THE UNIVERSITY OF TENNESSEE
AGRICULTURAL EXPERIMENT STATION
KNOXVILLE

404942

REPLY TO
UT-AEC AGRICULTURAL RESEARCH PROGRAM
P. O. BOX 142
OAK RIDGE, TENNESSEE

November 30, 1953

Stewart Brothers
Las Vegas, Nevada

Through courtesy of Joe Sanders of AEC

Dear Friends:

In letters from Joe Sanders he has persistently mentioned the fact that the Stewart Brothers are not convinced that radiation did not kill the cows that died around Papoose Lake in early June and want a note on this which they can understand, that is, one devoid of unfamiliar technical terms.

I have recently received the latest reports on the bones collected from that area and this concludes studies of direct interest on this phase. Therefore I'm attempting to write a letter which might be informative to you.

Because I was not there at the time of the deaths of these animals I must take the account of the symptoms of the cattle as related to me. Since you know cattle I have taken your observations at full value. It seems to me that the prominent symptoms of the affected cattle were related as being: A quick decline from apparent good health to complete collapse first indicated by a disinclination to drive with the herd. The collapse was characterized by very little struggle, stiffening of legs and neck, bloating and death. One animal in convulsion which was "tapped" or had her rumen punctured lived as did another which was not punctured. The carcasses of six dead cows in one lot and two dead cows on the lake together with circumstances such as tracks and displacement of earth around carcasses substantiate the observations of those who saw the cattle that death was sudden and from an acute cause. This much we know from reports and it is here we enter the picture to try to answer the question "Were the deaths of these cattle directly or indirectly due to the recent atomic bomb detonations?"

Animals dying from radiation sickness may die during or shortly after radiation (in this case it would have been minutes or hours at the most after the bomb detonation—not days) and in such a case the physiologic or pathologic changes are so insignificant they may not be recognized. On the other hand, animals usually live for days following exposure and when they die there are definite changes which are apparent in their tissues. Although not specific, these changes are characteristic of radiation sickness.

We were disappointed in not having an opportunity to see actually affected animals but had to take the material as we found it. We took

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tissues and blood from three or four cows but I believe you are satisfied now that none were related to the deaths around Papoose Lake excepting the recovered heifer which we slaughtered and the bones and other materials we collected from the carcasses in the vicinity of the lake. This is very little upon which to base any definite opinion as you can well understand.

However, we really worked over that material at great expense which, however, I think was money well spent, not only because you deserve the best answer we can give you but because it will be of basic value in the future.

There were two ways the cattle could have been injured by radiation effects--external or internal radiation. In either case radioactivity produces similar results insofar as it directly injures tissue cells which produce characteristic body changes or injury to cells which produce secondary effects which are manifested.

Because this laboratory had radiated cows with sublethal external irradiation and given internal doses of radiation to other cattle the effects were known to us. Since that time we have destroyed a cow with external radiation and have studied the changes which occurred in her tissues. In addition to this work on cows we have continued a previously initiated program of studies in which we used other domestic animals such as the pig, sheep and burro. Therefore we have a number of results for comparison.

We took the blood and other tissues of the slaughtered heifer, which was known to have recovered from an attack similar to those animals which died around Papoose Lake and examined them chemically and histologically (under the microscope). Especial attention was paid to tissues which react to radiation more promptly than others such as the lymphatic system. There was no indication of radiation injury. A chemist, radiobiologist, hematologist and pathology technician worked hours on the preparation of samples from the heifer alone - and of course many, many hours on the samples for the control-radiated animals besides, before we reached that conclusion.

Since we knew by Geiger-Muller counters and meter readings on the ground that there was radioactivity in the vicinity of Papoose Lake the radioactivity was actually measured in the different tissues of both the slaughtered heifer and the samples taken from the cadavers. Soil samples, water samples and samples of the food plants which the animals were eating and in several cases samples of food which the animals ate were taken. Most of the tissues had no measurable radioactivity in them. The thyroid gland,

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which concentrates iodine, had sufficient radioactive iodine to measure and it has been calculated that these animals received a dose of radioactive iodine which would be equivalent to a dose a doctor considers perfectly safe to give human patients for an examination of thyroid activity. We have photos of these glands which we hope to show one day in contrast to affected glands for the differences can be seen by anyone.

In addition, having good monitoring data, calculations have been made on the total dose to the skin of cattle, However, this is of scientific importance only. It can be seen from casual observations that the cattle received much less than the Almagordo or Trinity cattle which were burnt by the radioactivity over their entire dorsum and yet have remained in excellent health for years.

A certain radioactivity was found in the bones of the cattle. It is of such an extremely small amount that counting procedures takes weeks. However, it is of scientific interest and we hope to continue in the study of this element for a reason entirely apart from immediate effects.

The soil and water although carefully analyzed, and even test fed to sheep, produced no results which would indicate they contained dangerous radioactivity or the presence of chemical elements which would cause death by ingestion of normal amounts with food or to quench thirst. Thus we found no clues indicating radiation damage. We can find nothing in the literature or in our more extensive experience with other irradiated animals which would indicate that such a group of symptoms as you described could be connected with death due either directly or indirectly to radiation.

Although our studies into the matter have been lengthy and extensive there was nothing to indicate what was the actual cause of the deaths. We did not observe sufficient specific and objective changes to allow us to suggest any cause of death. We say this with regret but no apologies for we have really worked the material over.

As I tried to explain to you this is an unusual situation for you but it is not an unusual situation for me. Several times during the last 20 years I've been presented with the situation where deaths occurred in animals under circumstances which were extremely unusual in a particular section of the world. Fortunately I was closer at the time of the outbreaks in some cases and had sufficient materials available to be able to make a definitive diagnosis. It would be too much to tell you of these experiences but I'd like to copy a few words from one report:

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"Cows graze by themselves and appear fretful and worried. If driven she goes forward reluctantly, holding back towards the last of the herd, has a peculiar gait, head and tail held high, blinks her eyes and sometimes appears to duck as if trying to get away from some one. As excitement occurs the symptoms become more grave. The cow will fall down after a severe muscular spasm. Sometimes they are able to get up again after a convulsion--others die quickly in a severe tetanic spasm. Many die in this manner around water tanks or water holes".

I've copied that section from a report I published in April 1942 on "Grass Tetany" in range cattle.

This quotation is taken from a report made by two Argentins Veterinarians about 20 years ago:

"Epizootic Tetanoid Disease of Cattle breaks out suddenly in young cattle in districts subject to flooding and appears to be due to some intoxication. If driven, the animal falls to the ground and sustains contraction of various muscle group".

Although there are certain differences in these conditions and the circumstances of deaths reported by you it is my opinion that the nature of the cause of death in these cases and the deaths at Papoose Lake are similiar. In other words, I believe that the findings, or in some cases important lack of findings, indicate that the animals dying around Papoose Lake died from causes more closely allied to an intoxication than to radiation sickness.

I've purposefully not mentioned the other deaths of calves and cattle which occurred in the area towards Lincoln Mines because I was told you are reasonably certain that the poor range, lack of water and sequelae were responsible. Rough coats, weak calves, keratites or even total blindness, muscular weakness, incoordination and even convulsive seizures are listed in the text books as symptoms of vitamin-A deficiency which the University of Utah group reported was indicated by liver assay. This of course resulted from a general lack of good forage at the time.

In conclusion, rather than describe the normal and irradiated blood picture of the cows blood and compare your affected cow to those and do the same for each tissue we examined in drawing our conclusions, I've tried to explain what we did and how we reached our conclusions in an

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general way. If you want specific details such as blood counts, radiation counts, chemical blood levels or analytical data on soil please feel free to request them. It is entirely possible that I'll be out your way soon and I'd be glad to talk over any of this material with you.

With kindest personal regards.

Sincerely yours,

BFT:f

Bernard F. Trum
Lieutenant Colonel, Veterinary Corps
United States Army