Peter J. Shields Chair in Dairy Food Science
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ENDOWMENT PURPOSE
The Peter J. Shields Chair in Dairy Food Science was established in 1983 by the California Milk Advisory Board and the California Manufacturing Milk Advisory Board to attract and sustain outstanding dairy food science scholars in the Department of Food Science and Technology. The Chair was named to recognize the historic relationship of the “founder of the Davis campus” to the dairy food industry, and should provide the occupant with opportunities to conduct exemplary research and teaching, as well as to offer continuous interaction with the dairy food industry.

RESEARCH
With support from the Peter J. Shields Endowed Chair I have advanced a research agenda focused on understanding the beneficial impact of milk components on the gastrointestinal tract. In order to gain medical community acceptance of the unique benefits of the bioactive components within milk, it is critical to perform detailed mechanistic studies demonstrating how specific milk components improve health as well as beneficially modulate the gut microbiota. To accomplish this, Shields Chair funds have paid, in part, for senior scientific staff, postdoctoral scholars, graduate students and undergraduates doing research in my laboratory or the UC Davis Milk Processing Lab.

Shields Chair funding is also advancing strategies to understand environmental influences on how microbes transfer into and among dairy processing facilities. This work will advance novel strategies that reduce the flow of spoilage and pathogenic microbes within such facilities.

TEACHING
In the last year my faculty position and lab transferred to the Department of
Food Science and Technology at UC Davis. As part of that move I am currently developing two new courses, one undergraduate course on the microbiology of food fermentations and a second graduate level course on the influence of diet on gut health. To accomplish this task I will be using Shields funding in 2015-2016 to partially support a graduate student, Guy Shani, who will help coordinate lecture material and assist with multimedia presentation assembly.

**STUDENTS**

Shields Chair activities have advanced numerous student activities. In general, Shields Chair funding is used to cover gaps in personnel funding. In 2014-2015, the endowment paid, in part, for a Staff Research Associate (Dr. Karen Kalanetra), Project Scientist (Dr. Ishita Shah) and a Junior Specialist (Morgan Lee). Together, Drs. Kalanetra, Shah and Ms. Lee coordinate the microbiological and metagenomic work in my lab which supports all the ongoing milk-related research on milk glycans, intestinal health and environmental microbiology of dairy facilities. The endowment also partially covered a graduate student, Zachary Lewis, who recently received his PhD and whose work was profiled by NPR. Finally the Shields Chair helped fund five undergraduate researchers: Lindsey Contrereas, Chad Masarweh, Claire Shaw, Ryan Viveros and Grant Wilson. All of these undergrad students work closely with my graduate students and postdoctoral researchers to examine various aspects of bioactive components in milk. Recently Ms. Contrereas and Shaw presented their research at an Undergraduate Research symposium at UC Davis. Shields funding also allowed Postdoctoral Researcher Steve Frese to present his research on milk influences on the gut microbiome at the 2015 Meeting of the Human Biology Association.

**OUTREACH**

In the last year I presented our milk-focused research at various meetings including: the 1st International Conference on Human Milk Science and Innovation, the Global Forum on the Future of Food, the Human Biology Association Annual Meeting, the Annual Meeting of the International Society for Research in Human Milk and Lactation, the Annual Meeting of the American College of Rheumatology, The Gut Microbiota for Health: World Summit, the 4th Beneficial Microbes Conference, and Annual Meeting of the American Society for Biochemistry and Molecular Biology. Finally I had the honor to present a talk entitled "The Genius of Milk" at the Exploratorium in San Francisco.

I used Shields Chair funds to help host a range of invited speakers at the Department of Food Science & Technology including Prof. Willem de Vos (Finland Academy Professor), Dr. Rachel Dutton (Harvard), Dr. Tiina Mattila-Sandholm (Valio), Prof. Robert Hutkins (U. Nebraska), Prof. Jens Walters (U. Alberta) and Prof. Amanda Raymer-Tait (U. Nebraska). These visits and seminars enable Food Science & Technology faculty and students to interface with some of the leading researchers in the areas of gut health and the microbial ecology of foods.

I also met with, and presented research talks for, a large number of industry members visiting the UC Davis Foods for Health Institute including Merck, Roll Global, Arla Foods, Valio, Kraft Foods, Mars Inc. and Mengniu Dairy, among others.

Finally, I used Shields Chair funds to purchase the cheese for a "show and tell" event for the Future Farmers of America-Agricultural Field Day at UC Davis.
NEW AND UNIQUE ENDOWMENT USE
Our UC Davis Milk Bioactives program generated significant, international attention this year when the journal Science\(^2\) profiled our Milk Bioactives Program research. Our success with obtaining funding from NIH to examine milk bioactives was profiled by Dairy Foods\(^3\), Synthesis\(^4\) (the UC Davis Cancer Center journal) and the UC Davis Office of Research\(^5\). Finally our work on the influence of milk on the infant gut microbiota was covered by NPR\(^1\).

\(^1\)http://tinyurl.com/NPRMills
\(^2\)http://mills.ucdavis.edu/science-milk-bioactives
\(^3\)http://tinyurl.com/DairyFoodsMills
\(^4\)http://www.ucdmc.ucdavis.edu/synthesis/issues/spring2015/gutreaction.html
\(^5\)http://research.ucdavis.edu/banner-4/

LEVERAGING ADDITIONAL FUNDING
Two NIH grants were obtained during this period to examine how bovine milk glycans produced by Hilmar Cheese Company reduce gastrointestinal inflammation and improve gut barrier function. These two grants, totaling $6.9M, are also funding staff and research in the Food Science & Technology Milk Processing Lab. We also obtained a grant from the Thrasher Foundation ($300K) to examine how breastfed infants enrich a protective milk-oriented microbiota in their intestines.

In addition I obtained Sloan Foundation funding ($300K) to examine how building environmental conditions influence the microbial biogeography within Clover Dairy and Cowgirl Creamery. This larger systems approach is completely novel and will identify key, yet manipulable environmental parameters that drive microbial movement within these facilities.

THANKS
It is a great honor to be the Shields Endowed Chair in Dairy Food Science. Funding from this endowment is supporting exciting new studies at the Robert Mondavi Institute for Wine and Food Science. This research is defining the health benefit of milk, but also identifies novel bioactive molecules and microbes that can be employed to improve intestinal health. We are also using novel techniques to map microbial transfer throughout dairy production facilities, thus providing insight into dairy spoilage and contamination processes. In short, we are training the next generation of dairy scientists focused on using milk processing and milk components. It is an amazing time to study milk—the only food that evolved to make the consumer healthy.