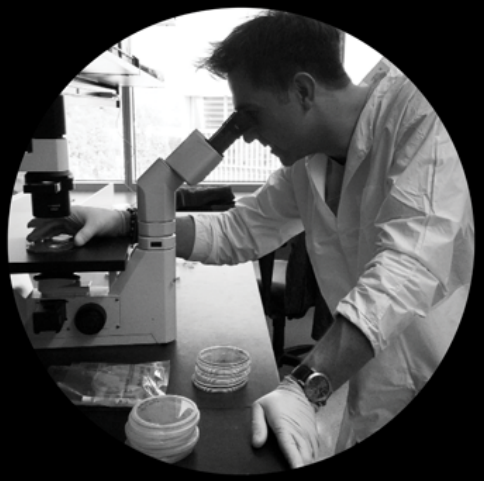


OVERVIEW

MICROBIAL ECOSYSTEM

We are home to an enormous microbial ecosystem containing more than 100 trillion bacteria, a number equal to our own human cells. More astonishing than the number of bacteria is the amount of genetic diversity they contribute to our physiology. It is estimated that for every one of our genes, there are approximately 145 microbial genes. This equals roughly 3.3 million microbial genes and only 23,000 human genes. Collectively, these microorganisms and their gene products are referred to as the microbiome.

DYSBIOSIS

This community of microbes performs essential functions that help maintain human health. Shifts in the composition, distribution and/or function of the microbiome have not only been implicated in diseases of the GI tract, but also play important roles in systemic diseases such as autism, hematological cancers and neurological disease. Due to the inherent plasticity of the microbiome, the manipulation of its communities has the potential for significant therapeutic applications to treat a number of diseases.

OUR GOALS

The goals of DePaolo Lab are to explore how intestinal perturbations caused by genetics and/or environmental factors (e.g., diet, infection, pollution) alter its microbial landscape and to use this newly acquired knowledge to develop strategies and therapies to treat human disease.

A HOLISTIC APPROACH

To accomplish these goals DePaolo Lab utilizes an integrated and multidisciplinary approach that incorporates both clinical human samples with relevant animal models of disease and pairs metagenomics analysis of host and microbe with novel functional assays. Through careful analysis and holistic approaches we hope to define new pathways, identify new targets and gain mechanistic insight into the relationship between our environment, our genes and the microbiome.

PROJECTS

Inflammatory Bowel Disease (IBD) & Associated Cancers.

CLINICAL MICROBIOME REPOSITORY

The relationship we have with our gut bacteria is a give and take. While much research is interested in how the microbiome is changing our bodies, we often forget that we also exert an enormous amount of influence on our microbial counterparts. From diet, to pollution, to antibiotic use, we are constantly exposing the microbiome to factors that could induce changes in their metabolism or function that may have detrimental effects on our health.

Focusing on IBD, we will be isolating, tracking and analyzing specific fecal bacteria from patients over the course of their disease. This will allow clinicians and researchers to pair these bacterial studies with patient response to treatments, disease pathology and inflammation bringing a new meaning to 'Personalized Medicine.'

INFLAMMATION-ASSOCIATED & SPORADIC COLON CANCERS

Our group has discovered a gene that may make cells more sensitive to chemotherapy and is associated with longer progression-free and overall survival in patients with colon cancer.

Current research is focused on identifying the pathways involved in this process. Our goal is to create microbiome-associated biotherapeutics that could increase the efficacy of chemotherapy.

Molecular Nutrition

DIETARY INTERVENTIONS IN NON-ALCOHOLIC FATTY LIVER DISEASE (NAFLD) & IBD

NAFLD is a condition in which significant levels of fat builds up in the cells of the liver leading to a wide spectrum of liver diseases such as cirrhosis and steatosis (infiltration of liver cells with fat). In the United States almost 10% of all children and 17% of 15-19 year old children have NAFLD. The need for improved diagnosis and treatment of NAFLD in children is highlighted by the multiple complications these children are at high risk of developing, including atherosclerosis and other cardiovascular complications.

Current research is focused on dissociating the effects of a number of specialized and popular diets from the effects caused by the microbiome. We are also beginning exciting collaborations with clinicians at UWMC and Seattle Children's Hospital. Together, we're investigating the impact of specific diets on children with IBD or NAFLD.

EFFECT OF DIET ON INFECTIOUS DISEASE & VACCINATION

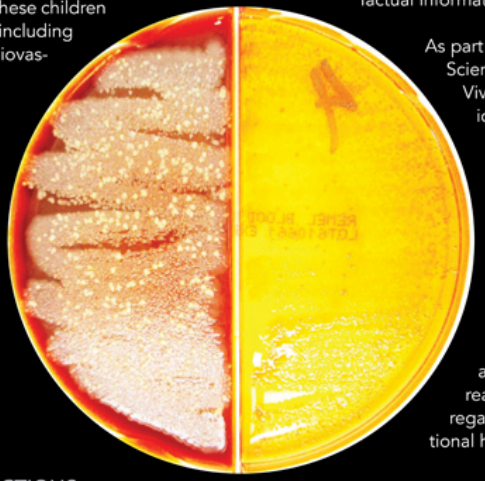
Poor diets and living conditions are thought to contribute to the low efficacy rate of oral vaccines in sub-Saharan Africa. In Africa 2.9 million children under the age of five will die from malnutrition each year and for those that survive nutritional deficiency takes a toll on their immune system. It is likely that prolonged malnutrition will also significantly alter the microbiome.

Current research is focused on investigating how different diets impact not just the host, but the microbiome and the pathogen, and the effects on oral vaccinations.

Art & Science

ART TO ADVANCE SCIENCE

Microbiome, probiotics and stool transplants (also known as fecal microbiota transplant or FMT) have entered pop culture and the mainstream media at a rapid rate, but is correct and accurate information being circulated? In an era where a single Tweet can reach hundreds of thousands of people instantaneously, and where information is always at our finger tips, it is critical that the information regarding health, disease and the microbiome come from legitimate sources providing factual information.

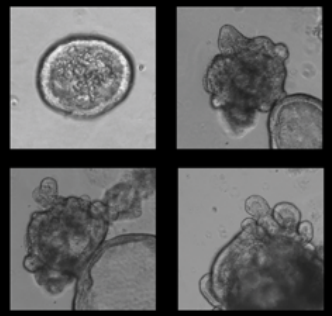


As part of the Center for Microbiome Sciences & Therapeutics (CMiST) Vivo Art program, we will dedicate part of our time and resources to working with artists and using their projects to help advance our research. CMiST and DePaolo Lab will establish relationships with the UW art and film departments to produce events featuring projects that will help to educate our local communities. An important piece of this initiative is to reach under-served populations regarding the importance of nutritional health and the microbiome.

INNOVATIONS

SMALL INTESTINE & COLONIC ORGANOIDS

Organoids are three dimensional organs grown in a plate. They were named one of science's greatest achievements in 2013. The self-renewing nature of the intestinal epithelium makes it an ideal organ to grow in vitro. Our lab has begun isolating the stem cells necessary for these cultures and propagating them for use in a number of our projects.



The mission of DePaolo Lab is to identify environmental factors that impact distinct ecological communities and develop therapies to maintain or restore ecological harmony, and to always encouage and guide our team to think critically, practice good science and think outside of the box.

depaolo lab

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