

# How “Menstruation Science” Will Revolutionize Biomedical Research

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Despite much hoopla around “Women’s Health” in the popular press, the investment community, and academia, the “ick factor” and mysteriousness of human menstruation arguably remains a force field that repels talent and resources from flowing into diverse areas of women’s health. Gynecology remains one of the least-funded areas of human health. At the same time, research and development in many chronic inflammatory diseases – which often skew female – is hindered by the use of poorly representative animal models for disease mechanisms and therapeutic validation. The animal-human gaps, especially in immunology, have spurred two concurrent technological developments that are now merging: systems biology/immunology and microphysiological systems (aka “organs on chips”, or living patient avatars). The NIH is launching the “Complement-ARIE” (Complement Animal Research In Experimentation) program to bolster technology development and deployment in this merger of systems biology and microphysiological systems. In this talk, I propose that gynecology presents fascinating opportunities for setting the performance bar for new technologies that will have broad applicability in all of biomedical research – especially in Microphysiological Systems (MPS), or what we call “living patient avatars”. Detailed examples of engineering avatars for endometriosis will provide specific technical insights, and motivate mechanistic connections between menstruation processes and other chronic inflammatory diseases that skew female. We envision that exploiting this wave of humanization efforts by using gynecological problems as the first application will not only direct new funding into gynecology, but have a tremendous impact on “menstruation science” as a foundation for the many ramifications on systemic health imposed by the requirements of human female reproduction.