

One of the most promising areas of inquiry in our search for the causes of and preventions for premature birth is the interaction between the mom and her microbiome, which is the community of microorganisms in her body. We know that inflammation as a result of infection is responsible for at least 50 percent of all cases of premature birth. And typically, that infection triggers a complex series of actions and reactions. These include the activation of cells of the immune system, such as neutrophils, which can precipitate the physical transformations of collagen breakdown, cervical shortening, fetal membrane stretch, contractions and ultimately, premature labor and birth. Although we know



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some details about how that process works, up until now, we haven't known why. For this reason, we've turned to some brilliant minds in microbiology and cell-to-cell communications for help.

That help will arrive in the form of the newly formed sixth March of Dimes Prematurity Research Center at

Imperial College London. There are many reasons why Imperial College London is an ideal fit. They've been collaborating and sharing information with March of Dimes Prematurity Research Centers (PRCs) for a number of years. And like the other centers, they specialize in researching the causes of and preventions for premature birth. Ultimately, Imperial College was motivated to apply, and was selected, because of their global leadership, unique expertise and pioneering work in the field of glycobiology, including its links to the immune system and premature birth.

Glycobiology is the study of sugar molecules that coat all cells, both human and bacterial. In the birth canal, these molecules perform a kind of "handshake" that either activates or deactivates immune responses that can in turn, either trigger or prevent premature birth. But like everything else in the study of premature birth, this process is even more complicated than

it seems. In some women, for example, certain types of bacteria like Lactobacillus in the birth canal protect against other groups of bacteria, such as Streptococcus, Staphylococcus and E. coli, entering the birth canal and infecting the mom, baby or both. But in other women, some types of Lactobacillus may perform the opposite function, triggering premature birth and putting both mom and baby at risk.

The expertise of Imperial College London in this area is unmatched by any other institution and not covered by the work of any other PRC in the March of Dimes network. It is however complementary to the research themes of other PRCs, including the microbiome (Stanford), physical changes in the structure of the birth canal and organs (University of Pennsylvania), and the genetics of premature birth (The Ohio Collaborative). Together these were the most important factors in their selection as the sixth center in our network.

Professor Phillip Bennett, M.D., Ph.D., is the center's principal investigator and has specialized in helping to prevent premature birth his entire career. Joining him to put the center together are Dr. David MacIntyre and Dr. Lynne Sykes from the Institute of Reproductive and Developmental Biology at Imperial College. Their team includes three world renowned specialists in the glycosciences: Professor Anne Dell, Professor Ten Feizi and Dr. Stuart Haslam. Also on the team are Professor Marina Botto and Dr. Pascale Kropf, experts in inflammation and immunology, as well as some of the finest microbiologists, chemists, mathematicians, obstetricians, gynecologists and researchers anywhere in the field of reproduction. Also contributing to the work will be three hospitals affiliated with Imperial College London—Queen Charlotte's Hospital, St. Mary's Hospital and Chelsea and Westminster Hospital.

One of the motivating factors for Professor Bennett's team to join March of Dimes' PRC network was the transdisciplinary approach. "What normally happens in academia is that isolated university groups work in competition with each other. But what we found exciting was the concept of a research family," Dr. Bennett said. "March of Dimes' model has some of the best universities in the world using their own individual expertise

"To be the first European Prematurity Research Center that's just exactly something that would fit us very well, and it's clearly very exciting to do the work we want to."

Professor Phillip Bennett, M.D., Ph.D.

Moms and babies in the U.S. are facing an urgent health crisis:

- In this country 1 in 10 babies is born prematurely each year
- Worldwide 15 million babies are born prematurely each year.
- Premature birth and its complications are the largest contributors to infant death in the United States and globally.
- More than 380,000 babies are born prematurely in the U.S. each year.
- In addition to the human toll, the societal cost of premature birth is more than \$26 billion in the U.S. per year.
- Women of color are up to 50 percent more likely to give birth prematurely and their children can face a 130 percent higher infant death rate.
- In this country black women have maternal death rates over three times higher than women of other ethnicities.
- More than 20 percent of premature babies are born to black women—that's 1 in 5 babies.
- Employers pay 12 times as much in health care costs for premature/ low birthweight babies compared to babies born without these complications.

Because premature birth has many possible causes, each PRC is charged with exploring a different transdisciplinary research target that is likely to be crucial to the prevention of premature birth. Imperial College London has a unique strength in glycobiology, a promising field of study involving sugar molecules on the surface of microbes and cells that may affect the immune response in pregnant women.

and skills to work together for a common cause—we find that to be a particularly attractive way of doing research.” March of Dimes believes the transdisciplinary approach to research will be profoundly important to understanding how premature birth happens and how to prevent it. As always, we’re limited only by resources, not ideas. More funding is vital for the research to continue.

The March of Dimes Prematurity Research Center at Imperial College London is supported by a grant from Ferring Pharmaceuticals. Both Ferring and March of Dimes are committed to advancing research to help prevent the 15 million babies born prematurely each year.

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PREMATURITY RESEARCH CENTER

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