Applicant 3

Biography

In 2021, as I was entering the last trimester of my Bachelor of Biomedical Science, I realised that reading and writing about human biology and health—rather than conducting lab experiments—was the work that I had enjoyed the most. This realisation (and a late-night Google search) led me to discover medical writing. Requiring both an interest in medicine and health care and a flair for writing, and providing the opportunity to learn through desktop research rather than lab work, medical writing peaked my interest immediately and I knew this was the career for me.

Throughout university, I wrote about a variety of biomedical topics—from literature reviews on epigenetics and the brain and the applications of induced pluripotent stem cells, to PowerPoint presentations on genome sequencing and Darwinian evolution; from a report on the ethics of genome editing for xenotransplantation, to an illustrated piece of long-form writing on the evolution of contraception. For the last trimester of my master's, I completed a 10-week placement with the (Institute name redacted) at (Hospital name redacted), where I contributed to the production of several medical communication outputs. Extended for a further two months, this was my first experience of working in a medical environment, and writing extensively about the institute's fascinating clinical trials strengthened my interest in pursuing medical writing.

Scientific research and information can seem like a maze of jargon, acronyms and long sentences to those unfamiliar. So, in my future career as a medical writer, I hope to contribute to reducing this barrier by producing accurate, timely and appropriately detailed medical and health content that is understood by its readers—whether that be doctors, regulatory bodies, government departments or the general public. I also hope that being a medical writer will allow me to never stop learning about medicine and health and the developments being made in these fields. I think that having a career in which I can play to my skills while still broadening my knowledge is a winning combination.

With an ever-increasing amount of research being conducted and developments being made that are relevant to human health and medicine, it has never been more important for this work to connect with those who can benefit from it most. I therefore see medical writers as the facilitators of these connections—a bridge of communication between medical and health research communities and wider society.

Friend or foe? How bacteria in the uterus may influence IVF outcome

The baby boom has gone bust.

Having almost halved from approximately five children per woman in 1950 to roughly two in 2021[1], the global fertility rate has been steadily plunging for decades.

While not having biological children is a deliberate choice made by some, for 48 million individuals and 186 million couples across the world, their absence is anything but, and carries with it significant social and psychological consequences[2].

A widespread health issue, infertility is defined by the World Health Organisation as "the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse"[3].

When conceiving naturally becomes an unlikely possibility, reproductive technologies such as in vitro fertilisation (IVF) can be used—but it too can fail. However, research investigating the microbial composition of the uterus in women undergoing IVF has revealed its influence on embryo implantation, sustained pregnancy and live birth rates[4].

Accounting for 1-3% of total human body mass and approximately equal in number to human cells, bacteria and other microorganisms greatly influence our health[4].

The microbiota is the variety of microorganisms present in a particular environment[4]. The microbiota of the female reproductive tract has commonly been inferred from the vaginal microbiota, as it has been researched in much more depth due to it being more accessible[5], thus reducing the chance of sample contamination that would make findings invalid.

In 2002, the vaginal microbiota was identified, with species of the bacterial genus *Lactobacillus* being linked to the optimal health of genital and urinary organs[4]. The vaginal microbiota's composition has been observed to be different in pregnant and non-pregnant woman, and the build-up of bacteria that can cause bacterial vaginosis has been linked to increased rates of miscarriage and premature birth[4].

These findings can lead us to assume the same of the endometrial microbiota, but the endometrium—the innermost uterine layer where an embryo implants—was once long thought to be sterile[4]. Two studies conducted in 1964[6] and 1967[7] on endometrial sterility came to conclusions that were opposite of each other[8], with the latter concluding that the past study's results that seemingly proved the existence of an endometrial microbiota were actually the result of samples being contaminated[7].

Since then, studies challenging the dogma of uterine sterility by investigating the endometrial microbiota's existence have discovered that the endometrium does in fact house many microorganisms[8,9]. With our skin and gut being extensively populated by microscopic life which play an important role in our health[10], is it not logical to wonder if the endometrial microbiota plays a role in female reproductive health?

In 2016, discovering this lack of thorough research, Dr. Inmaculada Moreno and colleagues in Spain investigated its composition to determine if is different to that of the vagina and if it plays a role in the outcome of IVF treatment[4].

Comparison of vaginal and endometrial samples from fertile women showed that although *Lactobacillus* was the most common bacteria in both, the two environments house different microbiotas, with the endometrial samples having far greater bacterial diversity[4]. These results show that, while not entirely exclusive, the endometrial microbiota is not a “carry over” from the vaginal microbiota.

Analysis of further endometrial fluid samples allowed researchers to classify an endometrial microbiota as *Lactobacillus*-dominated if more than 90% of the bacteria identified was *Lactobacillus*, and non-*Lactobacillus*-dominated if less than 90%[4].

Having demonstrated the abundance of *Lactobacillus* in the endometrial microbiota, researchers tested endometrial samples from 35 women undergoing IVF and monitored their treatment outcomes—would those with *Lactobacillus*-dominated endometria be met with more success? Would other bacteria have an influence as well?

According to this study’s findings, the answer to both of these questions is *yes*. Women with a *Lactobacillus*-dominated endometrial microbiota had rates of success in embryo implantation, pregnancy, continued pregnancy (no miscarriage) and live birth that were several times greater than those of women with an endometrium not dominated by *Lactobacillus*[4].

Interestingly, lower success rates were especially observed in women with high abundances of the bacteria *Gardnerella* and *Streptococcus*, where these women did not become pregnant or their pregnancy ended in miscarriage[4].

In 2022, Dr. Moreno revisited this research, this time conducting a larger study by collecting endometrial fluid samples from 342 women across 13 countries undergoing assisted reproduction treatment[11]. Similarly, findings demonstrated that the composition of the endometrial microbiota is a useful predictor of treatment success[11]. *Lactobacillus* was once again highly abundant in women who achieved a live birth, while *Gardnerella, Streptococcus* and other disease-causing bacteria were linked with unsuccessful treatment outcomes[11].

Numerous other researchers have conducted similar studies and produced results concordant with those of Dr. Moreno[12,13]. With this steadily growing collection of research demonstrating the influence that the composition of the endometrial microbiota has on IVF success, the importance of continuing this line of investigation cannot be overstated.

When considering how to improve assisted reproductive treatment strategies and success—and thus reduce the struggles with infertility being experienced by millions worldwide—we must not just look outward at eggs and sperm in petri dishes, but also *inward* to the microbial friends and foes present in the implantation environment of the uterus.

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