

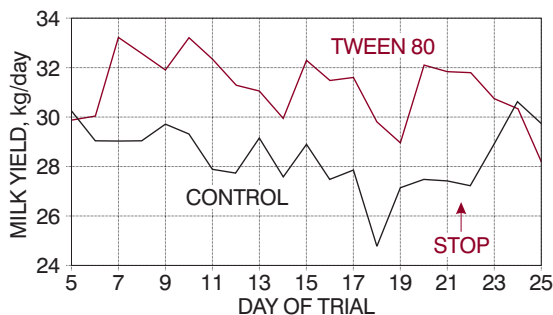
Surfactants Increase Feed Digestion

While searching for ways to improve the rumen digestibility of tropical forages, researchers at the University of BC discovered that an agent commonly used in prepared food and human medicines had dramatic effects on milk production. Tween 80 (also known as Polysorbate 80) is an emulsifier used to facilitate the blending of water soluble and non-water soluble ingredients. Emulsifiers act by altering the surface properties of ingredients—thus, they are also referred to as *surfactants*.

Recognizing the importance of the interaction between enzymes and feeds in the digestive process, the researchers tested the effect of several surfactants on rumen digestibility in laboratory (*in vitro*) trials. The rate at which a crude preparation of rumen enzymes was able to digest protein increased by 80% in the presence of Tween 80; cellulose (fibre) digestion rate increased by 75%.

To determine whether these *in vitro* results would translate into animal performance, a short production trial was set up. Eight control cows were fed a standard diet with no surfactant; eight others had Tween 80 included in their diets. Average milk yield response (see graph above) was 3.2 kg/day. Milk fat test was depressed and milk protein test was slightly improved.

Following this initial study, a larger lactation trial was run at UBC's Oyster River Farm on Vancouver Island. In this trial, 109 cows were divided into 3 groups—two inclusion levels of Tween 80 were compared with a control. Results are summarized in the table below. Milk yield increases were significantly



higher than control at both Tween 80 inclusion rates. Fat and protein tests were generally lower but component yields increased in line with the higher milk volumes produced with the surfactant.

How surfactants improve digestion

Additional trials at both UBC and at the Lethbridge Research Centre have focussed on the mechanism by which Tween 80 improves digestion. In an early study, it was determined that there was an increase in total rumen volatile fatty acid (VFA) production primarily due to increased production of propionic acid. This effect, combined with a decrease in gas production, means that Tween 80 increases rumen fermentation efficiency.

A more recent experiment demonstrated that Tween 80 enhanced the adsorption of microbial enzymes onto feed particles. This resulted in increases in the rates of digestion of both protein and cellulose similar to those seen in the initial experiments.

Further work is required to determine optimum concentrations and the conditions under which Tween 80 is likely to yield a profitable response.

sources: J.A. Shelford et al., *Adv Dairy Tech* 8:269 (1996)
G.M. Kamande et al., *J Dairy Sci* 83:536 (2000)

	Cows less than 29 DIM at week 1			Cows more than 28 DIM at week 1		
	Control	Level 1	Level 2	Control	Level 1	Level 2
Dry Matter Intake, kg/day	18.5	18.6	19.2	16.46	15.95	16.68
Milk Yield, kg/day	35.9	38.4	37.4	25.7	29.5	28.8
Fat Test, %	3.45	3.38	3.24	3.99	3.60	3.80
Fat Yield, kg/day	1.23	1.29	1.21	1.03	1.06	1.09
Protein Test, %	3.03	3.03	2.92	3.33	3.20	3.17
Protein Yield, kg/day	1.08	1.15	1.09	0.85	0.94	0.91
Body Weight Change, kg	-100	-51	-83	-63	-43	-55