bit more on the purposes and importance of each working group in the field of Blastocystis research.

I hope the authors would give equal importance on the influence of microbial flora on Blastocystis. It should not left out in understanding of Blastocystis-microbiota interaction.

The article is otherwise scientifically sound and concise.

P/S: there is a spelling mistake in figure 1, name of the university is spelled wrongly.

Is the rationale for the Open Letter provided in sufficient detail? (Please consider whether existing challenges in the field are outlined clearly and whether the purpose of the letter is explained)
Yes

Does the article adequately reference differing views and opinions?
Yes

Are all factual statements correct, and are statements and arguments made adequately supported by citations?

Yes

Is the Open Letter written in accessible language? (Please consider whether all subject-specific terms, concepts and abbreviations are explained)
Yes

Where applicable, are recommendations and next steps explained clearly for others to follow? (Please consider whether others in the research community would be able to implement guidelines or recommendations and/or constructively engage in the debate)
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Intestinal parasitology, Gut microbiome, host-parasite interaction

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 01 August 2024

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Małgorzata Lepczyńska
Department of Medical Biology, School of Public Health, Collegium Medicum, University of Warmia and Mazury, Żołnierska 14 C, Poland

The Letter is generally well-organized, very clearly and logically written. Overall, the initiative is undoubtedly impactful and crucial for World's healthcare landscape.
The initiative addresses a critical gaps in the current problems in methodology of *Blastocystis* detection as well as its biology, pathogenicity and treatment which may lead to misunderstanding of its true nature.
This Open Letter introduces to the reader the main challenges we are facing in research on *Blastocystis*. The authors pointed out some important concepts as:
- developing methodologies for the detection and subtyping of *Blastocystis* so the research findings can be more reliable than the results indexed previously;
- establishing a *Blastocystis* subtype and microbiome databank to make a new research easier to all scientists as well as to consolidate existing data;
- promoting training schools and workshops to expand expertise among researchers and health professionals;
- disseminating knowledge and improving communication between researchers and veterinarians, physicians, and the general public to increase awareness and understanding of *Blastocystis* to finally not underestimate its power.

The structure of several working groups is presented on the figure, what is a helpful addition that makes the content more accessible and clear.
The authors underlined how important the multidisciplinary program is, according to the nature of mysterious *Blastocystis*. Because the pathogenicity or commensal nature depends on the *Blastocystis* subtype, the geographic area or the gut microbiota composition, it is necessary to invite a large group of researchers and professionals of a various disciplines.
In the Letter the authors make the reader aware of the initiative importance: many medical branches will develop – starting from laboratory staff (methodology) through the researchers, public health professionals, ending on the clinicians and veterinarians according to the treatment.
The authors invite the reader to support their initiative as well as the researchers to join as a part of that cooperative community so the *Blastocystis* research network may be larger and give more effective results.
I strongly recommend approval of this manuscript.

Is the rationale for the Open Letter provided in sufficient detail? (Please consider whether existing challenges in the field are outlined clearly and whether the purpose of the letter is explained)
Yes

Does the article adequately reference differing views and opinions?
Yes

Are all factual statements correct, and are statements and arguments made adequately supported by citations?
Yes

Is the Open Letter written in accessible language? (Please consider whether all subject-specific terms, concepts and abbreviations are explained)
Yes

Where applicable, are recommendations and next steps explained clearly for others to follow? (Please consider whether others in the research community would be able to implement guidelines or recommendations and/or constructively engage in the debate)
Not applicable

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: medical parasitology (mainly Blastocystis), microbiology, medical biology, medical education

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 01 Aug 2024
Anastasios Tsaousis

We would like to thanks the reviewer for the positive response on our manuscript. Kind regards, Anastasios Tsaousis

Competing Interests: No competing interests were disclosed.

Reviewer Report 30 July 2024

https://doi.org/10.21956/openreseurope.19502.r42144

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Anna Lass
Medical University of Gdańsk, Gdynia, Poland

In my opinion, the article can be indexed as it is. It does not require linguistic or substantive corrections.
The letter presents the assumptions of the COST Action CA21105 "*Blastocystis* under One Health" in an accessible and concise way, emphasizing the importance of the topic undertaken jointly within an international, interdisciplinary network. The ideas, goals and challenges of the individual working groups established in this project are clearly presented as well.
The authors of the letter rightly highlight the crucial importance of integrating medical, veterinary, public and community research in understanding the nature of *Blastocystis*, thereby clearly demonstrating the appropriateness of undertaking multicenter cooperation in the spirit of the "One Health" approach.

Is the rationale for the Open Letter provided in sufficient detail? (Please consider whether existing challenges in the field are outlined clearly and whether the purpose of the letter is explained)
Yes

Does the article adequately reference differing views and opinions?
Yes

Are all factual statements correct, and are statements and arguments made adequately supported by citations?
Yes

Is the Open Letter written in accessible language? (Please consider whether all subject-specific terms, concepts and abbreviations are explained)
Yes

Where applicable, are recommendations and next steps explained clearly for others to

follow? (Please consider whether others in the research community would be able to implement guidelines or recommendations and/or constructively engage in the debate)
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: parasitology; epidemiological studies on the occurrence of Blastocystis in human, animal and environmental material, with particular emphasis on molecular and phologenetic studies

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 01 Aug 2024

Anastasios Tsaousis

We would like to thanks the reviewer for the positive response on our manuscript. Kind regards, Anastasios Tsaousis

Competing Interests: No competing interests were disclosed.