THE TOXICITY OF SOME SURFACE ACTIVE COMPOUNDS AGAINST RUMEN PROTOZOA

F.J. HART*, P. J. CHALMERS**, S.R. EDWARDS* and C .A. GRAHAM*

The bilipid cell membrane of protozoa can be disrupted by surface active compounds. Eadie & Oxford (1954) reported that compounds having both a lipophilic and a hydrophilic end with a non-polar center are able to physically disrupt the membranes of holotrich protozoa. Elimination of protozoa from grazing sheep has been associated with a 19 to 21 percent increase in wool growth (Bird & Leng 1983). In the present experiment a selection of surface active compounds was tested for toxicity to rumen protozoa.

Protozoa were isolated from strained rumen liquor by centrifugation. They were then resuspended in a modified McDougal's buffer containing glucose and urea. The toxicity of each compound to protozoa was assessed over a range of concentrations by incubating the protozoa for three hours and measuring the amount of gas evolved. Inhibition of gas evolution was expressed as a percentage of the control incubation. A non-surface active compound (Iodoacetic acid) of known anti-protozoa1 activity was included for comparison. Death of protozoa was recorded by direct microscopic examination. Results are presented in Table 1.

Table 1. Effect of various compounds on gas production of rumen protozoa.

	Inhibition of gas evolution relative to control (%)				
	Conc. of test compounds (ppm)				
Compounds	50	150	250	500	1000
Nonyl phenol ethoxylate (Teric GN9)	4±3.1	47±5.0	73±2.0	90±1.4	94±4.2
Pentdecanol ethoxylate (Teric 15A11)	0 0.0	0 0.0	8 2.0	59 1.2	65 0.0
Dodecanol ethoxylate (Teric G12A12)	0 0.0	0 0.0	55 1.2	75 4.7	82 2.0
Lauryl ethyl sulphate (Alkanate 3SL3)	0 0.0	0 0.0	0 0.0	49 5.3	82 4.2
Lauryl ethoxylate sulphate (Alkanate 3SN5)	0 0.0	0 0.0	0 0.0	4 1.2	49 0.0
Propylene Copolymer (Pluronic L64)	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
Iodoacetic acid	98 2.0	100 0.0	100 0.0	100 0.0	98 3.5
Control	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0

The most effective surface active compound was Teric GN9 (nonionic). This compound killed protozoa at 250 ppm. Teric G12A12, Teric 15A1 1, (nonionic) and Alkanate 3SL3 and Alkanate 3SN5 (anionic) also killed protozoa but were not as potent as Teric GN9. Iodoacetic acid (positive control) was extremely toxic to protozoa. It was also toxic to all rumen microorganisms while the surface active compounds were selective against protozoa.

While surface active compounds may kill protozoa in vitro, their commercial application is limited because of their toxicity to the host. The present screen is being used to assess a much wider range of compounds in the hope of developing a new, safe and selective antiprotozoal compound.

BIRD, S.H., LENG, R.A. (1983). In 'Recent Advances in Animal Nutrition in Australia' pp. 110-118. Eds D.J. Farrell and P. Vohra.
EADIE, J.M., OXFORD, A.E. (1954). Nature. 174: 973.

* Coopers Animal Health Aust. Ltd, The Northern Road, Bringelly, N.S.W. 2171
** ICI Aust. Operations Pty Ltd, Research Group, Newson Street, Ascot Vale, VIC 3032