This is what the microorganisms living in women’s wombs are like

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It is said that we are born 100 per cent human but that, upon death, we are 90 per cent microbial. In fact, fe
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In recent years, the advent of the ‘omics’ sciences (which enable the study of a large number of molecules involved in the functioning of an organism) has revolutionised biomedicine. These have made it possible to analyse microorganisms that could not be detected using traditional culture methods.

Exploring the microbiota in the absence of disease

Microbiome analysis enables us to examine the full range of microorganisms that reside in our bodies. Thanks to this, we now know that the majority of bacterial communities present in humans coexist without causing harm. In fact, they provide many benefits.

For example, in certain areas, such as the gut, greater microbial diversity may be linked to good health. Conversely, an imbalance in this relationship can lead to disease.

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Historically, however, research into the microbiota has focused on its altered states. Consequently, its ‘normal’ physiology or state had taken a back seat.

Consequently, determining the microbial composition in the absence of pathology is the starting point for the development of diagnostic and therapeutic methods.

In this context, the Human Microbiome Project was launched worldwide in 2007 with the aim of identifying the set of microorganisms that inhabit the human body without causing harm and establishing the appropriate methodology for their study.

This project sought to determine whether there was any association between the microbiome and health. Its initial findings showed that each part of the human body harboured its own distinctive microorganisms.

This opened up new possibilities for improving human health through the monitoring and modulation of the microbiome.

Who lives in the womb?

Microbial diversity varies throughout the human body and, in the context of reproduction and fertility, the vagina is known to harbour a highly active microbiota.

In terms of women’s or gynaecological health, a healthy vaginal microbiota includes species of the genus Lactobacillus. Any changes in the composition of bacterial communities could affect a woman’s health and even have an impact on her reproductive health.

However, until very recently, it was assumed that the human uterus was a completely sterile environment. Scientists believed that microbial invasion of the uterus only occurred in pathological perinatal conditions. Consequently, fertilisation and embryonic development were thought to take place in a sterile environment.

Early studies suggested that the uterus harboured its own microbial community, but it was not known whether these microbes were alive or, on the contrary, were merely sequences of degraded microbial genetic material.

Now, a new study by the University of Granada, the López Neyra Institute of Parasitology and Biomedicine (IPLN) of the CSIC and the Virgen del las Nieves Hospital in Granada, published in *Human Reproduction*—one of the world’s most prestigious journals in the field of human reproduction—has described and analysed the active microbiota inhabiting the uterus of women. As a result, more than 5,300 different microorganisms (including viruses, bacteria and fungi, amongst others) have been identified.

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Furthermore, it has been established that the composition of these microorganisms changes throughout the menstrual cycle. In other words, both their composition and their functions change, suggesting that this microbiota may be influenced by the hormonal changes that occur throughout the menstrual cycle.

All of this suggests that microorganisms may play an important role in the functions of the endometrium. Specifically, in preparing the uterus for embryo implantation and a successful pregnancy. However, the role of microbes in the physiology of the uterus requires further research.

Microorganisms in action

Furthermore, thanks to this new modelling approach (based on computer simulation), it has been possible not only to determine the presence of microorganisms, but also to suggest the metabolic processes in which they are involved within the organ.

All living cells are involved in metabolic pathways, but the way in which human and microbial cells might influence one another had not been explored until now.

This study has shown, for example, that during the phase in which the embryo implants, microorganisms are involved in the biosynthesis of prostanoids (derivatives of essential fatty acids) and the metabolism of L-tryptophan, both of which are crucial for pregnancy to be established.

These are the first glimpses of the possible interaction between host and microorganism, but further studies are needed to understand microbial functions in the human uterus.

Research such as this paves the way for the identification of minimally invasive microbial biomarkers and improvements in gynaecological treatments, with clinical and therapeutic implications at the uterine level that are as yet unknown.

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