

Trainee Expansion Program

AWARDEES SPRING 2018



We are pleased to present the awardees of the TEP Travel Funds, who each received up to USD 10,000 to advance their academic career.

ALBA BOIX AMORÓS



Breast milk biomarkers for mastitis

TTF Awardee 2018

ANITA ESQUERRA-ZWIERS



Human milk biomarkers for
perceived insufficient milk supply

TTF Awardee 2018

CAMILLE DUGAS



GDM, breastfeeding and the risk for
obesity and T2DM in children

TTF Awardee 2018

KRISTEN MEYER



Maternal IgA and the infant
microbiome

TTF Awardee 2018

RUKSHAN MEHTA



Mycotoxin contamination of human
breast milk

TTF Awardee 2018

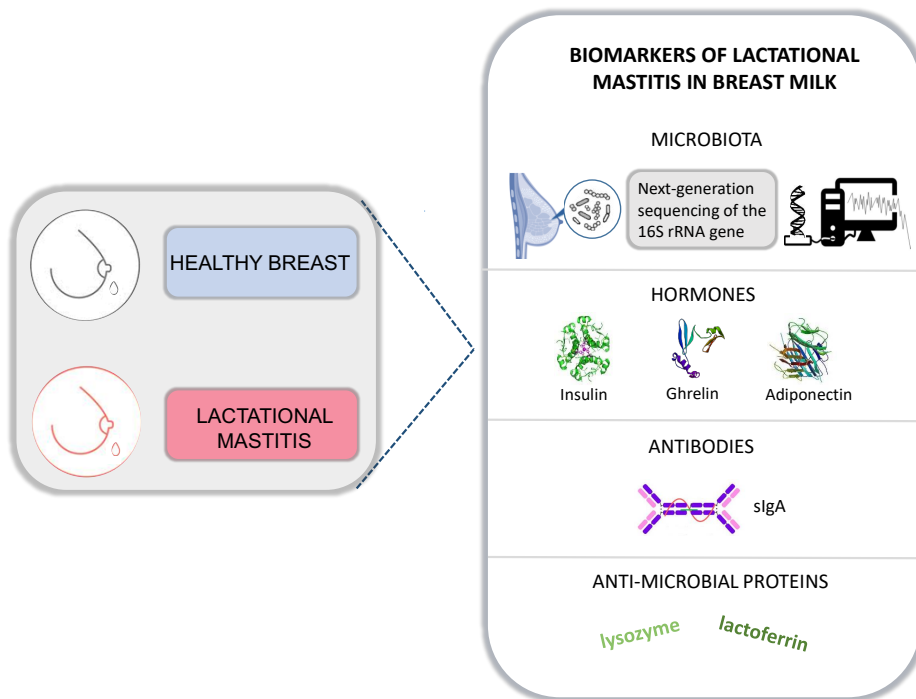
SHIRIN MOSSAVI



Breast milk bacteria strain diversity

TTF Awardee 2018

ALBA BOIX AMORÓS



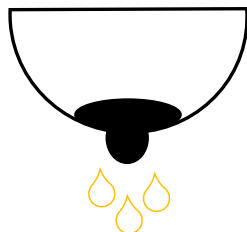
Breast milk (BM) hosts commensal bacteria under normal conditions. However, an imbalance in the bacterial ecosystem can lead to an overgrowth of opportunistic pathogens that may drive to mammary infections, such as mastitis, which is one of the main causes of early weaning. *Staphylococcus aureus* infections are responsible of acute mastitis, causing inflammation and systemic flu-like symptoms. Other commensal bacteria normally present in BM can overgrow and lead to sub-acute mastitis, which is a less acute state of the disease, but fastidious and with difficult diagnose. Little is known about changes in milk components, such as proteins and antibodies, associated to lactational mastitis. In addition, hormonal content during the disease has not been assessed before. Potential differences in BM composition between the healthy status and mastitis could be used as biomarkers of the disease, and novel bacterial next-generation sequencing approaches could help to better understand its etiology.

Alba Boix Amorós graduated from the Polytechnic University of Valencia (Valencia, Spain) with a BSc degree in biotechnology, after which she completed a MSc in biomedical research. During her master thesis, she developed a flow cytometry protocol to accurately quantify bacterial loads in different human samples, including breast milk. Alba is currently finishing her PhD, under the direction of Dr. Maria Collado and Dr. Alex Mira, in Valencia (Spain). Her work focuses on studying the human breast milk microbiota in healthy conditions and during lactational mastitis. She is excited to work at Dr. Donna Geddes's lab, where they will compare several breast milk components in samples from healthy and mastitis-suffering women, in order to examine potential biomarkers of the disease.

ANITA ESQUERRA-ZWIERS

PERCEIVED MILK SUPPLY

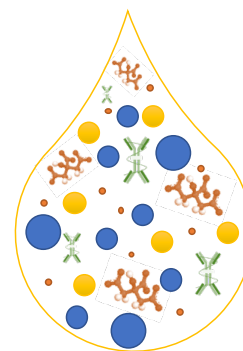
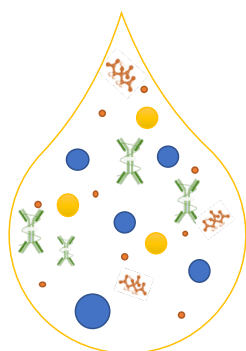
Insufficient



Sufficient



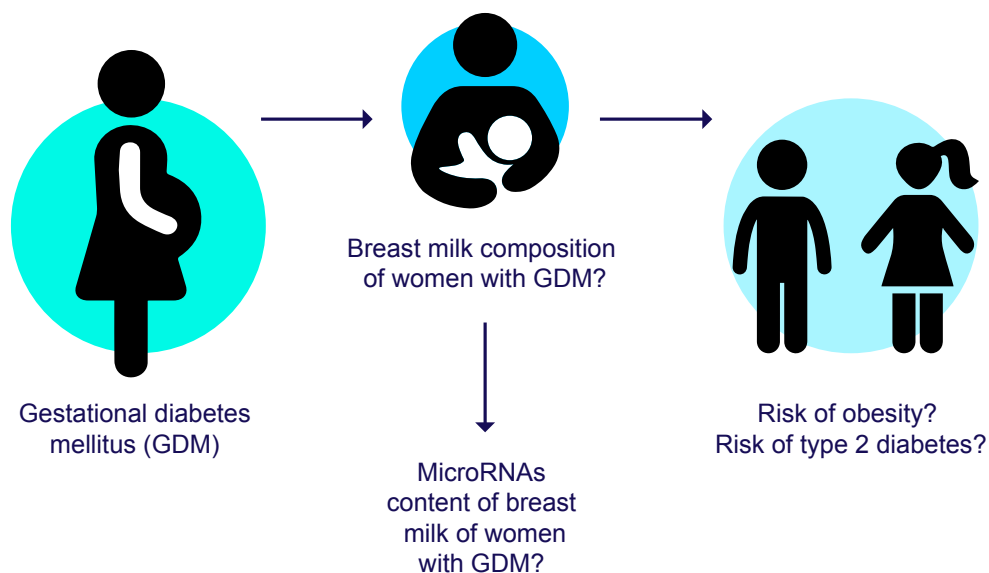
HUMAN MILK BIOMARKERS



Maternal perceived milk insufficiency is one of the main reasons cited for discontinuation of lactation. This barrier prevents infants from receiving optimal nutrition in their first year of life. Much research has been done on social, attitudinal, and behavioral determinants of breastfeeding but research is limited on the role of biological determinants. A better understanding of the biological determinants may offer practitioners a means of targeting early breastfeeding interventions to mitigate complications associated with a mother's perceived insufficient milk supply. This study will provide Anita with the tools to identify human milk biomarkers and evaluate any associations with perceived insufficient milk supply in term mothers controlling for attitudinal, social, and behavioral factors. Anita will obtain 100 term milk samples and measure perceived insufficient milk supply. These samples will then be sent to the School of Molecular Sciences at the University of Western Australia, Perth Australia where Anita will travel and collaborate with their research team to learn how to conduct human milk analysis, discuss, and disseminate these results.

Dr. **Anita Esquerra-Zwiers**, RN is an Assistant Professor in Nursing at Hope College, Holland, MI. Anita's dissertation research focused on mothers of preterm infants and the impact of donor human milk on mother's own milk feedings. During her time working with mothers of preterm infants she learned that some mothers were unable to provide exclusive human milk feedings regardless of their behavioral and motivational factors to provide for their infants. Since the completion of her dissertation she has been establishing her research group focusing on social, attitudinal, behavioral, physiological, and biological determinants of breastfeeding with term mothers.

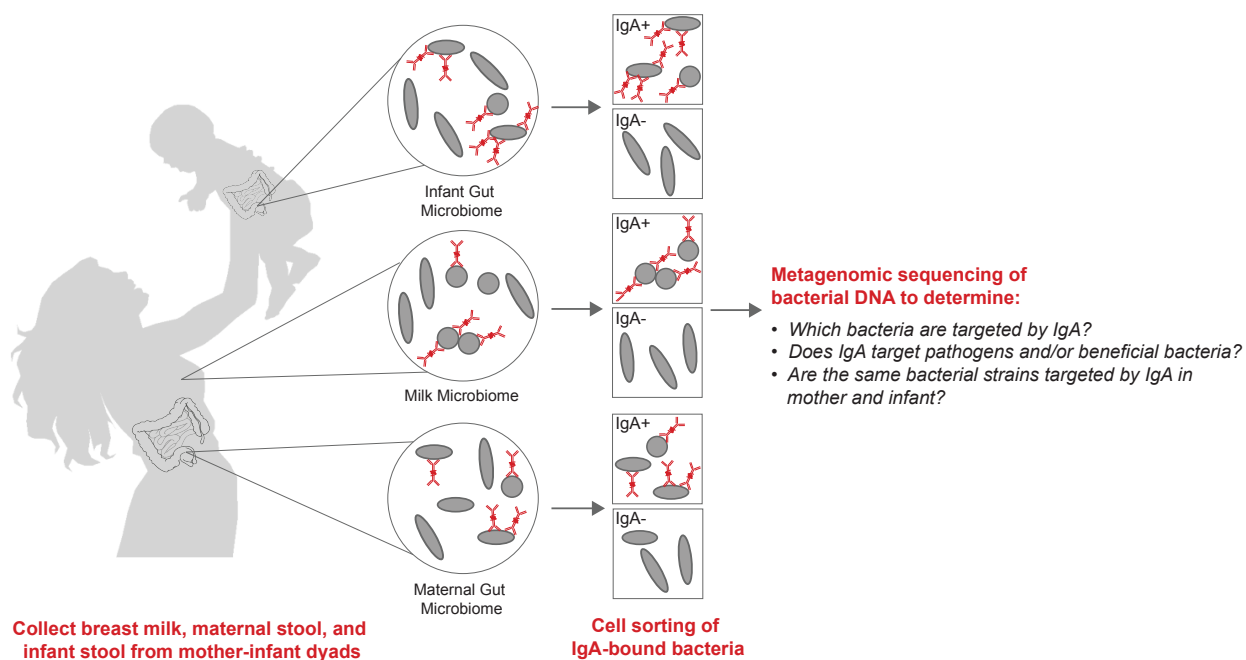
CAMILLE DUGAS



Previous works showed that breastfeeding is associated with a reduced risk of obesity among children exposed to gestational diabetes mellitus (GDM) in utero, but a longer breastfeeding duration seems necessary to achieve this protective effect when compared to children unexposed to GDM. This may be due to the breast milk composition of women with prior GDM that would be altered. However, no study compared microRNAs content of breast milk of women with and without a history of GDM. MicroRNAs are small RNAs particles involved in biological phenomena. They are present in human milk and are transferred to the breastfed infant. As they may be involved in health programming by epigenetic mechanisms, the study of microRNAs content in breast milk of women with prior GDM could allow us to better understand the association between breastfeeding and children's later health among a population at high-risk of developing obesity and type 2 diabetes.

Camille Dugas received both her B.Sc. and M.Sc. in nutrition from Laval University (Quebec City, Canada). During her master degree, she studied the impact of infant feeding practices on glycemic and anthropometric profiles of children exposed to gestational diabetes mellitus (GDM) in utero. To further investigate the association between breastfeeding and subsequent health of children exposed to GDM, an objective of her current Ph.D. thesis is to compare breast milk composition of women with and without a recent history of GDM. Camille will use funds of the Trainee Travel Fund to do a two months internship in Dr Bertrand Kaeffer's laboratory, at Nantes University, in France, to learn a technic developed by Dr Kaeffer's team to evaluate microRNAs content of breastmilk.

KRISTEN MEYER

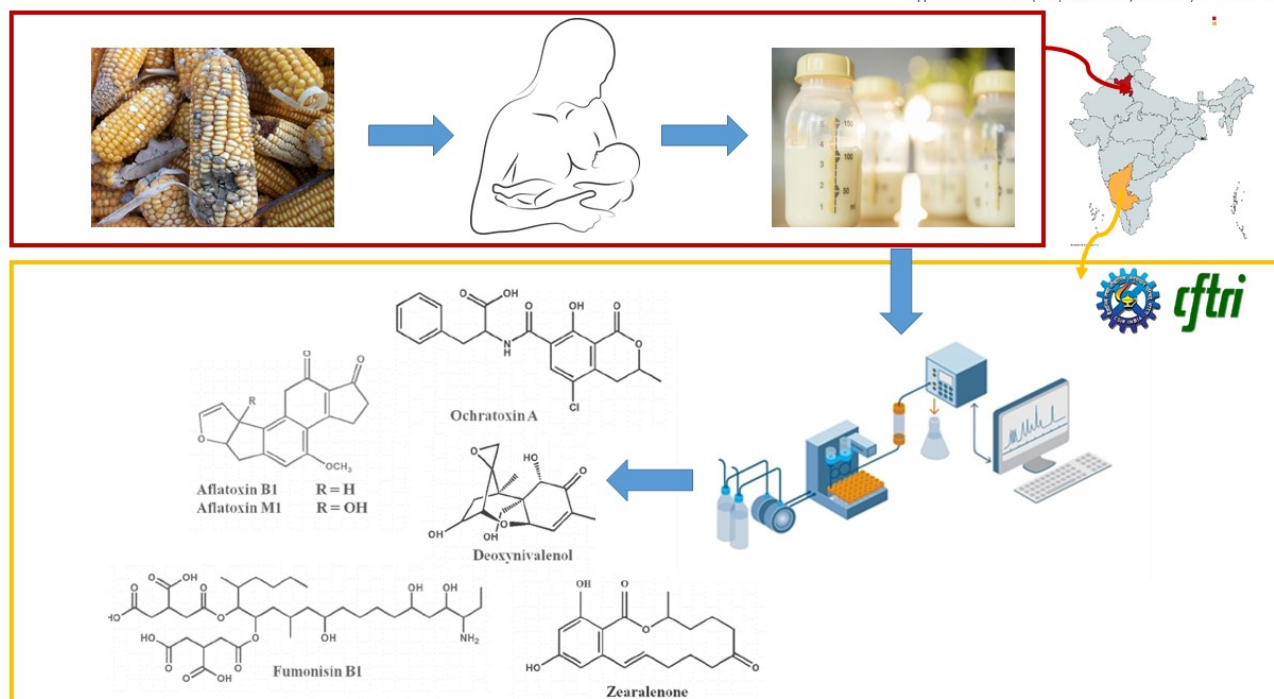


Breastfeeding significantly impacts the development of the infant gut microbiome as breast milk contains many bioactive components that serve to interact with and influence the microbiota in the infant gut. We aim to evaluate the impact of IgA, a highly abundant immunoglobulin in human milk that provides passive immunity to the infant in early life. Using maternal stool, breast milk, and infant stool samples collected from mother-infant pairs coupled with metagenomics sequencing of bacterial DNA, we aim to 1. identify which bacteria are targeted by maternal IgA in each body site, 2. determine if IgA targets exclusively pathogens, or if beneficial microbes are targeted as well, and 3. determine if identical bacterial strains are targeted in both breast milk and the infant gut, suggesting vertical transmission of IgA-coated bacteria. This will inform our understanding of how maternal IgA influences the infant microbiome and will help us understand if the role of IgA in breast milk may extend beyond providing passive immunity to the infant.

Kristen Meyer received her BSc in Chemistry from Washington State University and is now in the Medical Scientist Training (MD/PhD) Program at Baylor College of Medicine in Houston, Texas. Training in the lab of Dr. Kjersti Aagaard, Kristen's thesis research focuses on bioactive components of breast milk and understanding how the milk microbiome, human milk oligosaccharides, and maternal immunoglobulins interact to influence the trajectory of infant microbial development. Kristen will use the funds from the Trainee Travel Fund to study in the lab of Dr. Nicola Segata in Trento, Italy to learn computational tools for metagenomic analysis, which she will use to perform strain-level mapping of IgA-coated bacteria in breast milk and stool samples from mother-infant pairs.

RUKSHAN MEHTA

<http://www.differencebetween.net/science/difference-between-sc-ms-and-lc-ms/>
Appl Biochem Biotechnol (2014) 174:880–896, DOI 10.1007/s12010-014-0993-0



Food safety concerns and environmental exposures are gaining increasing visibility as issues of importance in global health. Mycotoxins are fungal agents found in 25% of the world's food supply chains. We are interested in characterizing contamination of human breastmilk with mycotoxins in Haryana, India among breastfeeding mothers with children 2-4 months of age. To date, there is no data looking at breastmilk mycotoxins among women in Haryana, the last mile link in the bioamplification pathways for these contaminants along the food chain. As part of a larger NIH funded study aimed at understanding the role of maternal malnutrition on lactation performance, this add-on will help us examine the levels of exposures in breastmilk of mothers using high-throughput liquid chromatography/mass spectrometry (LC/MS). We further hope to understand the role of the contaminants on human health, including inflammatory markers in the mother and subsequent impacts on gut integrity in the breastfeeding infant. Mehta in collaboration with Drs. Young and Kannan will work with CFTRI in India to learn extraction and quantification protocols for breastmilk mycotoxins, as part of this TEP.

Rukshan Mehta is a PhD student in the Doctoral program in Nutrition and Health Sciences at Emory University. Rukshan's dissertation will focus on the role of environmental exposures including mycotoxins and pesticides in breastmilk and their impact on child health. Rukshan is particularly interested in the intersecting roles of environmental health and nutrition with a focus on mothers and children in low and middle-income countries. She has worked on several international development projects employing implementation science modalities and is very interested in sustainable global health interventions such as breastfeeding. Rukshan completed her undergraduate degree at the University of Toronto and has a Master's degree in Social Work from the same. She began her PhD after spending 5 years working in international development both in Canada and overseas, last on a randomized control trial evaluating the effectiveness of multiple micronutrient powders to reduce anemia in children.