UNITED STATES ATOMIC ENERGY COMMISSION

REPORT ON SHEEP LOSSES ADJACENT TO THE NEVADA PROVING GROUNDS

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SUMMARY

1. Some studies have now been completed on experimentally produced beta lesions in sheep. Presently available data on the toxicity of Iodine 131 for sheep have been summarized. Information is available on the levels of radioactivity in the bones of sheep from affected herds as compared with the activity in bones of sheep from herds that were not in Nevada or where the losses were not abnormal.

2. Considering all of the information and data now available at this time, it is apparent that the peculiar lesions observed in the sheep around Cedar City in the spring of 1953 and the abnormal losses suffered by the several sheepmen cannot at this time be accounted for by radiation or attributed to the atomic tests conducted at the Nevada Proving Grounds. This opinion is concurred in by the U. S. Public Health Service (HEW) and the Bureau of Animal Industry. This report has been reviewed by the Department of Health of the State of Utah.

BACKGROUND

3. During April and May of 1953 several sheepmen who wintered their sheep north of the Nevada Proving Grounds encountered unusually heavy losses after the sheep were moved to the vicinity of Cedar City, Utah.

4. There was some fall-out of radioactive material from the March 24 detonation in the area where the sheep were north of the Nevada Proving Grounds and again around Cedar City from the May 19 detonation. In these areas it is estimated that the measured and integrated gamma dosage of radiation did not significantly exceed five roentgens.

5. Lesions probably occurred before shearing, but th[illegible]ecame apparent in large numbers and were reported after shearing. The sheep were first examined by Dr. A. C. Johnson, a veterinarian of some 30 years practice in Cedar City. He reported that he had not previously seen any lesions or losses comparable to those he encountered in the sheep around Cedar City this year. Subsequently experts in the field of radiation and the disease of sheep examined the affected herds around Cedar City and after they were moved to the summer range. The sheep were examined by experts from the Bureau of Animal Industry, U. S. Public Health Service (HEW), U. S. Atomic Energy Commission, Departments of Agriculture and Health of the State of Utah, and the Utah State Agricultural College. Unfortunately the peak of the losses had occurred before representatives from the various state and Federal agencies had an opportunity to examine the sheep and to collect material for laboratory studies.

6. The sheep in the affected herds manifested progressive stages of erythema, desquamation, papule and pustule formation on the face, ears and back. The black sheep were affected similarly to the white ones which tends to rule out photosensitization which is caused by several species of poisonous plants. It was reported that many of the lambs were small at birth, but appeared otherwise normal. Many of the lambs were dead at birth or died shortly thereafter.

7. Studies were made of radioactivity in the bones and various organs of the sheep. Sheep have been exposed to beta radiation to produce lesions for comparison with those observed in the affected sheep around Cedar City. Cultures were made of tissues and blood of affected sheep to determine whether or not infectious organisms were present that could account for the losses.

8. Bones of sheep that died during the spring were provided by the sheepmen from herds that had heavy losses and from herds which had no abnormal losses. Practically all of the activity in the bones could be attributed to strontium 90 - yttrium 90. The average strontium-yttrium content of the bones of four young

sheep from a herd that had no abnormal losses and which had been wintered in Nevada was 1.4×10^{-4} or 0.00014 microcuries per gram of bone. The activity in the bones of four sheep from herds in which heavy losses occurred was 1.9×10^{-4} or 0.00019 microcuries per gram of bone. Since there was no significant difference in the radioactivity of the bones of the sheep from herds having heavy losses and that of sheep from a herd where there was no abnormal loss, it adds to the evidence that the death of the 4 sheep was not related to radiation. Furthermore, the levels of activity in the bones of these sheep tested were far below the levels that could conceivably impair the health of animals or cause observable effects.

9. The thyroid gland of several sheep from affected herds showed relatively consistent levels of radioactivity which on the basis of decay rate was chiefly Iodine 131. The estimation of the dose of radiation to the thyroid is based on both the activity found in the organ and known degrees of contamination due to fall-out in the area where the sheep were grazing.

10. A considerable body of information is available on the toxicity of radioactive iodine to sheep. This radioactive isotope is one of the products from atomic detonations, and also occurs in the gaseous effluents from some of the Commission production plants. The principal grazing animals in the environs of the Hanford Plant in eastern Washington are sheep. Research has been in progress there beginning in 1950 to determine the levels of Iodine 131 on forage that would be toxic to sheep. Pregnant and growing range sheep have been used in these studies.

11. These studies have provided a substantial body of information on the effects of ingesting various levels of Iodine 131 on growth, reproduction, blood changes, and the pathology of the thyroid gland.

12. The thyroid glands of several surviving sheep from the Cedar City area were examined histologically and compared with the thyroids of sheep that had received known amounts of Iodine 131. The calculated dose of radiation to the thyroids of the sheep not wintered in Nevada is based on the activity found in the glands of sheep from non-affected herds. For the sheep wintered in Nevada the calculations are based on both the activity found in the thyroids and known degrees of contamination due to fall-out. Any assumptions used in the calculations were selected to give maximum levels rather than the more probable average values. Sheep that were wintered around Cedar City could have received in the order of 500 reps of radiation to the thyroid gland from the fall-out from the May 19 detonation. Sheep that were wintered in Nevada could have received in the order of 1500 reps from the March 24 detonation. If the sheep were exposed to the fall-out from both the March 24 and May 19 detonation the maximum dose to the thyroids would have been about 2000 reps. The period of high mortality according to the sheepmen occurred between May 1 and about May 25.

13. In the experiments at Hanford (see report on Comparative Study of Hanford and Utah Range Sheep) it was found that approximately 16,000 reps of radiation to the thyroid glands are required to cause observable histological changes in the gland. Moderate histological damage 93000 Definite histological damage and evidence of progressive hypothyroidism occur with a dose of 50,000 reps to the thyroid. The pathological examination of tissues obtained from the surviving sheep from affected herds around Cedar City showed no conclusive evidence of significant abnormal findings in the thyroid gland, bone marrow or any organ other than the liver. The fatty changes in certain of the liver specimens from sheep provided by sheepmen are characteristic of various chronic wasting diseases, malnutrition and pregnancy disease. These livers were from old debilitated non-pregnant ewes

14. Experimental sheep fed as much as 480 μc of Iodine 131 daily for a period of 43 days were in thrifty condition and did not show any gross effects. what would have been the effect if this dose had been given all at 2 times

This represents a dose of approximately 80,000 reps to the thyroid glands. On the basis of the experimental iodine radiation studies and the calculated dosages, it is apparent that radiation from Iodine 131 to which the affected herds were exposed did not exceed one-fortieth the levels that are known to cause gross observable effects in sheep.

15. Beta lesions in sheep known to be produced either as a result of fall-out or produce experimentally had not been observed previously. Therefore, beta burns have been produced experimentally in sheep by applying plaques of radioactive strontium 90 - yttrium 90. Radioactive strontium is one of the fission products produced by atomic detonations. The strontium plaques were applied directly to the skin of sheep after the wool had been removed by shaving. Strontium plaques were also applied over the wool of sheep that had been shorn five or six months previously. The exposures on the shaved areas ranged from 2,500 to 25,000 reps. The exposures over the wool went up to as high as 145,800 reps. The ears and areas around the muzzle were also exposed to various levels of beta radiation. The details of the experimental procedure and the results are in the report from the Los Alamos Scientific Laboratory "Comparative Study of Experimentally Produced Beta Lesions and Skin Lesions in Utah Range Sheep."

16. Ulceration was first seen in the exposed shaved areas at 25,000 reps within eight days. It occurred at the 2,500 rep level in 13 days. The ulceration at the lower level was quite superficial, but at the 25,000 reps the ulceration extended throughout the thickness of the epidermis. Growth of wool ceased on the exposed areas. In the sheep that were irradiated through the wool it required 145,800 reps to produce essentially the same effect as 25,000 reps where the wool had been shaved off. From this it is apparent that the fleece provides a very good protection or insulation against beta radiation. In this connection it should be borne in mind that the herds of sheep in which heavy losses occurred

not at same time interval - Cedar sheep

around Cedar City were not shorn until after they were brought from the Nevada winter range. This would have a two fold effect by shielding & at the same time retaining radioactivity

17. Biopsy specimens were obtained from the beta lesions at various levels of exposure for comparisons with skin specimens from affected sheep from Cedar City. Fifteen thousand reps applied directly to the shaved skin caused a loss of the superficial epidermis in the outer one-third to one-half of the wool follicles. Atrophy of the sebaceous glands was marked. Regeneration occurred early from the wool fiber follicle remnants. The new epidermis was quite hyperplastic and thickened. Twenty-five thousand reps applied to the shaved skin injured the full thickness of the dermis and the whole follicle was lost so that healing occurred by the ingrowth of the sheets of epithelium from the surrounding, relatively uninjured remaining cells. Blood vessels were found to be increasingly damaged as the dose of beta radiation was increased.

18. Grossly the lesions in the experimentally produced beta burns showed many similarities to the lesions observed in the specimens from the affected sheep, and grossly one could easily be mistaken for the other. However, there were easily recognized histological differences. In specimens from the affected sheep from Cedar City the epithelial hyperplasia is not seen, vascular changes due to radiation are not found, and there is no evidence of post-irradiation atrophy of the follicles and sebaceous glands.

names of pathologists

19. Studies were made of histological preparations of various skin disorders of sheep in an effort to determine whether or not the skin lesions seen in the Cedar City sheep and the experimentally produced beta lesions were specific. Histological specimens were obtained from the Armed Forces Institute of Pathology and from other sources. Examples of the following diseases were studied:

page 6 Lushbaugh report "The skin lesion was remarkably similar histologically, to severe beta ray burns as demonstrated experimentally."

Contagious ecthyma
Filarial dermatosis
Actinobacillosis
Papillomatosis
Infectious postular dermatitis
Ulcerative stomatitis (bacterial)
Viral granulomatosis
Sore muzzle disease (bluetongue)

doesn't tell same story as report page 8

From a study of these preparations it is apparent that loss of wool fiber follicles, focal loss of glands and/or follicles, superficial or deep dermal injury which are similar to the changes seen in the sheep specimens from Cedar City could be produced singly or in combination by a variety of organisms or agents other than ionizing radiation.

20. It is recognized that several head of horses that were near the test site probably within at least seven miles from the point of detonation did receive sufficient exposure to produce beta lesions. It should be borne in mind that most of the herds of sheep that suffered heavy losses after leaving the Nevada ranges were fifty miles or more away from the ground zero at the March 24 detonation. There have not been authentic cases of other livestock or wild animals in the winter range area or in the vicinity of Cedar City that have shown lesions similar to those encountered on the sheep. It requires approximately the same levels of beta radiation to produce lesions in cattle, goats and rabbits as it does in sheep. Therefore, the fact that lesions did not occur in other species examined in the areas, provides corroborative evidence that the lesions on the sheep were not due to radiation.

21. In cattle and horses in which beta lesions have occurred in connection with atomic tests and in animals in which beta lesions have been produced experimentally there has not been any measurable effect on the number of healthy offspring or in the general well being of the animals. There was no significant increase in the death rate of these animals, whereas the death rate in the affected range herds was abnormally high pointing to unidentified etiological factors.

22. Considering all of the data it is apparent that the peculiar lesions observed on sheep around Cedar City in the spring of 1953 cannot be reasonably accounted for by radiation or attributed to the atomic tests conducted by the U. S. Atomic Energy Commission. This opinion is concurred in by the U. S. Public Health Service (HEW) and the Bureau of Animal Industry.

23. The Atomic Energy Commission will have continued interest in livestock problems and production adjacent to the Nevada Proving Grounds. The etiology of the sheep losses will be further studied by Federal and State scientists from the various agencies that are engaged in livestock investigations.

Meeting of Livestockmen and AEC Officials, January 13, 9:30 a.m., [illegible] House, Conference Room, Cedar City, Utah

County Agent, Stephen L. Brower, opened meeting by introducing Mr. Pearson and asking him to introduce the men he brought with him, after which each stockman was asked to stand and introduce himself.

Pearson - We have quite a good deal of new information since last August. Of course we don't have as much material to work with as we would like but we have gotten a lot of information on limited material. We were rather late getting in here from our Service, getting in when your most serious losses had already occurred. This made it less favorable for a solution than it would have been. There are some gaps we do not have information on, we hope to fill in some of those gaps. We very much appreciate the fine cooperation of all of the sheepmen. With out it we could not have obtained as much information as we have. There are several lines of work we have studied. We are not only interested in finding out whether radiation was a factor, we would still have a genuine interest in obtaining information in finding out what did cause it. The first thing was to eliminate certain factors and indicate what lines could be under-taken in the future. We have had a rather extensive monitoring system to find out the fall-out patterns on a National and International scale, to find out the extent to which radio active material falls out. We have studied the toxicidity of radio active Iodine. No one had ever seen beta burns or lesions in sheep. We had seen them in most other species of farm animals but not in sheep. There has to be some basis of study, we had to produce beta burns experimentally. This took weeks of study so we have taken time but now have this information. I'll now call someone who did more detailed work on this. Dr. Terrill will give background information on fall-out. some is on slides.

Dr. Terrill - My discussion will be somewhat in the nature of a review. Quite a few of you were at the meeting last summer. I will give some background information in an effort to remind you of what we know and to determine where fall-out occurrs. Since the beginning of the tests the problem of fall-out has troubled this agency. During the last test series we had a monitoring system working on this it was the most extensive organization of that type up to date. The work was done by the Public Health Service and the AEC and the Air Force. You have probably seen the men in their cars who made the ground tests. That data was carefully correlated with the data obtained by the Air Force. There were no wide deviations between the two. Last summer you were shown a map on which the various groups of sheep are located by the Las Vegas Operations Office and showing the fall-out pattern of the tests. You had the opportunity to indicate if that map should be corrected as to the locations of your herds. There are two areas of fall-out that went in the general direction of the sheep. One during the March 24 shot and others due to a series of shots that fell out directly east. We have analyzed the data and it is pretty well agreed that there wasn't any direct correlation between the sheep that had died and the fall-out maps. We went over all of the information again. There are little differences as you go over data the second time but there is almost no difference between our data and this map as it has been developed, it is no different that we have pretty well agreed upon as a group. We have pretty well defined the off-site fall-out and cantcorrelate different levels of fall-out with the losses reported. I have some slides I am going to show you.

Pearson - Ask questions any time you want to.

Col. Trum - Showed two pictures of Indians in woolen blankets and some animals to get us used to the dides. Showed slide of a Utah sheep showing lesions on nose and ears which were thought to be Beta burns. Said that later they were produced at Los Almos experimentally and looked much like this. Most people couldn't tell the difference. Showed slide of the other type of lesion on the shoulder. As we go on with the slides you will see there is no relation to Beta burns.

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Trum - Epelation was reported as the hair came off and eff. e entire animal, but it wasn't like these. At oak Ridge we clipped one side aced Beta emmitting esotopes near and produced some lesions. At the e a month we began to see little lesions coming. Two small lesions at 10 and 5 sand reps and no lesion at 2,500 raps. (Col. Trum was showing slides and talking, giving bits of explanation). Showed slides of sheep which had been experimentally burned. Some had clipped places on sides with burns on them and others showed the side that had not been clipped. Showed slides of several lesions. Close up of one lesion showed that it had lost the wool but no scab was apparent. Showed burns at various stages until the skin sluffed off, then later as it started healing, the wool was coming in thin and fuzzy. The wool taken from a sheep that came into Cedar that was clipped and stored before May 19 showed no radiation. After that they had some. Wool was sent to laboratories and it was analyzed and the decay pattern of an isotope is such that by Extrapolating back you can determine the nature of the isotope. Information of this type can be made very accurately. With this method they can tell you where it came from and what time it was set off. All of the activity that was found pointed to the test on May 19. Most tests of sheep were before that time. No activity was shown on sheep in this area that could be found to date back before that time. The activity in the sheep in this area occurred around here. Most of the deaths had occurred before samples were taken. We did thyroid studies and burns. We had correlativity studies on sheep and cattle that were in the area all the time. - - showed a picture of a cow burned in Alma Gordo tests. She has produced calves regularly and she is marked for life. These tests were in 1945, and this picture was just taken two years ago. Showed another cow whose pictures were taken at the same time. She healed better than the other one and she has white hair but she is all right. Showed a closer picture of the same cow. Picture was taken five years after she was burned. We are keeping some of these sheep for future observation. We exposed cattle and about a month later a little heifer. Later a Nucrotic area came on the heifer. She was given around 30,000 rep and her mate was given 20,000 reps and nothing showed. Two months later some healing has occurred (picture) but there are some small scabs. Some areas don't have hair and some have. hair is different. She will be marked for life. We had some horses in the area. They had been burned very early. We had these lesions in June. They thought they had been in the area of greater fall-out than sheep or cattle. (Picture) White hair is healed place. On back they are not healed. They would have been within at least 25 miles on Tuesday. There are four still alive and in good shape but marked for life. (picture) horse they had burned with 15,000 reps. He shows no Lesions but hair stands straighter, 45 days later lesions becoming apparent. You could brush off hair and leave some of the skin. (picture) Animals have these lesions caused by actinic rays in the high mountains. They look the same as radiation. - - Began to show tissue slides. Showed hair folicals. showed white spot with hair in middle. Burn is about the depth of two thicknesses of paper. Skin moved down in. A thickness of paper is all that is affected by the burns. This was a sheep taken from the Cedar area. It is an infection. Showed experimentally done sheep. some sheep taken from here didn't produce anything like this although some looked near enough like it to confuse people. Showed another sheep where it hadn't started to heal. Showed picture of thyroid gland. Could effect through blood or through total body radiation. If it was enough in total body radiation it would effect the thyroid. Showed picture of normal thyroid. Slide of Corry ewe thyroid. Blood will not clot or retract in the normal time. This lasts about a month and then thyroid stops absorbing iodine. There is no clot retraction in an animal in the lethal dose range. within five days there is a change in the clotting time of the blood. It is greatly prolonged, from the normal 12 seconds to ½ a hour. Showed picture of a burrow overy. Showed pictures of effected bones. Showed picture of cow bones from stewart ranch. Showed picture of rays working from the inside out instead of as in an X-Ray outside in. Picture of same animal ~~in~~ four months. At four months the cattle were not effected.

_____. Asked about thyroid pictures.

_____, Were the horses in the slides 's.

Terrill: Yes they were.

_____: Those horses are right next to us.

Terrill: They were on the other end of the ranch.

_____: The cars told us we were in a hot spot.

Terrill: This has been a wonderful opportunity for us to evaluate the actual damage done with the known fall-out. You can't cause a big amount of damage with a small amount of radiation. For deformity the radiation had to occur before 6 or 7 days from conception. After that it won't cause that. People get excited just because they didn't know what to do. The equipment will register any radiation, even cosmic radiation. We must realize that they were measuring very small amounts of radiation. He related the story of Oak Ridge and the confusion caused by a small fall-out from one of the nevada tests. Also told a story illustrating the effect of rumors.

Steve: On the map showing the fall-out pattern what is the cause of the little isolated spots of heavier concentration.

Jim: If you make many measurements in an area you can say that it is high here even though it is surrounded by lower areas. The test site standards for the protection of people the correlate the material to protect people from radiation they will accumulate over a life time. We hope that people will be able to work in radiation industries without having any radiation effects that will produce noticeable changes. When we think of a hot area we mean radiation from 1 to 5 R. For immediate damage we think of radiation of thousands of R. or integrated doses of 300 to 400 R. We ask people to move if this radiation plus other radiation would effect the individual. But that doesn't mean we would expect radiation to cause immediate damage.

Steve: On the map some areas without roads showed most of the radiation recorded on the map, were there people there to tell.

Jim: As far as we know no ground measurements were made but airplanes went in and air surveys were made. They went over other areas too and correlated their findings with ground readings. We feel that there wasn't a substantial amount of radiation.

_____: In general was the air higher or lower than the ground.

Jim: It varied both ways. We correlated with the Military people and in some areas we feel that our data is better than theirs and in some it is not as good as theirs.

Jim: Showed pictures of the fall-out map. After the meeting is over if you feel these maps aren't accurate we would like that information. This map is not clear enough so we will use the other map.

Pearson: Standards set for humans—these are based on genetic effect. Changes can be induced in mutation. You can increase the rate of mutation by chemicals or radiations. These standards are set on possible rates of mutation. An increase in one out of 500,000 births is enough to notice. This is too small to be concerned about in livestock. In crops new varieties of oats and corn have been produced by mutation. This year the oat crop in Wisconsin and Minnesota practically 1/3 was destroyed by rust because the varieties that grow there is suseptible. Three or four years ago they started working on this , exposing oat seeds from radiation. They grew a crop from the seeds and then grew another crop. Five or six seeds in the crop didn't show the effect. Doing this they got a mutation resistant to rust. This is being used in a number of crops. At Brookhaven they have a station set-up for radiation of crops for getting new varieties with new characteristics. Radiation has a lot of potential beneficial uses. These are the uses Iesenhour meant.

_____: How were the tests made on the cattle.

Dr. Trum: We injected or gave in capsuls for the bone tests. Others were injected and fed both. On the hide we put it right on the hide. Air and dust could not effect the hide it would be internal. Even if the sheep are dead the radio activity is still there. On those we found they didn't have this. You can't duplicate it exactly—the air conditions, all you can do is make larger doses.

?— Where a sheep is getting dust on feed over a period of time how important is the accumulative effect.

Trum: It is possible we can't get the dust but we know how much is in the dust and if we find any one thing we know how much of the others was in that dust. I have been exposed to radiation in the yellow area several times. In tests we have used far greater amounts than anything we picked up.

_____: Did you carrying on the feeding of sheep in similar circumstances.

Trum: We fed the sheep dust and things we collected right close to the site. We used a heavier concentration. All our tests were made a long time after but we can extrapolate back. There are no effects of it.

_____: What about day after day after day pick up?

Trum: The thyroid has nearly all of the iodine in the body and if you make tests of the thyroid you can extrapolate back and figure how much they had there. The skin and muscle are hardly effected but the thyroid stays there. The bone and the thyroid.

Pearson: Nothing but sheep were effected this way. We know that the effects on sheep are the same as on other animals.

_____: What caused the injury.

Pearson: We don't know what caused it. We talked about diseases which we didn't find out about in six months. It could be something like that.

Steve: It takes the same amount of radiation? Is that in body weight?

Trum: It doesn't follow exactly body weight but the sheep and cow and goat take about the same effect. There are a number of things that could cause the same effect.

?——Two men said "This one is hotter than a $2 pistol"

Trum: That was unfortunate. They were measuring Miluconts. Most of the sheep had died before the radiation actually occurred. If they were hot enough to do damage they are too hot to work on.

_____: What level did the sheep get on the forage.

Trum: The black area is 100 times hotter than the yellow area. A sheep would have to have seven times that to cause its death in ½ of the sheep. On red he would have to have 10 times that to cause the death of 1 out of 10 in the total body radiation. In the yellow area he would have to be exposed to that for two or three months every day and you couldn't even pick it up. In the green area you would have to have this much every day for 67 days to kill them.

?——Are there any other effects of the bombs than radiation.

Trum: No.

Steve: May 19 is the only date on which there was any measured -out?

Terrill: No. In addition the arm which comes this way is a composite of several shots the major one was the May 19.

Public Health: We got in about the time of the AEC. We measured the fall-out in the wool using the decay curve mentioned. In order to estimate what happened here on March 24 we correlated our off-site readings and made an estimate. It is possible the sheep were radiated to some degree. We have no direct measurements other than the fall-out data of what happened in here after March 24. We have worked in the off-site area and used reactors to try to check gases. We can't duplicate gases, the only way we could do that would be to set off a bomb. The AEC has tried to get animals in the fall-out areas. It isn't easy to do. If we could dream up an experiment that would dimulate these conditions they would do it but it isn't easy. We can't simulate a life-time's conditions until a life-time is done but we can extrapolate. We just have to take it on faith.

_____: You have measured the radiation and didn't find enough radiation to kill them?

Trum: They didn't have it in amounts necessary to kill them.

_____: Is it possible that radiation might disturb natural body functions enough to cause death sometime.

Trum: Radiation effects everything the same way. It would effect the people, the horses, cattle, sheep, goats, and dogs in the same manner. It effects pigs in 50 rencons less than a horse, and a cow and a sheep differ about 100 rencons. They would all be effected in the same manner if radiation caused it. There would have been radiation deaths in people and other animals, it doesn't pick out sheep. Radiation is a direct thing and can be measured.

Brustad: Dosage is probably confusing here. The body dose radiation that these sheep got is around 5 rencons. You can get more rencons from a flourescope or an X-Ray machine than these sheep got through body radiation. We have something here you have never seen before. There are always things like this, often caused by disease. you could have been here 30 years and you wouldn't have seen it before because it hadn't been here before. We had to autopsy sparrows at Pasco. The County Agent had been putting-out wheat with strychnine and they had eaten it the same day as the shot.

Bustad: Well why doesn't everybody stand up and stretch for a minute or two. They did.

Bustad: I have been living with sheep mostly for about 5 years. In production of plutonium we deal with fission products because a lot of the stuff goes out the stacks and the wind carries it. It is much like what you are concerned with here today. You are concerned with whole body radiation, a cloud going over and causing rays that go through you. Then there are Beta Burns. They appear the same as you look at them as what your had here but not to microscope. There are two elements metabolized in the body—radio active iodine and radio active strontium, iodine in large amounts and strontium in small amounts.

Bustad gave his report.

_____: Radiation effects everything alike? A sheep takes 1000th what any other animal we know would.

Bustad: We have done a lot of radiation studies in which they put these animals under X-Rays and give them a dose which is the same as what kills man and the pig and a little more than it takes to kill the dog.

Pearson: We have had a number of sheep on the site.

_____: A very small amount would so disturb them they would die. They don't have a resistance other animals have.

Bustad: If the animals are fed properly and we give them some theraputics immediately I can get the same results as with a Bovine.

Pearson: We don't have an LD 50 for sheep but we have determined that it takes approximately the same amount of radiation for sheep as other animals.

Bustad: If sheep are treated the way I say they should be treated and fed the same way it should be fed they will act the same.

*** Can't make any money doing that!

Slides on sheep being fed and cells.

Steve: On control sheep showing tissue samples, what sheep were them?

Bustad: In the study sheep they were my control sheep.

Steve: You took control sheep from here.

Terrill: We tried to get tissues to Dr. Holmes. Those tissues were the same general nature and same number of counts as the sheep on the range. We thought that we had located some sheep that were never in Nevada and they were used.

Bustad: We gave pellets with iodine but we also took radio iodine and sprayed it over hay. We took samples of this hay—statistical samples, and we count thyroid twice a day every day. These sheep on chopped alfalfa hay we treated the theoretical formula should have had an average of 14 to 16 microcuries in 10 days. They had 4 microcuries in 10½ days. Our calculations are pessimistic by at least 2. If you give iodized salt it will protect the thyroid. It will cut the up-take in half. We are doing this under the most pessimistic conditions.

_____: You stated that you fed your control sheep many times what our sheep could have had. All our evidence is dead some months before any tests were made here. Your tests show radio activity decreases. How can you know that.

Terrill: We should submit that we did not measure iodine in any dead sheep. We took the samples and split them up and measured the radio activity independently in three laboratories and the results were similar. On the basis of calculating back to the May 19 shot we calculated the number of reps on the same basis as the group at Hanford. We calculated what the sheep could have received if there was a ratio between the measurements near Lincoln Mine at the same time. We did not get a representative sample of the sheep that died but we got the nearest we could when we came into the picture. (I don't think even if you were riding the bomb two feet from the explosion it would kill them acutely?) I have given sheep such strong doses that he was so hot I had a 20-minute time limit to take samples. He gained weight.

_____: Do you know of any animal in the area where the bomb was exploded that was damaged in health or showed marks from the bomb or killed by the bomb.

Bustad: The horses were five to 10 miles from the tests. They were burned but there was no imparment of health.

_____: Were there any dead ones?

Sanders: No. We have burned 104 cows and some 21 horses. We [illegible] the horses. There was no report of damage to the cattle. We can not settl[illegible]ng over $1000 anyway.

_____: The material from the bombs can damage or injure animals or people. We know that practically all the sheep that range in that area had these effects. We fed these sheep corn and tried to keep them up. I couldn't keep my sheep up where they were able to raise a lamb. I had never seen it before.

Pearson: We would like to have an answer for you. We don't have any explanation for it. There have been instances of disease coming in that caused different effects, we don't know what happened.

_____: The sheep didn't do like they should have done most of the winter. Starting in March. We were feeding ½ pound per sheep and increased to 1/3 pound before lambing. Lambed in May. Had two herds. Took bad ones out of good herd and took them over there and feed them heavy.

Bistad: There is very little protein in corn and they could be low in portein. How was their flesh?

_____: Range is white sage and black sage. Very little salt brush.

Harris: It has been our experience that straight corn is not as good a supplement as one with protein.

_____: What about your native feed. Sage is very high in protein.

_____: Some of the sheep were fed cottonseed meal with the same effects.

_____: March was the big month that showed effect but we noticed it expecially in April and May.

Harris: It could have been a carry-over from the winter nutrition. The critical time is in January and February and then when you get over into March and April on trail and get to lambing and even if you feed good then you will still get losses because they were weal all winter.

_____: We were feeding all winter.

Trum: We can't answer all of the questions you are asking satisfactorily. The question is, how can you with all the blanks in there, know that radiation didn't cause the deaths? We know how radiation re-acts. Radiation causes specific things. When radiation effects a group it leaves specific marks. It destroys tissues. It destroys tissues in the back and thyroid and even in the brain. The biggest change is in the blood change. Five to seven years after changes you can still see them in tissue changes. Blood changes can recuperate. We examined all the tissue we could get here and we examined the bones and they should still have radio activity and still have the damage. In no case did we find radiation that did that. We can't say what a small and subletnal amount will have on a sheep in bad shape. The amounts we have measured on so small that we couldn't concieve of it causing as much damage as a drop in temperature would. We also can't conceive of it only picking on sheep. I don't think we will ever have this similar set of circumstances. We all have X-Rays without thinking of the danger that it might cause us. Most people who are taking X-Rays are in bad shape and in no case has it killed them. Doctors use much greater radiation on people all the time than any of the doses that were obtained here.

Terrill: Drew chart to show how they can determine radiation fall-out.

Bustad: You still have sheep in the area. If there was damage enough in the area they are marked for life. If you could submit your thyroids they would still show the damage in the thyroid. If there was radiation burns they should be permanently marked with Beta burns and in the thyroid and bones.

_____: Beta burns on sheep, do they come from the inside or the outside.

Bustad: From the outside.

_____: You say the deaths can't be attributed to the bomb. Where do we go from here.

Pearson: If this shows up another year we will be in a much better condition to study this. We have a continuing interest in this. If and when the AEC conducts any other tests at the Nevada Proving Grounds we will expect to be in there in advance with people to make tests. This we definitely plan to do. At that time we would like to sponsor and conduct some studies aside from radiation and to this end we are setting up projects and providing some funds for the college who's business it is to study this. Dr. Hoffman of the Federal Bureau of Animal Industry will continue the study on these animals. We have also set up a project with the University of Nevada to carry on similar studies in Nevada, mostly on cattle. We would welcome suggestions.

Sethr: We are going to have more monitering done in the next tests. We figured that if and when we have another one we will have more data.

_____: On the basis of this study here there would be no basis for these gentlemen putting in any claim for these losses.

Woodruff: We can keep no one from putting in a claim. On the basis of our tests there was no damage. You could bring suit but the AEC has no authority for paying more than $1,000 and claims would have to be judged on the basis of these studies.

Those in attendance at meeting at Fire House in Cedar City, J. . 13, 1954, 9:30 a.m.

Joe B. Sanders - AEC LVFD

Seth R. Woodruff - AEC Las Vegas Field Off

Lorin E. Harris - U.S.A.C.

James G. Terrill - USPHS

LeGrande Shupe - USAC

Leo K. Bustad - G.E. Co. Richland, Wash.
(Hanford Atomic Products Operation)

P. B. Pearson - USAEC, Washington, D. C.

- representative for

D. C. Dix - Tribune

R. L. Heyborne - Radio KSUB

Robert G. LeCompte - AEC SFCO

5 CSU Students

Dr. A. C. Johnson

Lt. Col. Bernard F. Trum
U.T. AEC Agricultural
Research Program
Oak Ridge, Tenn.

W. T. Hoffman - BAI Salt Lake City

Statement from of Parowan, given September 16, 1952

I was out there a year ago last spring when they were shooting the bombs off. All the rest of the boys had come home before they started shooting. We climbed those peaks to watch them shoot them off. I had fed concentrates to my sheep all winter quite heavy because the range hadn't been good, and they were muttom fat. We watched the bombs shoot off and saw the cloud come over us. We started home the 27th of April, we move slowly and haul water all the time. There were some bombs shot off after we had started home, we could still see the cloud and hear the blast when we were on the trail.

We lambed at home on the alfalfa fields. We didn't notice anything particularly wrong with our sheep until we started lambing and then there were quite a few lambs born dead or died immediately after birth. They were abnormally small. Some of the boys would speculate on the cause of it and say that it was that bomb that was causing it and others would say no it's that concentrate you feed, but we had fed the same kind of concentrate for two years previous without bad results and we fed it the next year after without bad results and we are feeding it this year again so we don't think it's the concentrate. Our oldest ewes were 3-years old at that date of lambing in May of 1952. They were in awfully good condition before lambing as well as after. We had quite a few scabby headed sheep and quite a few ewes that appeared to be consumptives. They would wheeze and pant. Most of these ewes that appeared to be consumptive didn't live long and pretty soon there were others showed up that had previously appeared normal. My sheep weren't poor and didn't ever get poor.

When it came time to go on to the winter range last fall (1952) I was taking no chances on duplication of events and even after I had paid my grazing fees in Nevada I didn't dare go back out there. I leased a place of in Modena and wintere there.

I had about 100 head of sheep in my herd the winter before when I had the trouble. He decided not to send them out at all the next winter (the winter that I stayed in Modena) he kept them on the farm on feed. Most of these old sheep died that winter on oats and hay. They seemed to show up sick and linger along for a few days and then die.

The only extensive loss that I have had since has been a continual appearance of sheep that appear to be consumptive. The oldest sheep are only 4 years old now.

A year ago now, 1952, I was unable to get quite a number of my sheep to bear lambs. The spring of 1953 about 250 head of lambing age didn't lamb at all, (These were the ewes that went through the winter the year before in Nevada), Although those that lambed lambed out in approximately 20 days showing that it wasn't a deficiency of bucks.

I ran in the locality of the Irish mountain, "Tickaboo" Flat, "Timpiute" Valley, Wild Horse Valley, and the south end of Coal Valley. When they shot off those bombs that spring just before we left we were right down on the Lincoln Mines Road 20 miles west of Chrystal Springs and were hauling water to the sheep.

The concentrate I feed is a mixture of cotton seed and grain and bone meal, fed in salt. Two pounds of bone meal per 100 pounds of the concentrate. I never feed at night. We feed in mid day, Always with plenty of water.

I usually run about 1600 head of sheep.

Last year the lamb crop was about 85 percent and this year I got 110%. My usual average is about 110%. I lamb late enough (around the 12th of May that sheds aren't necessary. I have sheds available if we need them. The 85% I got last year I got through the use of adoptions. Every ewe that could handle a lamb raised one. I had no trouble getting the ewes to take the strange lambs.

C. C. Lushbaugh, M.D.
UNIVERSITY OF CALIFORNIA
LOS ALAMOS SCIENTIFIC LABORATORY
(Contract W-7405-ENG-36)
P. O. Box 1663
LOS ALAMOS, NEW MEXICO

VIA AIR MAIL

Dr. Monroe A. Holmes
U. S. Public Health Service
Utah State Department of Health
Salt Lake City, Utah

KODACHROME DUPLICATE
KODACHROME DUPLICATE
KODACHROME DUPLICATE
KODACHROME DUPLICATE

repres. group of sheepmen
Between secr. four minutes or [illegible]
some questions

1. No answer to cause
2. .. readings in area of animals
3. Dosage effects on animals not suffic. worked out
4. approved of present data.
5. Stringfellow's repres. there questioned as to direction of problem
   (a) as to claims - AEC cannot pay over excess of $1000. up to congress.
   (b) as to research - Utah State college to study sheep.
   ✓ Pearson & Harrison state need permanent base for studies - to find out all about sheep as to age, type, nutrition etc on broad scale then into radiation effect.

FEDERAL SECURITY AGENCY

ROUTE SLIP

(Fold here)

Form FS-30

Date 1/29/54

To: Constit. Organ. Bldg. Room

1. Utah State Health Dept.
   Attn: Dr. [illegible]
2.
3.
4.
5.
6.

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(c) Future plans for better data - AEC submitted plans involving $20,000 to aid in protection of P.H.
   (1) state of Utah needs more representation -
   Locations for measurements
   use of local personnel for monitors, etc.
   Med. & Biol. personnel
   film badges on sheep & livestock workers
   (2) USPHS plans for better obtaining of data
   use of vets etc
   civil defense groups for monitoring by paying hourly salary & mileage

Coleman to be assigned by USPHS in Mar. 1954

63

226 VI 50 UTAH STATE DEPARTMENT OF HEALTH

ROUTE SLIP

DATE ______

TO: Dr. Holmes

FOR APPROVAL	NOTE & RETURN
SEE ME	COMMENT
NOTE AND FILE	AS REQUESTED
NECESSARY ACTION	PREPARE REPLY
INVESTIGATE	FOR YOUR INFORMATION
FOR SIGNATURE	PER CONVERSATION

REMARKS:

FROM: ______

Letter to Stringfellow
Need for broader observations & research. Present data too little, too late.
1. Part Utah Health Dept. plays our suggestions
2. Emphasize interpretation of report as summary to date & on basis of present data it is a reasonable summary
3. AEC plans on research & broader radiation studies in collaboration with research people & sheep industry

- 2 -

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ER:RH

February 1, 1954

Dr. Monroe A. Holmes
Veterinarian
CDC Activities, USPHS
Utah State Health Department
Salt Lake City, Utah

Dear Dr. Holmes:

In reviewing the literature for animal and human responses to beta irradiation, I have just run across a 1948 report entitled, "Aberrant Tissue Developments of Rats Exposed to Beta Rays: The Late Effects of Beta Rays" by P. S. Henshaw and R. S. Snider. The report was published by the Atomic Energy Commission as MDDC 1663 and should be available through the U. S. Atomic Energy Commission, Technical Information Service, P. O. Box 62, Oak Ridge, Tennessee.

Henshaw and Snider, in this paper, report a high, late skin tumor incidence in rats exposed to single whole body doses of Beta radiation of up to 8500 rep; and to whole body doses of Beta radiation at rates up to 625 rep per day, 6 days weekly for more than 18 months (aggregate doses of more than 23,000 rep in 18 months). Because of its possible pertinence to the sheep deaths of last spring in Utah, I believe you might like to know of the existence of this paper.

Sincerely yours,

151

Samuel C. Ingraham, II, M.D.
Assistant Chief, Radiological Health Branch
Division of Engineering Resources

Respectfully forwarded:

Francis J. Weber, M. D.
~~Regional~~ Medical Director
Public Health Service Region VIII

DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
~~FEDERAL SECURITY AGENCY~~
PUBLIC HEALTH SERVICE
ATLANTA 5, GEORGIA

February 5, 1954

Dr. Monroe A. Holmes, Veterinarian
CDC Activities, USPHS
Utah State Health Department
Salt Lake City, Utah

Dear Dr. Holmes:

Reference is made to letter dated January 19, 1954 from Mr. James G. Terrill, Jr. concerning payment of travel expenses in connection with radiological health activities.

Advice is furnished that all travel vouchers submitted relative to activities described above should be forwarded to Mr. Terrill's office for appropriate action.

Sincerely yours,

L. C. Strickland
Chief, Audit Unit
Budget and Fiscal Section

Dr. James H. Steele
Communicable Disease Center, Atlanta

April 6, 1954

Through: Chief, Div. of Sanitary Engineering Services
Acting Chief, Radiological Health Program

Travel Reimbursement for Veterinarian Monroe A. Holmes

See attached copies of correspondence between Dr. Holmes and this office.

In accordance with previous agreement between Mr. Terrill, Chief, Radiological Health Program, and Dr. Holmes, it will be satisfactory with the Radiological Health Program for Dr. Holmes to use allotment #4-2430 in claiming travel reimbursement for his proposed trip in the vicinity of the Nevada Atomic Test Site.

This office is looking forward to receiving a copy of Dr. Holmes' report describing his findings during the trip.

Samuel C. Ingraham, II, M.D.

Attachments

cc: Dr. Monroe A. Holmes
Region VIII

COOPERATIVE EXTENSION WORK

IN

AGRICULTURE AND HOME ECONOMICS

STATE OF UTAH
CEDAR CITY

UTAH STATE AGRICULTURAL COLLEGE
U. S. DEPARTMENT OF AGRICULTURE
AND IRON COUNTY COOPERATING

April 13, 1954

EXTENSION SERVICE
County Agent and
Home Demonstration Agent
Work

Dr. W. M. Holmes
Public Health Veterinarian
Disease Control Section
State Department of Health
Salt Lake City, Utah

Dear Dr. Holmes:

Since your recent field trip checking the sheep situation down here reported considerable death loss in his range herd. I believe I mentioned to you that he had said early in the winter that he was getting some losses from sheep dying from Blind Staggers and Paralysis , a number of them died after they had gotten down and didn't seem to have any control over their front legs and they were unable to eat or drink.

He reports a number of animals having scabs or sores around their nose and mouth and fairly high up on the face. He asked if we could get him a Gieger Counter to check the brush and some of the dead animals out there. Of course we had none available and he is going to try to get one from a local prospector.

He reported that one animal definitely died of big-head where the head was greatly enlarged and that some had had a slight touch of big-head and had recovered.

Maybe you have reports of similar losses in other herds that you visited on your field trip. I would be interested in hearing what you did find on your trip out to Nevada.

Sincerely

Stephen L. Brower

Stephen L. Brower
County Agri. Agent

SLB :sf

cc: Joe Sanders
Mr. Bennett
Wallace Thorley

UTAH STATE DEPARTMENT OF HEALTH

SALT LAKE CITY

April 14, 1954

M.O.C.
Radiological Health Branch
Division of Engineering and Resources
U. S. Public Health Service
Washington, D.C.

ATTENTION: S. C. Ingraham, II., M.D.
Assistant Chief,
Radiological Health Branch

FROM: Monroe A. Holmes, D.V.M.
Veterinarian, C.D.C., U.S.S.
Utah State Department of Health
Salt Lake City, Utah

SUBJECT: Narrative Report on Continued Investigations of Sheep Deaths in S. W. Utah from Unknown Source

Date: April 6, 1954 through April 10, 1954.

After completion of official State business in St. George, Utah, at 2:00 P.M. proceeded to Cedar City, Utah to confer with Steve Brower, Iron County, Agriculture Extension Agent, arriving at 3:15 P.M. Contacted Mr. Brower and made arrangements for examination of local sheep herds and others coming in from winter range on the following day.

Wednesday, April 7, 1954 proceeded to the home ranch of , who is now in charge of the sheep since his father's death last year. The No. I herd, consisting of approximately 1500 - 2000 animals, had arrived in this area from Caliente Valley (20 miles west into Nevada) on Monday, April 5th. Shearing began the following day, with approximately 300 head in the shearing pens during the present observation period.

Careful observation of those animals, both sheared (shorn) and unsheared, revealed that approximately 50% of them were carrying old lesions around the commissures of the mouth and across the nose and on the anterior edge of the ears. These lesions had coalesced into reddish-brown, leathery appearing masses. Some of this outer covering had cracked, and upon pressure would become free, causing bleeding and erosion into the sub-dermal layer of the skin.

Mr. mentioned that on one of his trips to his No. II herd, wintering approximately 20 miles west of Panaca, Nevada, his range boss called to his attention that a number of sheep were bleeding at the corners of the mouth, and some also had irritation over the nose (approximately March 10, 1954) but had no other lesions. These lesions apparently cleared without further difficulty within a months time, leaving only the leathery scab.

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Because of the small size, and apparently due to the great losses in the last years yearling animals (12 - 18 months), about 800 of them were retained in the No. I herd in the Caliente Valley. On observation they were found to be 1/3 smaller than a normal animal of their age; the wool coat was rough, and they were relatively thin compared to other sheep grazed on the same area. The estimated lamb crop from these animals could be placed at approximately 40%, based on outward manifestations of pregnancy; e.g. enlarged girth, filling of the udder, etc., and in view that they were expected to lamb around the first of May.

In this same group, it was noted that the black "counter" sheep had unusual appearance of white around the muzzles. Most of the "counters" had been in the groups which suffered the largest losses last year. Closer examination of the white areas of the muzzle, revealed the wool to be very coarse, and closer to hair in texture than wool. Some of these animals had thickened areas over the back, although the wool growth was apparently normal. One or two had scattered areas of white on the black of the back, but were unable to catch them for closer observation. Mr. and the shearers were unable to say if this white muzzle was specific for the type of sheep, or whether it was an unusual occurrence. None of the counters were very old, hence cannot explain the appearance of the white hairs on ageing.

Proceeding to the home ranch of the , observed some 80 head of old ewes, 8 years of age average, which had been too ill last fall to place on winter range. These animals had been fed alfalfa hay, corn, soybean and other protein supplements with bone meal; however, were in very poor condition. Approximately 60 of the 80 showed similar nose and mouth lesions as did the herd. Pictures were taken of these animals, and will be forwarded at a later date.

Completing the observation of the herds at Cedar City, proceeded west through Caliente Valley to Panaca, Nevada. Several bands of sheep were grazing on irrigated pastures in the valley, as well as other livestock. Observed four of these groups closely, and inquired from local residents about the conditions of their animals. None had similar illnesses or losses either last year or at the present time.

At Panaca, conferred with , one of the . Of the 2500 head of sheep in his group, he had no unusual losses. The sheep were considered to be in better condition this year than last because of the relatively mild winter and late storms which added more moisture to the ranges and provided for more growth of vegetation.

From Panaca, proceeded due west over unmarked roads to the eastern slope of the Highland range, approximately west by direct airline to the Ranch. Here conferred with , who with each range 1500 sheep in this area. They had no trouble this year or last, and have not given any supplemental feed. This range is very well grassed and with good coverage of over vegetation, as well as having sufficient water.

From the ranch, proceeded north and west through the Highland range to approximately west of Panaca to the and ranch on the western slope of the Highland range at the eastern slope of the Kly Range. Arranged for a horse to proceed due west 8 miles over the floor of Dry Lake Valley to the No. II herd of . Met Mr. , the

range boss, and observed some 2475 sheep in this herd. The sheep were all in fair condition and had only normal loss during the winter; however, he did mention, without calling it to his attention, that during March the sheep had bleeding mouths and irritations across the nose. Was able to confine approximately 50 head and closely observe these lesions, which were apparently the same as those which were observed in the No. I herd. Again it was noted that the black "counter" sheep had the same white hair around their muzzles, and a spot here and there on their backs.

Returned to the and Ranch and drove north in the valley to contact their herd. Unfortunately the herd had moved and was in an area that was not accessible by car, and too far distant to return for a horse.

Left their ranch, and proceeded south in the Dry Lake Valley and met the herd of on the winter range. their herder, said there were 1100 head of sheep in this group, and that he had lost approximately 50 or 60 during the winter. These were among the apparently better ewes. Their deaths were due to paralysis involving all four legs. At the same time he had noticed many dead jack rabbits, but was not able to state within how long a period and how many altogether. They had not fed supplemental feed during this winter. He had also noticed that a few of the sheep had broken out along the muzzle approximately a month ago. Due to the lateness of the day returned to Caliente.

Left Caliente the following morning; proceeded south on Highway 93 towards Hiko. From Hiko went westward over several of the smaller mountain ranges and valleys trying to find the herd. After half a day was not able to locate them, but noticed evidence that they had begun to trail towards Cedar City with the route being taken over some of the areas that were impassable by car. This range, as one proceeded west, was drier and lacked the recent growth of vegetation. Apparently had not lost many sheep during the winter, as there was only evidence of two or three carcasses in his grazing area.

Proceeded north on Highway 93 towards Ely, Nevada. Near Mount Grafton, approximately 79 miles north of Pioche, observed several sheep herds; was able to contact the range boss and found that the sheep belonged to of Ely, who was running approximately 6,000 head of sheep in this area. This herder had known of the sheep trouble of the Utah herders, but had not experienced the same problem himself, either last year or this year. His ranges are approximately 2,000 feet higher in elevation and contain better vegetation than those that were noted further south. From Ely proceeded south on Highway 6, to Ranch belonging to . This gentleman had indirectly notified us that he had had 400 Herfords, which were manifesting what he thought to be burns or irritations on the back and that these had initially occurred last year. We examined 150 head and noted that the so-called lesions were due to scabies or ringworm infections, and not possibly to radiation or other causes. This range is located directly north of the Central Valley, and the A.E.C. Proving Grounds are located at the Southern end.

Visited several of the adjacent farms (4) to determine if additional animals were afflicted, but none were observed, so returned to Salt Lake City.

Comments:

The following items should be more fully considered:

1. Continued lesions of the nose and mouth of sheep involved last year.

2. Color differentials in the black sheep.

3. Closer tabulation of sheep losses during lambing and shearing this year.

4. Additionally, it was found that all herds had been vaccinated for sore mouth, which would eliminate the possibility of this disease causing the mouth irritations as observed.

5. The numerous changes of air currents in different localities should be fully considered in determination of fall out patterns. I was able to observe six distinct air current patterns in one valley that was 10 x 6 miles in size. Numerous patterns could easily occur because of the unusual geological formations.

It is recommended that radiological experts from either A.E.C. or Radiological Branch of the Public Health Service, cover the exact grazing areas of these herds to determine possible radiological pattern, to continue follow-up of these sheep both at their home ranges during shearing and lambing, and in the ealier period of their summer grazing.

Respectfully submitted,

Monroe A. Holmes
Veterinarian

MAH/s
cc - Dr. Weber
Dr. Steele
Dr. Spendlove
Lorin Harrison

April 14, 1954

M.D.C.
Radiological Health Branch
Division of Engineering and Resources
U. S. Public Health Service
Washington, D.C.

ATTENTION: S. C. Ingraham, II., M.D.
Assistant Chief,
Radiological Health Branch

FROM: Monroe A. Holmes, D.V.M.
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363-370

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Left their ranch, and proceeded south in the Dry Lake Valley and met the herd of on the winter range. , their herder, said there were 1100 head of sheep in this group, and that he had lost approximately 50 or 60 during the winter. These were among the apparently better ewes. Their deaths were due to paralysis involving all four legs. At the same time he had noticed many dead Jack rabbits, but was not able to state within how long a period and how many altogether. They had not fed supplemental feed during this winter. He had also noticed that a few of the sheep had broken out along the muzzle approximately a month ago. Due to the lateness of the day returned to Caliente.

Left Caliente the following morning; proceeded south on Highway 93 towards Hiko. From Hiko went westward over several of the smaller mountain ranges and valleys trying to find the herd. After half a day was not able to locate them, but noticed evidence that they had begun to trail towards Cedar City with the route being taken over some of the areas that were impassable by car. This range, as one proceeded west, was drier and lacked the recent growth of vegetation. Apparently had not lost many sheep during the winter, as there was only evidence of two or three carcasses in his grazing area.

Proceeded north on Highway 93 towards Ely, Nevada. Near Mount Grafton, approximately 39 miles north of Pioche, observed several sheep herds; was able to contact the range boss and found that the sheep belonged to off Ely, who was running approximately 6,000 head of sheep in this area. This herder had known of the sheep trouble of the Utah herders, but had not experienced the same problem himself, either last year or this year. His ranges are approximately 2,000 feet higher in elevation and contain better vegetation than those that were noted further south. From Ely proceeded south on Highway 6, to Ranch belonging to This gentleman had indirectly notified us that he had had 400 Herfords, which were manifesting what he thought to be burns or irritations on the back and that these had initially occurred last year. We examined 150 head and noted that the so-called lesions were due to scabies or ringworm infections, and not possibly to radiation or other causes. This range is located directly north of the Central Valley, and the A.E.C. Proving Grounds are located at the Southern end.

Visited several of the adjacent farms (4) to determine if additional animals were afflicted, but none were observed, so returned to Salt Lake City.

Comments:

The following items should be more fully considered:

1. Continued lesions of the nose and mouth of sheep involved last year.

2. Color differentials in the black sheep.

3. Closer tabulation of sheep losses during lambing and shearing this year.

4. Additionally, it was found that all herds had been vaccinated for sore mouth, which would eliminate the possibility of this disease causing the mouth irritations as observed.

5. The numerous changes of air currents in different localities should be fully considered in determination of fall out patterns. I was able to observe six distinct air current patterns in one valley that was 10 x 6 miles in size. Numerous patterns could easily occur because of the unusual geological formations.

It is recommended that radiological experts from either A.E.C. or Radiological Branch of the Public Health Service, cover the exact grazing areas of these herds to determine possible radiological pattern, to continue follow-up of these sheep both at their home ranges during shearing and lambing, and in the ealier period of their summer grazing.

Respectfully submitted,

Monroe A. Holmes
Veterinarian

MAH/s
cc - Dr. Weber
Dr. Steele
Dr. Spendlove
Lorin Harrison

April 15, 1954

Mr. Stephen L. Brower
County Agriculture Agent
Iron County Extension Service
Cedar City, Utah

Dear Mr. Brower:

After leaving you the other day, I proceeded directly west through Panaca into the Dry Lake Valley area. I saw one of the at Panaca, but don't recall his name. I also contacted at the and Ranch, herd, herd, and several of the Nevada sheep ranchers. I again run across the above mentioned herds, with exception of the first , having scabs and sores around their nose and mouth and on the ears. With the exception of the herd, the others have not reported any unusual deaths. After conference with the sheep herders in charge of that herd, I feel these animals must have gotten into toxic plants or into some predator poison bait, as the symptoms are not typical of other afflictions.

I agree with you that a radiation Geiger Counter Monitor should possibly revisit the grazing area and go over exactly the range as involved, rather than the accessible roads. Personal observations indicated that because of the various ranges and mountains, the up-drafts and down-drafts vary greatly even within short distances, and some of these reaching up to extremely high altitudes.

I will have a more complete report of my trip within the near future and will forward it to you. I would, again, like to stress the importance of either yourself, or if it is possible for me also, to observe these range sheep once they have arrived in Cedar City. If you could provide the time of arrival either through letter or telegram, it would be greatly appreciated.

I appreciated your help on this last trip, and I am looking forward to completion of the pictures that were taken. I will need these for a future conference in May.

Sincerely yours,

Monroe A. Holmes
Veterinarian
Utah State Health Department

MAH/s
cc - Dr. Terrell
Joe Saunders
Lorin Harrison

APR 15 1954

Dr. Paul B. Pearson, Chief, Biology Branch,
Division of Biology and Medicine, AEC, Washington, D. C.

Joe B. Sanders, Acting Field Manager, Las Vegas Field Office

LIVESTOCK LOSSES

SYMBOL: ME

There is attached a letter received in this office on April 14, 1954.

I plan to go to Cedar City area on or about May 3, 1954 to obtain some trotters from stillborn lambs for Bernie and will discuss sheep losses, symptoms, etc., during 1954 with and some of the more familiar stockmen.

's herd ranged during the winter of 1953 around Sunshine, 50 miles north of Hiko and I am assuming the sheep referred to in Steve's letter were also in this area.

That there should be radiation of our making there, or any other place outside of NPG, is impossible, but if Steve thinks a radiac meter is necessary to prove this point, I see no objection to taking one along to Cedar City and leaving it with Steve.

Please advise any recommendations concerning the letter or follow up on livestock difficulties in this area. I will coordinate all future activities with Monroe Holmes.

Enclosure:
USAC ltr dtd 4-13-54

CC: Monroe Holmes

April 16, 1954

Dr. Wayne Binns, Head
Veterinary Science Department
Utah State Agricultural College
Logan, Utah

Dear Doctor Binns:

I wish to thank you for the copy of the proposed project regarding the nutritional study and pathology of range sheep in southwest Utah. I have conferred with Doctor Spendlove on the outline of this project and we are in accord with your views in that this seems to be largely a nutritional study, and does not necessarily coincide and collaborate in trying to determine the etiology of the sheep losses in 1953.

I have been unable to go into details regarding this project with Doctor Spendlove, but personally, I feel he may wish to make recommendations either to Doctor Pearson of the A.E.C., or directly to the project leader at the College. It may be of interest to you to know that on a recent trip to the southwestern Utah area and into the Nevada winter ranging area of these sheep, I have observed either residual lesions of the nose and mouth of these affected herds or possibly additional infections due to browsing nature of these animals. Unfortunately, I did not have any radiation measuring equipment with me; therefore, I was not able to check the range and vegetation as to possible radiation fallout particles.

I had hoped to be in Logan before this, but have been kept extremely busy for the past few weeks. If you do happen to be in Salt Lake, I would appreciate it if you would stop in to see me for a few minutes and we could discuss the pamphlet that you had previously mentioned.

Yours sincerely,

Monroe A. Holmes, D.V.M.
Public Health Veterinarian

MAH/cp

CC - Dr. Spendlove

PROJECT OUTLINE

Agricultural Experiment Station
Utah State Agricultural College

Project No. 423
Fund: State, gifts and contributions

Title:

The Effect of the Level of Nutrition on the Pathology and Productivity of Range Sheep.

Personnel:

Lorin E. Harris and David O. Williamson of the Animal Husbandry Dept.; LeGrande Shupe of the Veterinary Science Department; L. A. Stoddart and C. Wayne Cook of the Range Management Department.

Date of Initiation: 1954-55

Date of Completion or Revision: 1956-57

Objectives:

1. To obtain from ranchers information in relation to their present practices in raising sheep, including lamb crop, weight of wool, management practices, and other factors which affect their production.

2. To determine how the level of nutrition in range ares affects the maintenance of body weight, lamb crop, and weight and quality of wool.

3. To obtain clinical symptoms, gross and histological pathology of sheep grazed under different levels of nutrition.

Organization and Cooperation:

All phases of the research will be conducted cooperatively by the departments of Animal Husbandry, Veterinary Science, and Range Management.

Arrangements will be made for the cooperation and assistance of livestock operators, ranchers, the Bureau of Land Management, and certain services of the Atomic Energy Commission to facilitate the achievement of the objectives of this research. In cases where such cooperation is developed, detailed written agreements will be made to outline the basis of cooperation.

Budget Requirements:

Salaries: Current Expense:

REASONS FOR UNDERTAKING STUDY:

After recent atomic blasts in southern Nevada, Utah ranchers reported unusual lesions on sheep having grazed in the vicinity. Veterinarians concurred that the symptoms did not result from known causes, and atomic radiations came under suspicion as the causative agent.

Recent research by the Atomic Energy Commission and General Electric would seem to show conclusively that such damage could not have resulted from atomic radiation, hence this project was established to determine what role nutrition level may have upon animal pathology observed in the area.

METHOD OF PROCEDURE

The experiment will be conducted southwest of Cedar City, Utah, in areas where the range is in a depleted condition.

Phase I Survey of Factors Which Influence Sheep Production

Various herds of sheep in the vicinity of Cedar City will be visited periodically by a Veterinarian, an Animal Husbandman and a Rangeman. These men will check the herds for disease, note the methods of feeding and management, and check the condition of the range. These factors will be related to wool and lamb production to determine the factors which are causing poor performance in some of the herds.

Phase II Supplementary Feeding Trial

1. Determination of the diet of range sheep. A preliminary survey of the diet of the sheep grazing in the experimental area will be made during February and March of 1954. Methods similar to those used by Cook, Harris, and Stoddart (1948), Cook and Harris (1950), and Green et al. (1950) will be used.

2. Design for supplementary feeding trial. Based on the diet of the ewes as worked out above, supplements will be selected and fed during the periods as outlined in table 1 for the years 1954-55, 1955-56, and 1956-57,

The analyses of variance is outlined in table 2. It will be noted that for the various possible comparisons there are several sheep to compare.

3. Herding and winter range feeding plan. Experiments in Australia (Belschner 1951) have shown that daily supplementary feeding is not necessary to obtain satisfactory results. Because of this fact the ewes will be fed supplements every third day by cutting them into feed groups as outlined in table 1. These procedures have been worked out by Van Horn in Wyoming and Harris, Cook, and Stoddart in Utah. The temporary chute and pens will be moved about every two to three weeks.

4. Supplements. Supplements will be made up to satisfy the treatments as outlined in table 1, or other supplements, such as the inclusion of vitamin A, will be devised if the preliminary survey of the range shows that this is justified. The supplements will be checked by chemical analysis to see that they are of the correct composition.

5. Weighing of sheep. The ewes will all be weighed every 28 days while they are on the winter range allotment. While on the summer range allotment they will be weighed every 56 days. The lambs will be weighed at birth and at weaning time.

6. Wool data. At the beginning of the experiment small areas on the side of each ewe will be sheared and tattooed according to the procedures of Slen (1952). Wool samples will be taken at periodic intervals from these areas. In addition, a side sample will be taken just before shearing time and the total fleece weight will be taken at shearing time.

Table 1. Experimental design for feeding three supplements during three periods while ewes are on the winter range:

Supplement	age of ewes in years	Season* 1	2	3	Total	Control ewes**
		Number	ewes	per	treatment	
Phosphorus plus straw and molasses as carriers (pellets)	Lambs	16	16	16	48	16
	1	16	16	16	48	16
	2	16	16	16	48	16
	3 to 4	16	16	16	48	16
	Over 4	16	16	16	48	16
Alfalfa, sunncred plus phosphorus (pellets)	Lambs	16	16	16	48	--
	1	16	16	16	48	--
	2	16	16	16	48	--
	3 to 4	16	16	16	48	--
	Over 4	16	16	16	48	--
Complete pellet including phosphorus, protein, and energy sources	Lambs	16	16	16	48	--
	1	16	16	16	48	--
	2	16	16	16	48	--
	3 to 4	16	16	16	48	--
	Over 4	16	16	16	48	--
Total		240	240	240	720	80

* The ewes in season 1 will be fed from November 1 to about April 25; the ewes in season 2 from about January 15 to April 25, and those in season 3 only when climatic conditions seem to indicate that feeding is necessary.

**These ewes will receive range forage only.

7. Other observations and notes. Blood will be taken during the experiment at periodic intervals and analyzed for inorganic phosphorus, plasma, carotene, plasma vitamin A. clotting time, and hemoglobin.

Abnormalities of the ewes will be noted.

Phase III Diseases and Pathology

Clinical examinations will be made routinely of all sick sheep and those animals on the different levels of nutrition. A complete and thorough post mortem will be performed on all animals in the experiment which die or become severely diseased.

Complete bacteriological cultures will be made of all animals autopsied. Tissue sections will be taken at time of autopsies and prepared for microscopic examination to determine the histopathology present.

Table 2. Analyses of variance:

Source of variation	Degrees of freedom	Number of animals to compare
Replication	15	50
Age	4	144
Season	2	240
Supplements	2	240
Age x season	8	48
Age x supplement	8	48
Season x supplement	4	80
Age x season x supplement	16	16
Control vs. treated	1	
Control vs. treated x age	4	
Age within control	4	
Error	731	
Total	799	

Reports

Each year a complete report will be made and submitted to all cooperators.

Literature Cited

Belschner, H. G. Sheep management and diseases. Philadelphia, Pennsylvania. The Blakiston Co. 1951. 723 p.

Cook, C. Wayne, L. E. Harris, and L. A. Stoddart. Measuring the nutritive content of a foraging sheep's diet under range conditions. Jour. Anim. Sci. 7 (2):170-180. 1949.

Cook, C. Wayne, and Lorin E. Harris. The nutritive content of the grazing sheep's diet on summer and winter ranges of Utah. Utah Agr. Exp. Sta. Bul. 342:1-66. 1950.

Green, Lisle R., Lee L. Sharp, C. Wayne Cook, and Lorin E. Harris. Utilization of winter range forage by sheep. Jour. Range Management 4: 233-241 1951.

Slen, S. B., and F. Whiting. Further observations on the effect of level of protein in the ration of the mature ewe on wool and lamb production. Sci. Agr. 32: 375-379. 1952.

Proposed Budget

First Year

I. Capital Outlay

Equipment			
1	two-ton truck	$2,500	
1	water tank	500	
1	pickup truck	1,700	
1	sheep camp	1.500	
1	chute and temporary corral	500	$6,700
875 ewes at $15			13,125
Use of 8,750 acres of land at 25 cents an acre			2,187
2 horses			300
1 dog			50

II. Operating Expense

Salaries			
	L. E. Harris	$1,000	
	LeGrande Shupe	1,000	
	L. A. Stoddart	500	
	C. Wayne Cook	500	
	David O. Williamson	4,000	
	Veterinarian (to be hired)	6,000	$13,000

Labor		
1 herder	$3,000	
1 camp tender	3,000	
Extra labor at lambing time	500	
Summarizing records	1,000	$7,500
Feed		2,480
Travel		2,000
Chemical analyses		1,000
Histological and veterinary supplies		1,000
Miscellaneous		500
Total		$49,842
To be furnished by Utah Agricultural Experiment Station and Stockmen		$24,842
Requested from Atomic Energy Commission		$25,000
Total		$49,842

Budget
Second and third years
(yearly amount)

It is anticipated that the budget for the second and third years will be approximately the same as for the first year. It will not be necessary to replace the equipment; however, it is planned to study the diet more intensively in the second and third years.

Project Approval

Utah Agricultural Experiment Station	Date
Atomic Energy Commission	Date

April 16, 1954

Dr. Wayne Binns, Head
Veterinary Science Department
Utah State Agricultural College
Logan, Utah

Dear Doctor Binns:

I wish to thank you for the copy of the proposed project regarding the nutritional study and pathology of range sheep in southwest Utah. I have conferred with Doctor Spendlove on the outline of this project and we are in accord with your views in that this seems to be largely a nutritional study, and does not necessarily coincide and collaborate in trying to determine the etiology of the sheep losses in 1953.

I have been unable to go into details regarding this project with Doctor Spendlove, but personally, I feel he may wish to make recommendations either to Doctor Pearson of the A.E.C., or directly to the project leader at the College. It may be of interest to you to know that on a recent trip to the southwestern Utah area and into the Nevada winter ranging area of these sheep, I have observed either residual lesions of the nose and mouth of these affected herds or possibly additional infections due to browsing nature of these animals. Unfortunately, I did not have any radiation measuring equipment with me; therefore, I was not able to check the range and vegetation as to possible radiation fallout particles.

I had hoped to be in Logan before this, but have been kept extremely busy for the past few weeks. If you do happen to be in Salt Lake, I would appreciate it if you would stop in to see me for a few minutes and we could discuss the pamphlet that you had previously mentioned.

Yours sincerely,

Monroe A. Holmes, D.V.M.
Public Health Veterinarian

MAH/cp

CC - Dr. Spendlove

UTAH STATE AGRICULTURAL COLLEGE
HENRY ALDOUS DIXON, PRESIDENT
LOGAN, UTAH

DEPARTMENT OF
VETERINARY SCIENCE

[illegible]

Dr. Monroe A. Holmes
[illegible] Capitol Building
Public Health Service
Salt Lake City, Utah

Dear Dr. Holmes:

Enclosed please find a copy of the [illegible] Project that is to be conducted on sheep in [illegible] Utah.

We have gone over this project several times and this is supposed to be the final form. We would appreciate any suggestions that you might have.

Very sincerely yours,

Wayne Binns

Wayne Binns, [illegible]
Veterinary Science Department

[illegible]

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
WASHINGTON 25, D. C.

IN REPLYING, ADDRESS THE
PUBLIC HEALTH SERVICE
REFER TO: ER-RH

May 14, 1954

Dr. Monroe A. Holmes
State Department of Health
Salt Lake City, Utah

Dear Dr. Holmes:

This is to keep you informed as to the distribution of your reports. Copies of the correspondence initiated by Dr. Pearson and myself are enclosed.

Sincerely yours,

James G. Terrill, Jr.
Chief, Radiological Health Program
Div. of Sanitary Engineering Services

Enclosures

ER-RH May 11, 1954

Dr. Paul B. Pearson
Chief, Biology Branch
Div. of Biology & Medicine
Atomic Energy Commission
Washington 25, D. C.

Dear Dr. Pearson:

In accordance with our agreement to keep you fully informed on any information that comes to our attention regarding the veterinary factors associated with the test site, I am enclosing a copy of Dr. Holmes report of April 14.

I am also enclosing a map of the area which Dr. Holmes forwarded to us. This map may be of considerable use because it appears that Dr. Holmes made a real effort to travel over the country-side and it may reflect more accurately than previous maps the actual location of the herds. It will be appreciated if you will return this map at your earliest convenience. For the present we are considering this as supplemental information and will discuss it at your convenience. We have no plans to review the investigations at this time.

If you wish to transmit this report to anyone outside the Division of Biology and Medicine, it would be appreciated if you will clear it with us since this may make it necessary to edit or comment upon Dr. Holmes report so it will meet requirements of Public Health Service policy.

Sincerely yours,

James G. Terrill, Jr.
Chief, Radiological Health Program
Division of Sanitary Engineering Services

Enclosures

JGT:pc

EMB:PBP

MAY 10 1954

Mr. James G. Terrill, Jr.
Chief, Radiological Health Program
Division of Sanitary Engineering Services
Department of Health, Education, and
Welfare
Washington 25, D. C.

Dear Mr. Terrill:

We appreciate your sending us a copy of Dr. Holmes' report of his trip through Utah and Nevada on the inspection of several herds of sheep. The map showing the location of the various herds is very helpful and if you have an additional copy we would be glad to have one for our files. The map is being returned to you herewith. The report will not be transmitted to anyone outside of the Division of Biology and Medicine.

I will appreciate it if you will send me any subsequent reports you have from Dr. Holmes that are pertinent to the sheep problem in southern Utah and Nevada.

Sincerely yours,

Paul B. Pearson
Chief, Biology Branch
Division of Biology and Medicine

Enclosure: Map

ER-RH

May 14, 1954

Dr. Monroe A. Holmes
State Department of Health
Salt Lake City, Utah

Dear Dr. Holmes:

This is to keep you informed as to the distribution of your reports. Copies of the correspondence initiated by Dr. Pearson and myself are enclosed.

Sincerely yours,

James G. Terrill, Jr.
Chief, Radiological Health Program
Div. of Sanitary Engineering Services

Enclosures

cc: State Health Officer, Salt Lake City
Regional Medical Director, Denver
Communicable Disease Center, Atlanta
Art Wolfe, Cincinnati

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

ADDRESS REPLY TO:
OFFICER IN CHARGE
[redacted]
CINCINNATI 26, OHIO

ROBERT A. TAFT
SANITARY ENGINEERING CENTER
4676 COLUMBIA PARKWAY
CINCINNATI 26, OHIO

May 19, 1954

Dr. George A. Spendlove
Director of Public Health
State Department of Health
Salt Lake City 1, Utah

Attention: Dr. Monroe Holmes

Dear Dr. Spendlove:

Reference is made to the letter from Dr. Holmes, dated February 2, 1954, in which he indicated that close supervision of range sheep was planned for this spring in order to elucidate, if possible, the spring 1953 episode.

I would appreciate being brought up to date in regard to this situation. Also, I would appreciate any available information you may have regarding the research and investigation being conducted on this problem by the Agricultural Experiment Station in Logan.

Best personal regards.

For the Officer in Charge.

Very truly yours,

Art Wolff

ARTHUR H. WOLFF
Assistant Chief
Radiological Health
Training Section

May 24, 1954

Arthur H. Wolff
Assistant Chief
Radiological Health
Training Section
Health, Education, & Welfare
4676 Columbia Parkway
Cincinnati 26, Ohio

Dear Art:

Regarding your letter to Dr. Spendlove of May 19th, you probably have received, by this time, a copy of my report to Jim Terrill and Ingrham.

I am unable at the moment to determine what significance the facial lesions and gray hair may have in relation to possible radiation fall-out. I anticipate a trip to Cedar City this week to observe the sheep during lambing and shearing. Having seen them in the field, and comparing them again on their home range, I may be able to tie up some of the loose ends.

As far as the research and investigation being conducted by the Utah Agricultural College, all I can say is that the proposed project in which A.E.C. is donating $25,000.000 is merely an extension and expansion of a nutritional and feeding study of sheep that they have been conducting for the past several years with no particular reference as to the sheep pathology and losses which occurred last year. Although Dr. Spendlove and myself, as well as the College veterinarians, are in disagreement with this proposal, evidently there is not much we can do about it in trying to influence specific studies into the sheep losses.

We appreciate your continued interest and will certainly keep you informed from time-to-time of any developments.

Sincerely yours,

Monroe A. Holmes
Public Health Veterinarian

MAH/wh

cc: Dr. G. A. Spendlove
Regional Office - #VIII
Dr. James Terrill

PUBLIC HEALTH SER ICE

Dr. Paul B. Pearson, Division of Biology and Medicine, AEC

May 19, 1954

Chief, Radiological Health Program,
Division of Sanitary Engineering Services, PHS

Mr. Brower's notes on January 13 meeting at Cedar City, Utah

Although I don't think that the stockmen themselves could have misinterpreted anything these notes indicate that I said at this meeting, the inconsistencies in detail are such that it might lead to some disagreeable interpretations in the future. I think it would be well if we could get together and refresh our memories and come up with a version that we might pass on to Bernie Trum to check. As near as I can determine the major difficulties are statements that Trum made which are attributed to me. To the best of my knowledge there isn't any rush on this so I will get in touch with you by phone and set a time for our joint review.

(Sgd) James G. Terrill, Jr.

James G. Terrill, Jr.

Dr. Spendlove

June 2, 1954

Paul B. Pearson, M.D.
Chief, Biology Branch
Division of Biology and Medicine
Atomic Energy Commission
Washington 25, D.C.

Dear Dr. Pearson:

In continuing our investigations and observations of the sheep losses which occurred in Southern Utah, it has been brought to our attention that the wife of a sheepherder, Mrs. of Cedar City, Utah, and San Bernardino, California, is filing suit against the Atomic Energy Commission for possible radiation injury. In talking with this woman it was learned that she had visited the A.E.C. Clinic in Los Angeles, where several examinations were conducted. She visited the clinic some time the early part of 1954.

Your cooperation in sending us the medical record of this person would be very helpful as it will give us some basis for answering questions which frequently come up regarding this matter, and we do wish to obtain her clinical record in order that we may keep a complete file on the Utah sheep problem.

Sincerely yours,

George A. Spendlove, M.D.
Director of Public Health

GS/s
cc - James Terrell
Dr. Holmes

UTAH STATE DEPARTMENT OF HEALTH

SALT LAKE CITY

June 9, 1954

TO: George A. Spendlove, M.D.
Director of Public Health
Utah State Department of Health

THROUGH: A. A. Jenkins, M.D., Chief
Preventive Diseases Services
Utah State Department of Health

FROM: Monroe A. Holmes, D.V.M.
Public Health Veterinarian

SUBJECT: Continued Investigation of Utah Sheep
Deaths from Unknown Etiology
Cedar City, Utah
May 25, 1954, through May 28, 1954

The various herds which had been afflicted in May of 1953 have had continuous, but intermittent observations since that time. Observations were made: (1) during the summer grazing; (2) their return to home ranches before being taken to their winter range in Nevada; (3) during the latter part of their winter grazing while still in Nevada; (4) and also on their return to the home ranches for shearing and lambing in the spring of 1954.

The observations made of the sheep, while in Nevada, during March of 1954, revealed that one out of every five sheep observed had scabby lesions on the dorsum of the nose and around the commissures of the lips. Some of the black sheep evidenced white patches on the body as well as "graying" of the muzzles; the latter condition being possibly an age factor or an hereditary one.

The herds of , and were seen during the present investigation. All of the herds coming from the winter ranges were in much better condition than a year ago. Although some of the animals in each of the above herds had various lesions around the nose and mouth, these were not indicative of possible recurrence or sequelae to last year's affliction, except in the No. 1 herd, which had been noted in the previous observation during March.

In all the previously afflicted herds there had been no unusual deaths, either in the adult ewes or new lambs, and the expected losses were within normal range (approximately 1-3%) as accepted by the sheepmen of this area.

Continuing inquiries into possible human afflictions, it was found that a Mrs. , Cedar City, had instituted legal action against the Atomic Energy Commission for radiation injury. The suit was filed in San Bernardino, California, the first part of May, 1954.

In conferring with , her husband, and father-in-law, the following information was obtained:

1. While herding sheep in the Hamlin Valley on the western border of Utah, in 1953, they observed the flash and saw the cloud pass over their sheep camp, shortly after the atomic cannon shot. (May?)

2. The next day Mrs. became nauseated and vomited several times during the day. She felt flushed and was unable to eat.

3. Five other members of the sheep camp had various symptoms, with the majority feeling weak and tired and with eyes watering and irritated.

4. Blistering occurred over most of the exposed portions of the body, with loss of toenails and fingernails.

5. Hair loss began three weeks after first symptoms of nausea, with gradual thinning, and later with chunks of hair coming out upon combing; was affected to a lesser extent.

6. Sensitivity to direct sun rays became more and more noticeable up to the end of 1953, then a gradual decline in sensitivity.

7. Became very agitated and nervous, with considerable weight loss (15 lbs.)

8. Entered Iron County Hospital August 31, 1953, under the care of ; discharged September 7, 1953, with final diagnosis of acute eczema.

Therapy while in hospital was palliative and non-specific, relieving pain and instituting healing.

9. Re-entered Iron County Hospital on September 17, 1953, being discharged September 27, after final diagnosis of acute allergy. Received the same treatment as previously.

10. Mrs. felt that her condition had not improved and was directed by her physician to , a skin specialist in Salt Lake City, on September 30th. She arrived at this office in a state of near irrationality, and would not permit a full period of observation. She left Salt Lake the next day. Dr. diagnosis from history and brief observation was that of contact allergis dermatitis.

11. Mrs. , feeling she had not received proper attention, went to Los Angeles for additional help. While there, she learned of possible radiation injury so went to the A.E.C. Clinic, where she was examined and talked to a . She mentioned that she had been given assurance she would receive a report upon completion of the laboratory work; however, she was unable to get any information from this clinic. She thereupon instituted a suit for $100,000.00 for damages and personal injury.

12. In conferring with Mr. and his father, , their symptoms were largely of sore eyes and tiredness. Their personal feelings and declaration on the wife's trouble was that the alkali dust, as a result of extreme winds, caused the sore eyes and skin irritation of all concerned; tiredness was

the result of overwork during the lambing time because of the efforts to save the lamb crop. Sheep losses were not understood and they could not explain it, other than a poor year (no feed, old animals, storms, etc.)

Dr. was the personal physician of Mrs. and has attended her over a period of several years. In discussing the recent illness of Mrs. with him, several interesting items were brought out.

1. His diagnosis of the recent illness was acute eczema and allergy; with confirming diagnosis by Dr. Dermatologist in Salt Lake City, of acute contact allergic dermatitis, complicated by neurosis (not specifically described).

2. Dr. feels that has added to the psychological problem, or may be the cause of the psychological problem, which also has complicated the clinical symptoms which he observed.

3. Mrs. past personal history has indicated tendencies toward nervousness and agitation; therefore, present condition is not necessarily unique.

It became necessary to travel west from Cedar City into the Hamlin Valley, approximately miles, to interview the male members of this family. Several stops were made on the way to record possible radiation counts. The following measurements were made:

1. Thirteen (13) miles North of Modena near a group of trees 50 feet from road.

a. Health Department counter
Background reading - 0.03 to 0.05 mr/hr
Foliage and soil - .05 to 0.1

b. County Agent's counter
Background reading - .3 to .5 mr/hr
Foliage and soil - .5 to .9

2. .8 miles east of first reading, midway on valley floor, following readings were obtained:

a. Health Department counter
Background reading - .03 to .05
Foliage and soil - .05 to .1 (200 to 300 on upper s

3. 8.6 miles north of first reading at sheep camp.
Background reading - .03 to .05
Foliage and soil - .05 to .1 (200 - 300 counts)

Several readings were taken on live sheep, but no appreciable difference was noted over background counts.

Respectfully submitted,

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Communicable Disease Center
and
Utah State Department of Health

MAH/s

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EXAMINER

JAN 12 1955

Atomic Blasts Didn't Kill 30 Utah Sheep--AEC

CEDAR CITY (AP) — Extensive tests have shown that radioactivity from atomic explosions in Nevada was not the cause of death and illness among sheep in southern Utah and Nevada last spring.

This report was made today by the Atomic Energy Commission at a meeting of sheep owners in the Cedar City area.

The AEC said its conclusions, reached after extensive research studies, were concurred in by the U. S. Public Health Service and the Bureau of Animal Industry of the U. S. Department of Agriculture. The report also was reviewed by the Utah State Health Department, but the AEC did not say the Utah agency concurred.

While the AEC report denied that radioactivity was the cause of the sheep malady, it did not say what had caused the sheep losses.

THE
DESERET NEWS

MAR 17 1954

A-Experts Finish S. Utah Survey For Sheep Study

CEDAR CITY—A survey of ranges and discussions with sheepmen regarding co-operation in a proposed Atomic Energy Commission-financed study were concluded in southern Utah and Nevada this week.

Plans for the program to test nutritional phases of ranges and of the sheep have been tentatively made, but have not yet been approved by the A E C, according to sheepmen of the area. The study is to be conducted by the Experiment Station of the Utah State Agricultural College, with U S A C and University of Nevada personnel.

The study has been set up in an attempt to help determine what caused severe losses to Utah sheep which had wintered on Nevada ranges last year during and after atomic blasts on the Nevada proving grounds.

In Cedar City to discuss plans for the project study were Dr. R. H. Walker, director of the experiment station, and Dr. L. A. Stoddardt, head of the department of range management, U S A C, and the following who made the range survey: Dr. Lorin Harris, Dr. Wayne Cook and Dr. LeGrand Shupe of the U S A C. Prof. Max Robinson of the College of Southern Utah also made the trip to the ranges.

Although the project has not been approved, it is believed that an allocation of about $25,000 may be made available for this study.

Plans as set up in the proposed project would provide for the services of a veterinarian at the range area all of the time to help determine factors which cause the sheep losses should the sheep show signs of the malady while on the winter ranges.