ORGANOTIN TOXICITY TRIAL IN CATTLE

DEPARTMENT OF AGRICULTURE
EDMONTON, ALBERTA

Background

This project was prompted by an incident which occurred in a small cattle feedlot in Northern Alberta in late November and early December, 1976. A group of 45 eleven month old cattle were being fed a liquid urea molasses supplement. The supplement was obtained from a local feed supply company and the feed supply company obtained its storage barrels from a variety of sources. One of the sources was a company engaged in the manufacture of polyvinyl chloride plastic piping by the heat extrusion process. It was later discovered that these barrels had been inadequately cleansed and contained an organo-tin stabilizer called "ADVASTAB TM 387". This preparation contains 56% Monomethyl tin, 14% dimethyl tin and the remaining 30% is mineral oil.

Early in December, 5 animals became ill suddenly and all died. Clinical signs observed within two days of consuming this material included incoordination, goose-stepping, dilation of the pupils and a very aggressive behavior which progressed to convulsions and death within 4 hours of onset of convulsions. A total of 8 animals either died or had to be euthanized which resulted in a fairly sizeable payment by the insurer of the local feed company to the owner.

Toxicity Trial

Since the only available Veterinary literature on the subject of organotin poisoning usually describes the effects of organotin in rats and other laboratory animals, it was decided to initiate a small trial involving cattle. A total of eight cattle were purchased. These were of mixed breeds including Guernsey, Hereford and Holstein. Both steers and heifers were included in the group and they varied in weight from 460 to 710 lbs.

The purposes of this trial were to determine normal levels of tin in control animals, significant levels of tin

in control animals, significant levels of tin in animals which died acutely, observe clinical signs and record both gross and histopathological changes in tissues.

The dosage schedule involved is described on the accompanying table. Since no base lines were available for cattle, Animal #1 was given the LD_{50} for rats which is 1350 milligrams per kilogram of bodyweight. This resulted in death of the animal at 48 to 60 hours post-dosing. The second calf was given 675 milligrams per kilogram of body-weight (half of the LD_{50} for rats). This produced little effect except for a few mild neurological symptoms and the animal was euthanized at two weeks of age. Animals #3, #4, #5 and #6 were given the chemical at the rate of 3/4 of the LD_{50} for rats (1012.5 milligrams per kilogram of bodyweight). This rate of dosage produced varying symptoms and in Animal #4, the maniacal and aggressive signs observed in the natural outbreak were noted.

The levels of tin detected in the various animals are recorded on the enclosed table. You will note that the levels demonstrated in the control animals are very low which is what one would expect to find since we do not live in an area of tin mining or in the vicinity of a tin smelter.

The microscopic examination of the various tissues collected has not yet been completed. However, it is expected that the severe neuronal degeneration which was noted in the lateral horn of the grey matter of the spinal cords of animals which survived for a period of time following the natural outbreak will be present in the spinal cords of the animals which exhibited nervous signs and lived for a period of time following dosage.

A letter was forwarded to all members of the Alberta Feed Manufacturers Association which outlined briefly the events of this incident and warned them of the need for extreme caution when using containers which had been previously used for chemical storage for dispensing feed to the general public.

D. W. MacDonald, D.V.M., M.Sc.
ANIMAL DISEASE SECTION

CC: Drs. Christian, Vance

ORGANOTIN TOXICITY TRIAL
TIN LEVELS DEMONSTRATED IN VARIOUS TISSUES AND BODY FLUIDS*
TEST ANIMALS

ANIMAL NO.	DOSAGE	LIVER	KIDNEY	SKELETAL MUSCLE	RUMEN CONTENTS	HAIR	BRAIN	HEART MUSCLE	BLOOD	SPLLEN	URINE	ABOMASUM CONTENTS
#1	1350 mg/kg	22.4	64.6	13	810	16.6	47	19.2	5.8	27.6	182	447
	Result: Symptoms in 24 hrs. Death at 48-60 hrs post-dosing.											
#2	675 mg/kg	22	36	28	40	55	34	30	<0.2	34	--	30
	Result: Mild neurological symptoms. Euthanasia 2 weeks.											
#3	1012.5 mg/kg	18.4	12.6	10.0	34.0	14.0	12.2	3.8	<0.2	8.4	--	22.4
	Result: Neurological symptoms at 90 hrs. Euthanasia in 10 days.											
#4	1012.5 mg/kg	4.68	6.28	0.60	1184	<0.50	<0.50	0.04	0.80	1.60	88	112
	Result: Maniacal, aggressive signs in 16 hrs. Death at 41 1/2 hrs.											
#5	1012.5 mg/kg	24	46	20	1380	25	16	34	34	30	190	288
	Result: Mildly aggressive behaviour at 16 hrs. Euthanasia at 47 hrs.											
#6	1012.5 mg/kg	32	36	14	40	40	17	17	48	28	100	161
	Result: Slight ataxia at 19 hrs. At 5 days, unable to rise. Euthanasia.											
					CONTROL							
#2	Nil	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.07	<0.2
#1	Nil	<0.2	<0.2	<0.2	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2	<0.05	<0.2

* EXPRESSED AS PPM (WET MATTER BASIS)