title	Probing the surface of lactic acid bacteria with atomic force microscopy
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department	Chemistry/Biochemistry
proj_desc	We have just started a new collaborative project between The Dairy Products Technology Center (DTPC) and The Chemistry and Biochemistry Department. It is directed at understanding how growth media affects the surface properties of lactic acid bacteria (lactoacidbacilli). Lactic acid bacteria are widely used in the food/dairy industry as probiotic additives as they play an important role in the control of undesirable microorganisms in the intestinal tract. Critical to the probiotic efficacy of these bacteria is their ability to adhere to the intestinal epithelium. Many studies have already been conducted that probe the adhesion of different strains via various adhesion tests, but little is currently known about the molecular level details of why some strains adhere better than others. Further, it appears that the nature of the media in which the bacteria are grown plays an important role in adhesion of lactic acid bacteria. Our recent work in this area indicates that lactic acid bacteria grown in media with milk may coat themselves with lipids and/or proteins from the milk fat globule membrane (MFGM). Our hypothesis is that the MFGM coating is an essential part of the probiotic effect these bacteria have and that this coating enhances adhesion to the intestinal epithelium. The research students would work on involves growing different strains of lactic acid bacteria in media with and without MFGM material followed by imaging the bacteria with an atomic force microscope. The bacteria will be adsorbed onto poly-L-lysine glass or mica coated slides so they can be imaged in a buffer, pH7, solution with the AFM. In addition to topographic, phase, and deflection mages we will also collect force-volume images of the bacteria. These force-volume images will then be used to determine the relative elasticity and adhesion forces on the surface of the bacteria with nanometer lateral resolution. If our hypothesis is correct, we should see increased adhesion and elasticity from the bacteria that were grown in media containing MFGM material.
inter_desc	This project combines aspects from dairy science, chemistry, biochemistry, biology, and physics. We are interested in making quantitative measurements of the elasticity and adhesion properties (physics and chemistry) of bacterial surfaces (biology). Lactic acid bacteria will be the focus of our efforts as they are used in the food/dairy industry (food and dairy science) as probiotics with proven health benefits.
links	
students	2
majors	CHEM, BIO, DSCI, FSN, MATE, MCRO, PHYS
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