

Development of video analysis of protozoal activity and future implications on ruminant nutrition research

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Methane production in ruminants is a large source of inefficiency for producers and, therefore, a growing area of study for ruminant nutritionists. Microorganisms that live in the rumen of dairy cattle produce methane as a byproduct of fermentation, and 6% of gross energy that cattle ingest is eructated in the form of methane, contributing to green-house gas emissions. Studying these organisms is difficult due to their complexity, speed, and small size. In recent studies conducted at the OSU ruminant nutrition laboratory, the need for a more widespread and complete way of analyzing treatment effect on microorganisms has become necessary. In response to this need, we developed a way to record video of live protozoa, opening up countless possibilities. Using ImageJ computer software (NIH, Washington D.C.) we are now able to analyze numerous aspects of protozoa such as motility, volume, average surface area, length, width, speed, displacement, distance, and the proportion of live cells. The technique I developed was fundamental in a recent research project to ensure vitality of protozoa after each step, including collection, filtering, and sampling. Having video data also allows better quantitative comparison among treatments (low vs. high concentrations of glucose, etc.) for motility i.e., total velocity (including turning by the cells) and net distance traveled (displacement ignores turning). We hypothesized that treatments dosed with 5 uM glucose will display more activity, displayed by higher speed and more total distance traveled, when compared to 20 uM glucose concentration. Video analysis is currently in progress, but initial data indicates that the hypothesis will be supported. This method of video data collection and modified ImageJ analysis will be used for future research in the Dairy Nutrition Laboratory at OSU.