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LOS ALAMOS SCIENTIFIC LABORATORY
OF THE UNIVERSITY OF CALIFORNIA o LOS ALAMOS NEW MEXICO

July 3, 1947

NUCLEAR EXPLOSION 16 JULY 1945

Health Physics Report on Radioactive Contamination Throughout New Mexico

Part B: Biological Effects

by

L. H. Hempelmann

[redacted]

[redacted]

[redacted]

INDEX

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Part I

Reports of visits to the region northeast of the Alamogordo Bombing Range after the nuclear explosion 16 July 1945.

[redacted]

[redacted]

This document consists of 1 pages.
No. 1 of 2 copies, series A

-4-
I-A

IN REPLY
REFER TO

WAR DEPARTMENT
UNITED STATES ENGINEER OFFICE
P. O. BOX 1539
SANTA FE, NEW MEXICO

31 July 1945

MEMORANDUM TO DR. LOUIS HEMPELMANN:

Subject: Trinity

1. Pursuant to your request of 27 July that the health of persons in a certain house near Bingham, N. M. be discreetly investigated, the following report is made.

2. Intelligence representatives on 28 July determined that the house in question is occupied by M. C. Ratliff, his wife, and a 10 year old grandson. All were in good health and made no statement which would indicate that anything unusual had occurred in recent weeks.

3. Ratliff raises only goats, having a herd of approximately 200 head. The condition of the herd has not changed during recent weeks.

Daniel H. Dailey
Daniel H. Dailey
1st Lt., Corps of Engineers

LB SECRET

[redacted] 17 August 1945

ITINERARY OF TRIP

made by Colonel Warren, Captain Whipple and L. H. Hempelmann on 12 August 1945

Left site at 5:00 AM, had lunch at Trinity. Colonel Warren had to return immediately to site but Captain Whipple and Hempelmann went to Bingham, White Store and the Hot Canyon to make further measurements and to interview persons. Victoreen Meter #46,174 calibrated on evening of 11 August 1945 by Whipple and Hempelmann. Another single range Victoreen Meter was calibrated but failed to work properly on 12 August 1945.

Bingham 3:30 PM - R.H. Dean, wife, daughter and son live here. They were awakened by the shot on 16 July 1945, entire house rattled and three windows broke. They went to the window to see what had happened, saw the huge cloud of smoke, reasoned that there was an explosion of some sort and went back to bed for about 30 minutes. The entire family has been quite well and healthy.

Meter reading 46174

Victoreen single range - ground = 0.003 r/hr

Inside store (waist level) < 0.0001 r/hr.

Speedometer reading at Bingham was 776.0 miles. From here we drove eastward on the road to Claunch and then continued east where this highway turns north onto the road to the "Hot Canyon". The following are the readings and observations as made by us:

Mileage	Observations	Readings
776.0	see above	0.003 r/hr
780.0	Cows appear healthy, no apparent anemia or diarrhea, noses pink, grass sample taken	
781.2	At junction with road which leads to Hot Canyon. [redacted]	0.02 r/hr (ground) 0.013 r/hr (waist)

~~SECRET~~

[redacted] ONLY

Mileage	Observation	Reading
781.45	On road to Hot Canyon	0.022 (ground) 0.018 (waist)
781.7	" " " " "	0.022 (ground) 0.020 (waist)
781.8	" " " " "	0.030 (ground) 0.025 (waist)
781.95	" " " " "	0.027 r/hr (ground) 0.020 (waist)
782.2	Measurements at roadside	0.027 (ground) 0.025 (waist)
782.2	Measurements 20' off road	0.029 (ground) 0.026 (waist)
782.45	Point corresponding to previous highest reading in Hot Canyon	0.024 (ground) 0.023 (waist)
	Same place but off road (20')	0.032 (ground) 0.029 (waist)
782.50	At roadside	0.027 (ground) 0.025 (waist)
	off road (20')	0.029 (ground) 0.027 (waist)
782.7		0.030 (ground) 0.027 (waist)
782.7	on and off road	0.032 (ground) 0.030 (waist)
782.9		0.028 (ground) 0.025 (waist)

No more readings taken while going in towards the house in the Hot Canyon; however, the following readings were taken on the way out:

1/2 mi. from house	0.033 (ground) 0.028 (waist)
1/4 mi. from house [redacted]	0.026 (ground) 0.025 (waist)
just below house - this reading was checked.	0.0013 (ground) 0.0018 (waist)

Raitliff House in Hot Canyon (Chupadera Mesa) Mr. and Mrs. Raitliff (both over 50 years) and their 10 year old grandson live here. They were asleep on the morning of the shot; they heard, felt and saw absolutely nothing. They

were aware of nothing unusual until the grandson returned home from Bingham late in the afternoon. He had left early in the morning (presumably by horseback) had reached Bingham at 9:00 AM and learned of the explosion here. By being at Bingham during the day and indoors at night, he missed most of the heavy exposure of the first day in the "hot canyon". During this day, Mr. Railiff had spent most of the day outdoors but Mrs. Raitliff was indoors a large portion of the time. During the following two weeks there was no change in their usual habits of going indoors about 7:00-8:00 o'clock to dinner, retiring after hearing the evening news broadcast and arising at about 6:00 AM. Their house is a well built two room adobe structure with thick walls about 15" thick and a tin roof supported on wooden rafters. The house measures about 25 x 15 feet, is about 12 feet high and affords great protection (see below). The tin roof is used to collect water for the cistern the exact size of which was not learned but is presumably 50-250 barrel capacity since others in the neighborhood are of this size. There was rain in this area on the night after the shot: this means that some of the activity was carried into their drinking water and may have been drunk on the following day and thereafter.

The health of the inhabitants of this house has been good except that Mr. Raitliff complains of nervousness, tightness in the chest and poor teeth. These are not new symptoms. The animals - goats, turkeys, donkeys appear to be in excellent health. Samples of drinking water and soil from the yard were taken. The following measurements were made in various locations in the yard, the nearby countryside and in the house:

Yard	Position I	0.027 r/hr	(ground)
		0.023	(waist)
	Position II	0.025	(ground)
		0.022	(waist)

[redacted] ONLY

Position III	0.023	(ground)
	0.023	(waist)
Position IV	0.028	(ground)
	0.025	(waist)
Position V	0.027	(ground)
	0.021	(waist)
Position VI	0.023	(ground)
	0.022	(waist)
Position VII (doorstop)	0.017	(ground)
	0.013	(waist)
Position VIII (behind house)	0.028	(ground)
	0.022	(waist)
Position IX (inside house)	0.003 r/hr	
	0.004	

White Store: Mr. McSmith and family (wife, two small daughters, daughter-in-law) live here in a new adobe house with a double roof. They were awakened by a plane circling overhead the morning of the test. The plane sounded to them as if it were in distress. Shortly thereafter, their bedroom lit up as if by a light source in the room and during the blast that followed, the entire house shook. The family saw the pink cloud from the bedroom window and watched it float very high overhead. They dressed and were outside within 30 minutes. The house was not damaged and their concrete cisterns were unharmed. The following measurements were made:

on ground in front of store	-	0.008 r/hr
in air	-	0.005 r/hr
inside store	-	0.0005 r/hr

17 August is 744 hours after TR shot of 16 July.

See LA notebook 311A on page 25 et seq for data.

L. H. Hempelmann, M.D.

8/17/45 - Calibration of Victoreen Survey Meter 46,174 checked - still unchanged and okay.

Hempelmann

[redacted]

ESTIMATED DOSE OF RADIATION
RECEIVED BY THE FAMILY IN HOT CANYON

The following is an estimate of the dose of gamma radiation received by members of the Raitliff family in the hot canyon:

Period	Geometric Dose	Dose from Ground	Total (Dose) Accumulated	Allowable Dose	Factor by which Tolerance Dose Is Exceeded
2 wks	15r	32	47	1.4	33
4 wks	15r	33.1	48.1	2.8	17
8 wks	15r	34.0	49.0	5.6	8.7
12 wks	15r	34.4	49.4	8.4	5.9

The total doses for each two week period were derived from measurements of actual radiation intensities in this region indicating initial intensities and rate of decay (see Section). The dose for waist level is given for a per.

L. H. Hempelmann

I-C

This document consists of 1 pages.
No. 1 of 4 copies, series A.

INTER-OFFICE MEMORANDUM

DATE 4 October 1945

TO: Dr. Louis Hemplemann

FROM: Capt. T. O. Jones

SUBJECT: After Effects of Final Test Shot

On 12 September 1945 representatives of this office, under suitable pretext, visited the ranch of M. C. RATLIFF, 7 miles northeast of Bingham, New Mexico.

The health of the members of RATLIFF's family was excellent, and none had received medical attention. The stock and poultry were reported in fine condition.

T. O. JONES
CAPT C E
Intelligence Officer

Form 25

L-D

[redacted]

INTER-OFFICE MEMORANDUM

TO: Memo to the files DATE March, 1946

FROM: L. H. Hempelmann

SUBJECT: Ratliff family

It was verbally reported to me in March, 1946 that Lt. Robert A. Taylor's agents had visited the Ratliff family and found them all to be in excellent health.

Hempelmann

[redacted]

Part II Clinico Pathological Study of four cows from the Nalda Ranch alledgedly damaged by the nuclear explosion 16 Jul, 1945.

II-A

1 April 1946

Memo: TO TRINITY FILE

From: L. H. HEMPELMANN

Subject: Cattle Northeast of the Alamogordo Bombing Range Alledgedly Damaged by the Nuclear Explosion 16 July 1945.

On 11 October 1945, a letter was written by a Carrizozo attorney to the Commanding Officer of the Alamogordo Air Base filing claim for injury to cattle of the Red Canyon Sheep Company by the nuclear explosion 16 July 1945.

See files of Major Newcombe for this letter.

L. H. Hempelmann

To: Washington Headquarters
Washington, D.C.

Date: 6 November 1945

From: Area Engineer (Col. Stewart)
Clear Creek, N.M.

Investigation of claim of Red Canyon Sheep Company being conducted and following is report of findings to date. This information was previously given to Lt. Col. Friedel at Oak Ridge on telephone, 1 November. Stewart, Newcomb, Hemplemann, Thompsett and Chilcote visited headquarters of Red Canyon Sheep Company on 31 October 1945 and talked to Louis Nalda, president, regarding claim of alleged damage to cattle as result of atomic bomb test on sixteen July (To General Groves from Col. Stewart REF EIDM LA one_____) it will be recalled cloud traveled in northeasternly direction and that certain area in townships four south and ranges six and seven east in Socorro County between Bingham and Chupadero mesa in southern part of Cibola National Forest were reported by Col. Warren's group as being heavily contaminated due to settling of dust particles in this area. These dust particles being products of the explosion. Nalda stated that he noticed about 1 August that cattle grazing on that portion of his range in the heavily contaminated area had lost hair along the back and over the hips extending down about one third on the side. Nalda reported this condition grew generally worse with blistering to the bare skin on the cattle being visable until about the middle of August after which time the cattle appeared to improve generally and the hair started growing back. However in the new hair considerable amount of white hair appeared in the red hair giving a roan appearance to previously normally red areas. Nalda felt that this condition was result of the test as he stated the cloud traveled in northeasternly direction from the test site and because of the time he first noticed the condition which is abnormal for range cattle in this part of the country. Inspected three hundred and fifteen cattle Nalda had in the corrals which includes all his cattle that grazed in the contaminated area plus a few head that grazed

further to the east in an area which according to Nalda none of the cattle there were affected. Out of the three hundred fifteen cattle one hundred and thirty six showed visual effects. In this regard fifty two calves born prior to date of test showed roan effects on back and sides, however according to Nalda calves did not lose hair and have bare spots but when winter coat grew in white hairs were present making areas appear roan in color which is not normal. Nalda stated other cattlemen having cattle in the general area which coincides with reported area of heavy contamination have experienced the same condition in their cattle. These cattlemen being principally T.R. Coker, Bursum Cattle Company and Harvey Cattle Company who possibly may have more cattle affected than Red Canyon Sheep Company. Nalda also advised that rancher near adobe on the Bingham-Carrizozo road has a black cat which was effected and now has white streak down its back. Purchased from Nalda on 31 October, two cows showing worst effects still having bare spots with possible ulceration and one cow with hair partly white grown back over affected area and one cow with no visual effects. These cows are now at Los Alamos for pathological study by Dr. Hemplemann. Present plans in accordance with instructions forwarded by Col. Friedel based on determination made in conference at Oak Ridge of General Groves, General Farrell, Col. Nichols and Col. Warren are as follows; A. Dr. Hempelmann to complete study on four cows now at Los Alamos as rapidly as possible to determine extent of damage if any and to find out whether particles from the cloud could cause such a condition in the cattle that may have been exposed. B. Stewart to complete survey of cattle of other ranches in area to determine extent of condition in general. C. Stewart to purchase all cattle showing visual affects at current market prices and ship to Col. Hodgson at Oak Ridge. Stewart and Newcomb leaving Los Alamos this date to contact ranchers having grazing land in heavy contaminated area to determine number of cattle involved and to make preliminary arrangements for purchasing and shipping cattle in accordance with instructions. Plan to return to Los Alamos in two or three days.

Stanley L. Stewart
Lt. Col. CE

REPORT OF INSPECTION OF RANGE CATTLE OF RED CANYON SHEEP CO., INC.

By R.E. Thompsett, Captain, V.C.

Report #1

A physical examination of the cattle and young stock on the Red Canyon Sheep Company ranch sixteen (16) miles northwest of Carrizozo was made October 31 by Dr. Louis Hempelmann and the undersigned. All animals were beef-type animals reportedly from registered Hereford stock.

HISTORY: (As understood by the undersigned to have been stated by Mr. Nalda, Manager of the Stock Company), "Late in July and early in August about fifty percent (50%) of the animals pastured in a certain area of his range land were noted to be losing hair and having blister-like lesions on their backs. The animals pastured in this area were mainly cows with sucking calves and a few bulls. The cows were noted at that time to have the most serious lesions. The calves were only slightly affected but soon afterwards turned grey particularly on their backs. As the lesions healed on the cows, grey hair appeared as the new hair came in. Two bulls turned grey. Some cattle owned by different ranchers were reported to be turning grey about the same time."

It is interesting to note Mr. Nalda's conception of the malady. "A cloud of smoke went over this pasture land early in July in the area where these cattle had been pastured." His conception of the diseased animals was that it might be due to this smoke. He conoted that he had given the animals little thought until he had heard the news of a large experimental explosion in that locality and then correlated that episode with trouble in his herd. Mr. Nalda stated that a friend of his who had once undergone X-ray treatment on his face had a similar greying experience on the hair of his face.

EXAMINATION AT THE RANCH: The animals brought for examination were all animals pastured in the particular locality. They were displayed in four groups.

Group I. Eighty-eight (88) cows. Of these cows twenty-one (21) were noticeably grey on a hurried examination.

Group II. One hundred and sixteen (116) dry cows. Of these sixty-one (61) animals were noticeably grey.

Group III. One hundred and five (105) calves. Of these fifty-two (52) animals were noticeably grey.

Group IV. Two (2) bulls. These were both noticeably grey.

In all about forty-three percent (43%) of the three hundred and eleven (311) animals pastured in this area were noted to be grey.

In general the appearance and attitude of all animals was excellent. A close examination of the skin of several animals was made and the skin seemed to be very normal as to thickness, texture and general health. Although the dorsal surface of the affected animals was grey, they enjoyed a heavy and normal winter coating of hair. Exception is made for two (2) animals. These

two (2) cows still suffered from alopecia on the flat dorsal surface of the back. That area may be noted in the accompanying diagram as the red area. The area of alopecia in these two (2) cows is noted to be slightly thickened and creviced as to be dehydrated. The backs of these same animals were noticeably sore and to have recently hemorrhaged.

It was noted that if the cows were affected, their calf was affected also. If the dam were not affected, the calf was likewise unaffected. A few cows that were affected had claves at their sides that were unaffected. The writer inquired when the ranch last castrated and branded calves and Mr. Nalda stated that it was late in June. The undersigned thus derives the opinion that the calves in the fetal stage were unaffected.

The undersigned has attempted to display the areas being affected in these animals by the accompanying diagram. The red area in the diagram is most intensely grey except in those two (2) animals described above where lesions were still noted. The blue denotes grey areas of less intensity. Ordinarily grey hair is defined as being a dispersement of white hair within hair of another color. The writer desires to specify that some of the hair was entirely white dispersed within the red hair, while part of the individual hairs were tipped with white, while the base of the hair was a normal red color. The uncolored area in the diagram was found to have little or no grey hair involvement.

One grey calf that was closely examined was found to be grey in all areas. However, the diagram pictures the average case. It may also be stated that Herefords have white faces, necks and underparts, which make the detection of affected areas difficult.

CLINICAL SYMPTOMS: Four animals were purchased and transported to the Station Veterinary Hospital. These animals were:

1. Badly affected cow with lesions on back.

2. Same.

3. An average grey cow.

4. A cow unaffected and pastured in an entirely different locality of the range.

Superficial and deep scrapings have been made on all animals noted under clinical symptoms. To date no evidence can be shown as to a parisitic skin condition (trichophytosis; sarcaptic, psoroptic or chorioptic mange, or pediculosis).

DIAGNOSIS: For the ease of the reader the writer undertakes the diagnosis by the process of elimination.

1. Parasitic skin diseases are eliminated due to lack of microscopic findings along with an atypical history and lesions.

2. General alopecia may be eliminated due to the lack of a known predisposing cause such as: malnutrition; internal parasitism; infectious

diseases; or metallic poisoning. In reported case histories of general alopecia the new hair has never been reported to be white.

3. "Light sensitization" may be considered in a certain respect. However, a typical case of "light sensitization" causes a superficial necrosis of the white areas of the skin after exposure to the sun in animals that have been "sensitized" to light by eating certain legumes, namely clover, and buckwheat.

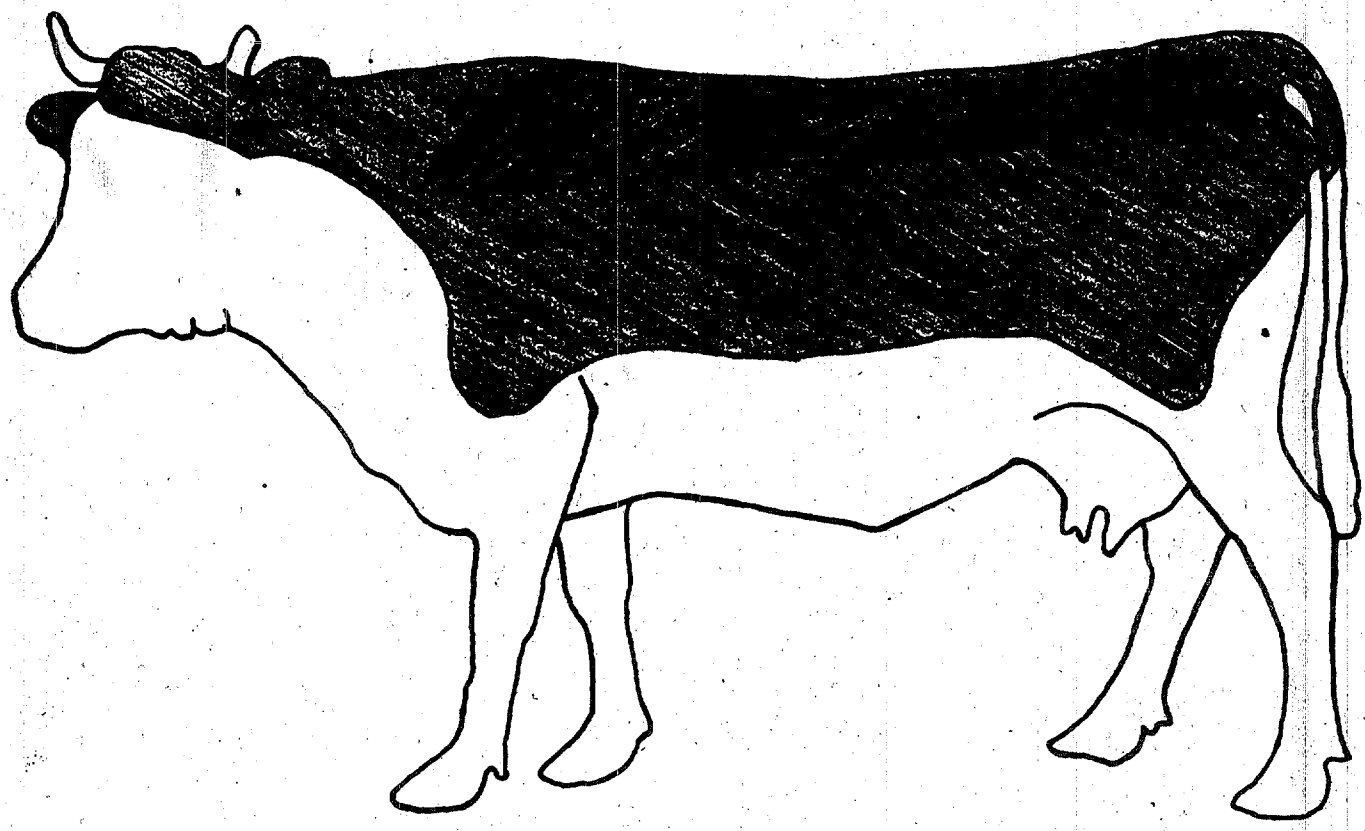
In parallel to this disease the writer brings attention to the work of Hausmann (Bcoihem, Zeit, 1914, 76, 309.) He found that certain pigments in the blood, especially hematoporphyrin and artificial fluorescent substances "sensitize" living cells to light. Quoting Udall 1936, 123;

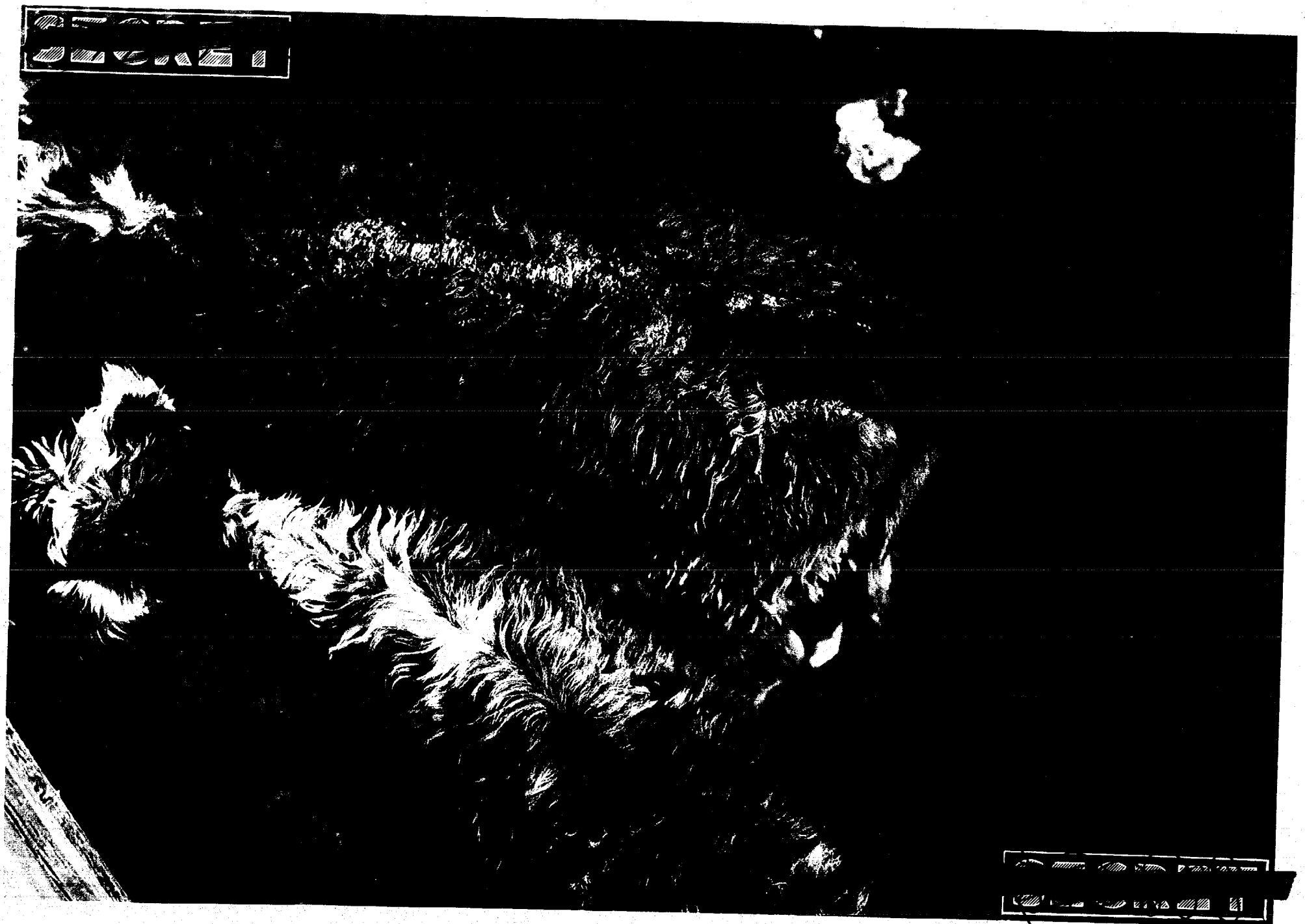
"In Europe it has been observed that feeding buckwheat is followed by toxic symptoms in animals that are white or have white markings." Our case is different from this in that the areas affected were not areas of white hair.

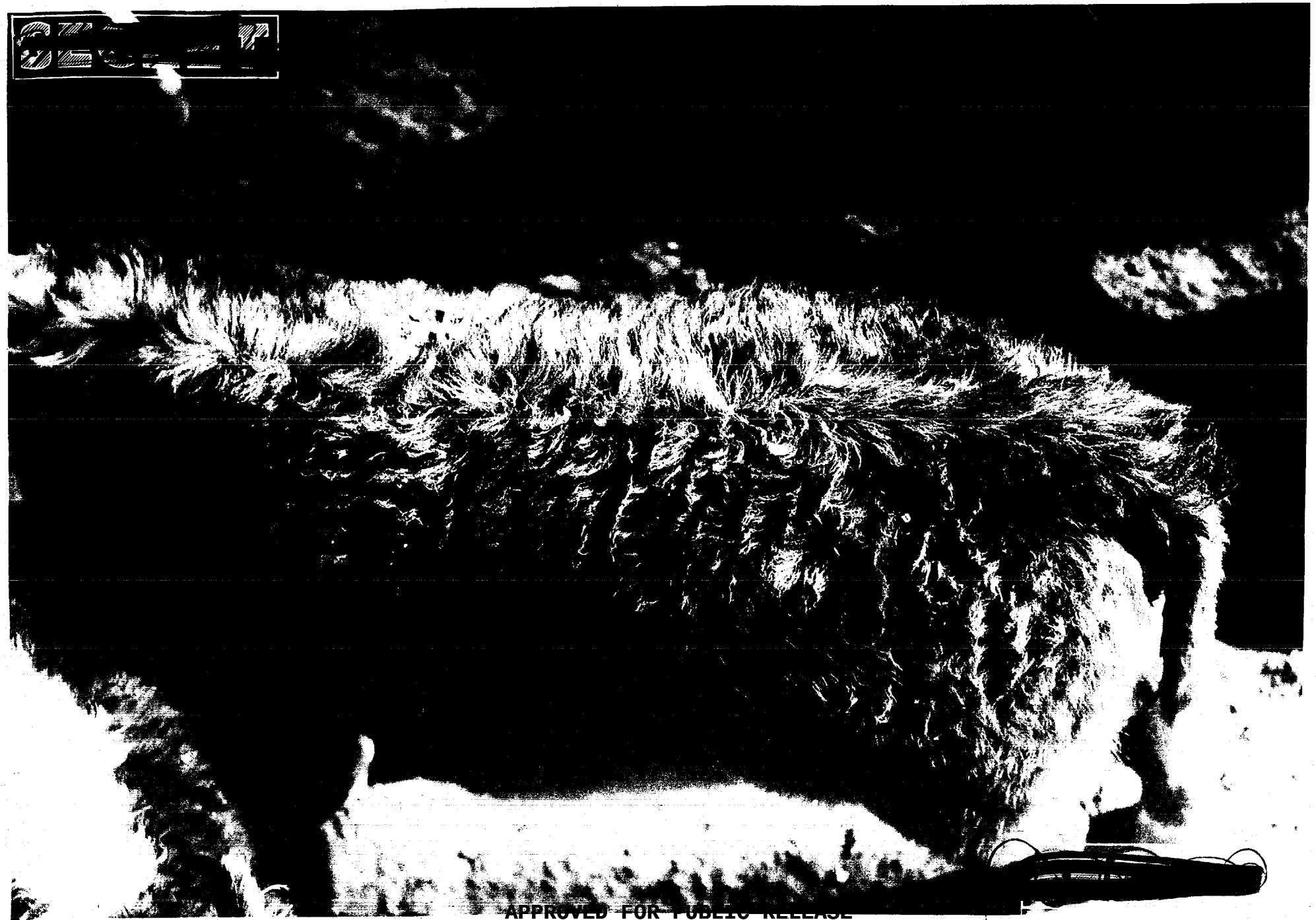
4. A final diagnosis is not being made by the undersigned at this time.

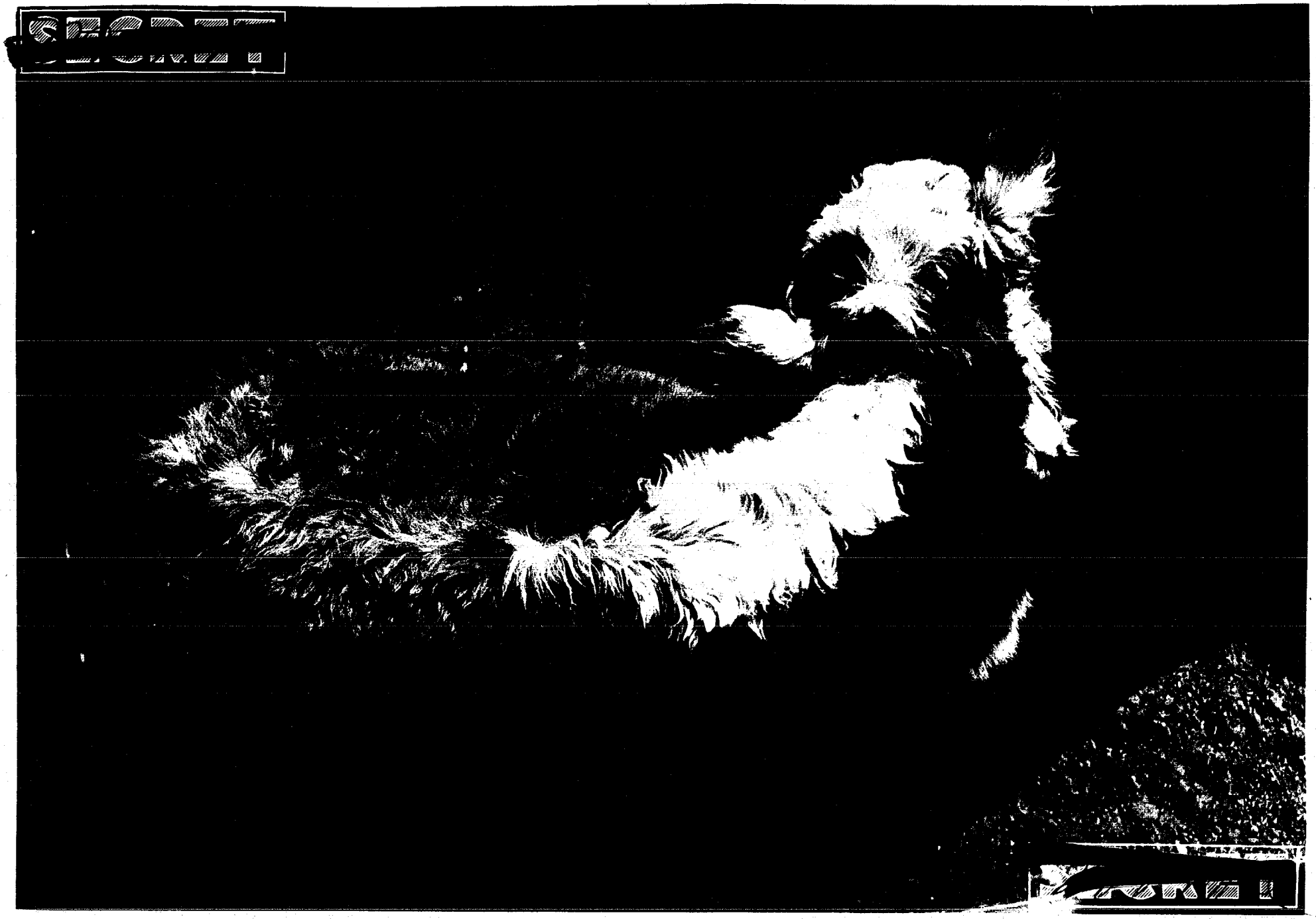
W. E. Thompson

7 November 1946









II-B

HEMATOLOGY REPORT ON FOUR COWS

The first group of three cows alledgedly damaged by the nuclear explosion 16 July, 1945 was brought to this site for study November 1945. One normal cow (Okay Doak) was included with this group for purposes of reference.

The blood counts of the cow, Okay Doak, were essentially normal as compared with the textbook description of the blood counts of normal cows. This cow had marked eosinophilia, never less than 20 percent and on one occasion 34 percent. This seems to indicate an infestation of worms. The white count varied between 8,000 and 10,000 cells per cubic millimeter. The lymphocyte count was about 35 percent, of which less than 2 percent contained neutral red granules. The red count was 8,000,000 cells per cubic millimeter. The gross appearance of the sternal marrow was normal. Microscopic examination revealed an adequate number of megakaryocytes. Except for the increased number of eosinophils, the marrow appeared normal. About 25 percent of the granulocytes were eosinophilic in type.

The blood counts of the cow, Lulu Belle were fairly normal--a red count of 7,000,000 cells per cubic millimeter and a white count of 5,200 cells per cubic millimeter of which 25 percent were lymphocytes. Twenty percent of the lymphocytes contained neutral red granules. On gross examination the sternal marrow appeared normal with many clumps of white cells. Microscopically the bone marrow contained some fat globules, but otherwise seemed normal.

The blood count of the cow, Roanie, seemed to be abnormal, with a white count of about 3500 cell per cubic millimeter, 20 percent to 35 percent of which were lymphocytes. Twenty percent of the lymphocytes contained neutral red granules. The red count was between 6,500,000 and 7,000,000 cells per cubic millimeter. The gross appearance of the sternal marrow was normal; on microscopic examination however, the marrow was seen to contain only very few cells. These did not appear in clumps but were scattered over the preparation. There were a great many fat

globules. There seemed to be a very definite hypoplasia of the marrow.

The blood counts of the cow, Bessie, were the most abnormal of all. The red count was about 6,000,000 cells per cubic millimeter, but the cells appeared macrocytic. The white count was about 3,000 cells per cubic millimeter of which 30 percent and on one occasion 50 percent were lymphocytes. Many of the lymphocytes were young; some showed two nuclei. The abnormal lymphocytes containing neutral red granules constituted about 20 percent of the total. The sternal marrow appeared normal on gross examination, but was composed chiefly of fat globules, only a few clumps of marrow cells could be found on the entire preparation. The clumps consisted mostly of nucleated red cells. There were infrequent scattered white cells. This seemed to indicate a more definite hypoplasia of the marrow than any of the others.

The number of platelets of the three abnormal cows appeared to be slightly higher than normal. There were no reticulocytes seen on any of the normal or abnormal preparations. In all of the four sternal marrows, there seemed to be a decrease in primitive cells.

It should be mentioned that the above blood studies were done on excited struggling animals. This may have raised the total white blood count.

Annamae Dickie

Annamae Dickie

15 November 1945

HEMATOLOGICAL RECORD

NAME Okay Doak

DATE	RBC	%	GMS	RETIC	PLATELETS	WBC	Cell M/L Volume	P/L	REMARKS
11-5-45	8.55		14.1	0	975,000	10,316	43		
11-7-45	7.80		13.8	0	1,193,000	8,000	45		
11-16-45	8.08		15.9	0	1,228,000	8,150	47		
Average	7.94		14.9	0	1,210,000	8,075	45		
Bessie, Lulu, Roanie } Average	7.12		11.7	0	1,326,000	4,391	38.5		

SUPRAVITAL ~~WRIGHTS~~ STAIN

DATE	EOS	BAS	PMN				LYMPHOCYTES			MONOCYTES			REMARKS
			MYEL	META	STAB	SEGS	SMALL	INT	YOUNG	ACT	YOUNG	STIM	Granules
11-5-45	18	1			8	32	34	1		6			0%
11-7-45	22				2	28	42			6			2%
11-16-45	36	2			6	31	20			3		2	4%
Average	29	1			4	29½	31			5½			
Bessie, Lulu, Roanie } Average	5.7	1.2			5.7	47.2	30.7	0.7		9.0			

FORM 201 M--2-46

APPROVED FOR PUBLIC RELEASE

HEMATOLOGICAL RECORD

NAME Bessie

DATE	RBC	%	GMS	RETIC	PLATELETS	WBC	Cell ~~M/L~~ Volume	P/L	REMARKS
11-6-45	7.99		12.2	0	1,440,000	4,175	43		
11-10-45	6.07		12.0	0	1,105,000	3,017	41		
11-12-45	5.85		11.9	0	1,053,000	3,125	40.5		
11-17-45	7.85		14.4	0	2,041,000	3,950	43.5		
Average	7.19		12.6	0	1,412,000	3,567	42		

SUPRAVITAL ~~WRIGHTS~~ STAIN

DATE	EOS	BAS	PMN				LYMPHOCYTES			MONOCYTES			REMARKS Granules
			MYEL	META	STAB	SEGS	SMALL	INT	YOUNG	ACT	YOUNG	STIM	
11-6-45	9	3			5	46	28	2				7	24%
11-10-45	9	1			11	35	33	1		4		6	29.4%
11-12-45	7				5	30	49	2	1	1		5	28.0%
11-17-45	6	4			4	56	20			8		2	35.0%
Average	8	2			6	42	32½	1½		8			

FORM 201 (M)-2-46

HEMATOLOGICAL RECORD

NAME Roanie

DATE	RBC	%	GMS	RETIC	PLATELETS	WBC	Cell ~~M/L~~ Volume	P/L	REMARKS
~~11~~-5-45	6.58		10.9	0	974,000	5,753	35.5		
11-7-45	6.58		11.2	0	1,198,000	3,550	38.5		
11-17-45	7.00		11.7	0	1,036,000	3,425	35.5		
Average	6.72		11.3	0	1,069,000	4,243	36.5		

SUPRAVITAL ~~WRIGHT'S~~ STAIN

DATE	EOS	BAS	PMN				LYMPHOCYTES			MONOCYTES			REMARKS
			MYEL	META	STAB	SEGS	SMALL	INT	YOUNG	ACT	YOUNG	STIM	Granules
11-5-45	2	1				45	48			3		1	12%
11-7-45	7	1			2	41	33			4		12	22%
11-17-45	3				8	57	20	1		6		5	19%
Average	4½	½			3	48	33½			10½			

HEMATOLOGICAL RECORD

NAME Lulu Belle

DATE	RBC	%	GMS	RETIC	PLATELETS	WBC	Cell ~~M/L~~ Volume	P/L	REMARKS
11-6-45	7.09		10.9	0	1,226,000	5,275	36		
11-13-45	7.81		11.5	0	1,765,000	5,450	36		
Average	7.45		11.2	0	1,498,000	5,363	36		

SUPRAVITAL ~~WRIGHT'S~~ STAIN

DATE	EOS	BAS	PMN				LYMPHOCYTES			MONOCYTES			REMARKS
			MYEL	META	STAB	SEGS	SMALL	INT	YOUNG	ACT	YOUNG	STIM	Granules
11-6-45	4			1	8	46	28			4		9	26%
11-13-45	5	2			7	57	24	1		1		3	32%
Average	4½	1			8	51½	26	½		8½			

FORM 201 10-2-46

APPROVED FOR PUBLIC RELEASE

	CELL VOLUME	RBC COUNT	HEMOGLOBIN	MEAN CORP VOLUME	MEAN CORP HEMOGLOBIN	MEAN CORP HB CONC.
Bessie	42	7.19	12.6	58.4 cu microns	17.5 "	30.0%
Roanie	36.5	6.72	11.3	54.3	16.8 "	30.9%
Lulu	36	7.45	11.2	48.3	15.0 "	31.1%
Average	38.5	7.12	11.7	53.6	16.4 "	30.6%
Okay Doak	45	7.94	14.9	56.6	18.7 "	31.1%

SUMMARY OF PATHOLOGY REPORT OF COWS ALLEGEDLY DAMAGED AT ATOMIC BOMB TEST JULY 16, 1945

5154

On 16 July 1945, a group of Hereford cows was allegedly damaged by the Atomic Bomb test.

Tissues from one control (Oaky Doak) and three exposed animals (Roanie, Bessie, and Lulu) were obtained for study four months later. I did not see the gross tissues on cow Lulu. (Autopsies: Oaky Doak - 23 November 1945; Roanie and Bessie - 24 November 1945; Lulu - about 10 November 1945.)

From the study of these cows, there is no direct evidence that they have suffered effects of radiation.

The greying and epilation of the skin is compatible with irradiation effect. The peculiar distribution of these skin changes requires one to account for them on the basis of local exposure.

The mild decrease in cellular elements in the bone marrows as described in two of the three allegedly exposed animals is probably compatible with irradiation effect; however, it would be impossible to attribute it to that.

It seems very unlikely, providing the animals suffered an acute exposure, that the bone marrow would not have returned completely to normal after four months. For chronic exposure one might guess that the bone marrow could be depressed after four months. (For rats being chronically irradiated, the bone marrow remains cellular at death. This is not true for dogs and guinea pigs. Our available data for this statement has not yet been completely evaluated.)

In my opinion, based on the study of the four cows presented above, and with reference to considerations concerning humans:

1. The remaining cows will prove to be fertile.

2. If fed a normal diet, the remaining cows will continue to live.

3. The animals show no direct evidence of having been exposed to irradiation. The skin lesions offer the only indirect evidence that they may have been exposed to irradiation.

4. The epilated areas will produce a few hairs because all hairs and follicles are not absolutely absent in the regions examined. Complete return of the hair in all probability will not occur. (Children whose scalps have been epilated usually have a full head of hair return without greying in three months. These animals have gone four months without evidence of even an attempt at return. The absence of follicles in areas is further evidence that growth is unlikely. Doses only a little above the therapeutic epilation in children can cause permanent epilation.)

5. Only time will decide whether or not the grey hairs will remain grey. Presumably the partially grey hairs will become entirely roan before long.

6. The slight bone marrow changes are equivocal and might well be due to causes other than irradiation. I believe they could be attributable to individual variation; certainly they are not specific for radiation effect.

I am indebted to Dr. Dowdy and Mr. Bishop for practical considerations concerning humans.

The sterilizing dose for humans is 625 r at the ovary over a five day period.

The abortive dose for humans (abortion most easily obtained in the early months of pregnancy and obtained within one month) is 400 r.

This evidence, if it can be translated directly to cows, suggests that if conception occurred before exposure, the total dosage to the ovaries was less than 625 r. If conception occurred after exposure, the animals are fertile and the exposure to the ovaries was less than 400 r.

Lower doses may cause anomalies in the fetus. No gross abnormalities were observed.

Complete epilation can be accomplished, and depending upon the dosage and mode of administration, it can grow back in; usually within three months.

Roger G. Metcalf

Roger G. Metcalf,
Captain, V. C.

RGM:leg

PATHOLOGY REPORT

BESSIE

by

R. G. METCALF

5258

BODY: The body is that of a well developed and mildly undernourished Hereford cow about four and one-half years of age and weighing approximately 900 pounds. Over the back of the animal there are extensive irregular areas of the skin which are almost completely epilated. In these irregular areas the skin itself is very dry, crusted, and scaly. A few brown and grey hairs do appear even in the most severely affected portions. The lesions posteriorly over the rump and anteriorly on the left do not appear quite so severe, and there is more hair present in these regions. There is a mixture of brown and grey hair.

Peripherally from the epilated, crusted areas, there are large numbers of grey hairs mixed with some brown hair. This greying viewed from a distance gives one the impression that a layer of dust has settled upon the animal. It extends faintly upon the head and ears, along the dorsum of the neck back over the rump and downwards as far as the greatest diameter of the abdominal bulge. Along this line there is a surprisingly sharp demarkation between these greying hairs and the normals. (See chart drawn by Capt. Thompsett.) Many of the hairs towards the periphery of the greying are whitened only at the hair tips. These partially grey hairs are mixed with those which have a completely grey shaft and those which are normal. The skin under these non-epilated regions does not appear grossly abnormal.

Section of the skin reveals it to be .5 cm. in thickness at the site of epilation, site of greying, and normal areas. There is no subcutaneous scarring. The cross section of the skin, except for the lack of hair and scales, appears similar in all sections.

Over the ventral region of the belly there are two small epilated areas measuring about 4" x 4". The skin in these regions is a little thickened, raised, and scaly. Such lesions are considered to be normal and are attributable to local irritation caused by lying down.

There is a fresh incision over the carotid on the left through which the animal was bled. The method of killing by exsanguination explains the bloodless tissues. The blood clots readily on the floor. There is a small bullet hole in the forehead. It was necessary to shoot the animal when the blow on the head did not stun it completely.

The eyes and mucous membranes of the mouth are not remarkable. There are no petechiae or ulcerated areas. An eye is taken for examination of the lense.

Upon section from the udder to the zyphoid the subcutaneous fat is present but not abundant. The peritoneal cavity does not contain fluid. The surfaces are smooth and shiny without petechiae. The principle features are the large uterus and the tremendous (normal) stomach. The right cornu of the uterus contains a living fetus estimated to be about three to four months of age (Capt. Thompsett).

The rest of the viscera are in normal position. The pleural and pericardial spaces do not contain fluid. There are no petechiae.

HEART: 1580 grams. Measures 8" x 6½".
There is a moderate amount of epicardial fat. Over the epicardial surface there are streaks of grey faintly outlined against the dark brown myocardium. Upon section the chambers appear normal. The endocardium has a delicate grey cast. The valves are not abnormally thickened. They are not distorted. The right ventricular wall measures about 3/4" in thickness. The left ventricular wall measures about 1 3/4" in thickness. There are no scars. The coronary vessels are patent without calcification.

The aorta has a slightly wrinkled endothelial surface with most of the striation being in a lateral direction.

LUNGS: Weight 7 lbs.
The lungs are very pink in color, light, and fluffy. The trachea and bronchi are normal. They do contain a small amount of fresh stomach contents unquestionably aspirated at time of sacrifice. There is no hemorrhage; no petechiae.

LIVER: Weight 8 lbs. Measures 18" x 10" x 3".
It is deep ebony brown in color. The capsule is not thickened. Upon section the brown smooth surface and the lack of blood make it difficult to outline liver lobules. There are no abnormal findings. The gall bladder is thin walled, contains 300 cc. of bile and has a smooth mucosa. The bile ducts are not dissected. A section of liver is taken for the determination of radioactivity.

SPLEEN: Weight 365 grams. Measures about 13" x 4½" x 1".
The organ is flat and thin. It is plastered firmly against the stomach. The capsule is tough and grey. Upon section the surface is deep red with a sprinkling of a large number of small grey dots among the heavy trabeculae. The pulp does not scrape away readily upon the knife. A section is taken for the determination of radioactivity.

PANCREAS: Normal in appearance. The lobulations with a red center are distinct. Islets are not identified.

KIDNEY: Right - 335 grams. 6½" x 3½" x 2".
Left - 277 grams. 6" x 3½" x 1 3/4".
The surface is smooth and lobulated. There is only a small amount of perinephric fat. The capsule strips readily leaving a smooth red brown lobulated (normal) surface. Upon section the cortex appears normal. The striations are regular, and the glomeruli appear as tiny sanded red dots. The pelvis and Calyces are normal. The ureter is not opened to the bladder. The bladder is not opened.

ADRENALS: Normal in size and shape. The cut surface presents a dull grey medulla and deep brown cortex. No evidence of hemorrhage. The organs weigh 12 grams.

OVARIES: Left - 5 grams.
Right- 3½ grams.
Left ovary presents a large yellow corpus luteum which accounts for most of the mass. The right ovary upon section presents several small yellow areas and small fluid containing cysts.

UTERUS: The uterus contains a small viable calf. The cotyledons are normal in appearance. The calf weighs 400 grams. It is estimated to be about three to four months of age. Length - 8½"; width at thorax - 1¼"; height at thorax - 2¼"; overall height - 5"; head, pole to nose - 3"; head, width - 1½".

BOWEL: Except for the stomach, this is opened entirely. Sections are taken from the stomach which of course contains a tremendous amount of food in various stages of digestion in the various compartments. There are no ulcers in the large or small bowel. There is no blood in the bowel. There is one area in the small bowel which has a multitude of 1 cm. grey raised areas with a depressed pink center. These are presumed to be normal lymphoid collections and sections are taken.

LYMPH NODE: These are abundant in the mesentery, peripancreatic region, and pulmonary hilus. Those in the axillary and cervical regions are not examined. The abdominal nodes are very long with a deep blackish brown center and a yellow grey cortical region. The pulmonary nodes are a homogenous grey.

BONE MARROW: There is no red femoral marrow. It is entirely fat. The sternal rib and vertebral marrow are red in color. Sections of each are taken.

PROVISIONAL ANATOMICAL DIAGNOSIS:

1. Spotty epilation and scaling skin of back.
2. Abnormal greying of hairs on back and sides.
3. Pregnancy, estimate three to four months.
4. Small epilated, thickened area on ventral abdomen - traumatic, chronic.

PART II.
BESSIE MICROSCOPIC SECTIONS

HEART: # 32, 36, 24:
Normal.

25, 10:
Aorta - normal.

LUNG: # 19, 34:
Normal.

LIVER: # 1:
Autolyzed gall bladder mucosa.

33:
Liver - normal.

SPLEEN: Tissue lost.

LYMPH NODE: # 8, 9, 21, 27, 30:
Normal.

31, 17:
Some blood cells in sinusoids.

11:
Considerable pigment in sinus macrophages.

BONE MARROW: Sternum:
Cells abundant, perhaps slightly less than the control animal. Some increase in fat over that of the control. Megakaryocytes present. The red and white series are about equally represented.

Vertebral marrow:
There is a very definite decrease in cellular elements over that of the control animal. There is some increase in fat. Dead bone spicules (seen in the control in lesser numbers) fill many of the marrow spaces.* Megakaryocytes are present, and the distribution of red and white cells is about equal. Taken alone one could not consider this an abnormal marrow.

PANCREAS: # 29:
Normal.

ADRENAL: # 15, 37:
Normal.

STOMACH: # 14:
Normal.

38:
Esophagus - normal.

*These are pieces of bone carried in with the saw.

SMALL BOWEL: # 3, 18:
Normal.

22:
Autolyzed.

LARGE BOWEL: # 7:
Normal.

5, 6:
Colon with large lymph follicles - normal.

OVARY: # 13, 16:
Corpus luteum.

26:
Normal.

THYROID: No section.

SKIN: # 38:
At site of trauma on belly - slightly thickened corium. No hair follicles.

A: Epilated area.
Obviously not completely epilated. There are a few normal follicles. There are vestiges of glands. Some atrophic follicles and glands. Corium is thickened. There is no increase in pigment.

B: Normal skin.
No follicle atrophy. Corium thin. Small amount of pigment in basal cells.

C: Area of greying.
Not particularly remarkable. A rare atrophic follicle is present. Corium thin with some pigment.

D:
Skin over belly has area of subacute inflammation. There is a slight decrease of follicles. Deep down growths of epithelium.

Dissecting microscopic examination of the skin:

1. Normal portion of skin similar to that described for Okay Doak.
2. The normal grey hair over abdomen had a pale shaft without evidence of a distinct central core.
3. Grey hair on back: There was a decrease in the number of hairs. An occasional broken sticky dried up "dead" red hair was present. The "bulbs" at the hair ends were fairly good - perhaps a little collapsed in comparison with the normal red hair bulbs. The grey hairs tend to have a dark central "core".
4. Epilated area: Almost no hair - no bulbs in the derma. A few old broken dried "dead" red hairs without bulbs present. A rare grey hair present without bulbs.

DIAGNOSIS:

1. Spotty epilation skin of back.

2. Abnormal greying of hairs on back and sides with slight decrease in normal number of hairs.

3. Pregnancy.

4. Small epilated, thickened area of skin on ventral abdomen - traumatic, chronic.

PATHOLOGY REPORT
by
R. G. METCALF

1 4 6 a

ROANIE

5258

BODY: The body is that of a well developed undernourished Hereford cow about eight or nine years of age, and weighing approximately 850 lbs. The hair on the back from the rump to the tips of the ears, when viewed from a distance, appears as though a layer of fine dust had settled upon the animal. On closer inspection this is found to be represented by many grey hairs mixed in with the normal red-brown hair. This greying extends over the side of the animal as far as the greatest diameter of the abdominal bulge. Along a line which extends from the mid anterior thigh, lateral center of the abdomen and mid rear thigh there is a prominent demarkation of normal hair below the line, and an abnormal greying above it. (See chart drawn by Capt. Thomset which gives the regions affected and the relative severity of the process described for these regions.) At the periphery there are some hairs with greying of the tips of the hair, the rest of the shaft being brown. This phenomena is not so prominent in this animal as in the other two affected cows. The skin beneath these areas of greying does not seem to be abnormal. There is no scar tissue and no abnormal thickening or thinning of the skin.

Over the ventral region of the belly there are two small epiliated areas measuring about 4 x 3 inches. The skin in these regions is a little thickened, raised, and scaly. Such lesions are considered to be normal and are attributable to local irritation caused by lying down.

There is a fresh incision over the carotid on the left through which the animal was bled. The method of killing by exsanguination explains the bloodless tissues. The blood clots readily on the floor. There is a small bullet hole in the forehead. It was necessary to shoot the animal when the blow on the head did not stun it completely.

The eyes and mucous membranes of the mouth are not remarkable. There are no petechiae or ulcerated areas. The lense is removed from the left eye. It is crystal clear.

Upon section, from the udder to the zyphoid, the subcutaneous fat is present but not abundant. The peritoneal cavity does not contain fluid. The surfaces are smooth and shiny without petechiae. The principle features are the large uterus and the tremendous (normal) stomach. The right cornu of the uterus contains a living fetus estimated to be about three months of age. (Capt. Thomset).

HEART: 1600 gms. $9\frac{1}{2}$ x $6\frac{1}{2}$ INCHES.

There is an abundance of epicardial fat. On the epicardial surface there are several small petechiae. There are a few streaks of grey over the epicardium. Upon section, the chambers appear normal. The endocardium has a delicate grey cast. The valves are not abnormally thickened. They are not distorted. The right ventricular wall measures $\frac{1}{2}$". The left ventricular wall 1 3/4". There is no scarring. The coronary vessels are patent without calcification. The aorta has a slightly wrinkled endothelial surface with most of the striations being in a lateral direction.

ROANIE -Page 2-

LUNGS: Weight 6 lbs.
They are pink and air-containing, without pleural petechiae. The trachea and bronchi are normal.

LIVER: Weight 7 lbs. 17" x 10" x 3".
The liver is deep ebony brown in color. The capsule is not thickened. Upon section the brown smooth surface and the lack of blood make it difficult to outline liver lobules. There are no abnormal findings. The gall bladder is thin-walled, contains 300 cc of bile, and has a smooth mucosa. The bile ducts are not dissected. A section is taken for the determination of radioactivity. of liver

SPLEEN: Weight 282 gms. 12" x 3 3/4" x 3/4".
The organ is flat and thin. It is plastered firmly against the stomach. The capsule is tough and grey. Upon section the surface is deep red with a sprinkling of a large number of small grey dots among the heavy trabeculae. The pulp does not scrape away readily upon the knife.
A section is taken for the determination of radioactivity.

PANCREAS: Normal in appearance. The lobulations with a red center are distinct. Islets are not identified.

KIDNEY: Right - 325 gms. 6" x 3½" x 1 3/4".
Left - 290 gms. 5½" x 2 3/4" x 2".
The surface is smooth and lobulated. There is only a small amount of perinephric fat. The capsule strips readily leaving a smooth red-brown lobulated (normal) surface. Upon section the cortex appears normal. The striations are regular and the glomeruli appear as tiny sanded red dots. The pelvis is normal; however, at the tips of a Calyx in both kidneys there is a soft tan mulberry shapped stone about 1 - 2 mm. in diameter. There is no localized reaction or gross evidence of blockage. The ureter is not opened to the bladder. The bladder is not opened.

ADRENAL: Normal in size and shape. The cut surface presents a dull grey medulla and deep brown cortex. No evidence of hemorrhage.

OVARIES: Right - 7 gms.
Left - 5 gms.
The right ovary upon section presents several small yellow areas and small fluid containing cysts. The left ovary presents a large yellow corpus luteum which accounts for most of the mass.

UTERUS: The uterus contains a small viable calf. The cotyledons are normal in appearance. The calf weighs 400 gms. It is estimated to be about three to four months of age. Length is 10".
Overall height 6".
Width at thorax 1½".
Height at chest 3".
Head, pole to nose 3½"; width 2".

BOWEL: Not opened in its entirety. However, examination of representative portions of stomach, small, and large bowel did not reveal any abnormal findings. Small granular reddened area at pyloris, 1 x 1 cm.

LYMPH NODE: These are abundant in the mesentery, peripancreatic region, and pulmonary hilus. Those in the axillary and cervical regions are not examined. The abdominal nodes are very long with a deep blackish brown center and a yellow grey cortical region. The pulmonary nodes are a homogenous grey.

BONE MARROW: There is no red femoral marrow. It is entirely fat. The sternal rib and vertebral marrow are red in color. Sections of each are taken.

PROVISIONAL ANATOMICAL DIAGNOSIS:

1. Abnormal greying of hairs on back and sides.
2. Pregnancy, estimated three to four months.
3. Small epilated, thickened area on ventral abdomen, traumatic, chronic.

ROANIE PART II. MICROSCOPIC SECTIONS

HEART: # 11, 17:
Normal.

LUNG: # 21:
Normal.

LIVER: # 2, 24:
Normal.

KIDNEY: # 7, 9, 14, 23:
Normal.

SPLEEN: # 19:
Normal. Abundant iron by stain.

4:
Large abundant follicles with heavy trabeculations. Normal picture.

LYMPH NODE: # 12, 16:
Normal. Sinuses are packed with mononuclear cells.

18, 35:
A1 - Pulmonary node - normal.

27, 16:
A2 - Pulmonary node - normal.

BONE MARROW: Sternal Marrow:
Abundant with an even distribution of myeloid and erythroid elements.

Vertebral Marrow:
There is a decrease in the number of cells over that of the control animal. More fat is present. Megakaryocytes are present. There is an equal distribution of red cell and white cell series. Old bone spicules (seen in the control) are abundant. These are pieces of bone carried in with the saw.
NOTE: Taken alone it would be difficult to consider this abnormal marrow. There is no fibrosis.

PANCREAS: # 10:
Normal.

ADRENAL: # 8, 10:
Normal.

STOMACH: # 6:
Esophagus - normal.

22:
Small section from pyloris (at reddened roughened area). There is an area of chronic inflammation with fibrous reaction and round cell infiltration resulting in distortion and erosion of the mucosa. There are many giant cells and some foreign bodies (hay ?) in the abnormal crypts.

SMALL BOWEL: # 3, 28:
Normal.

30:
Duodenum normal.

LARGE BOWEL: # 13:
Normal.

OVARY: # 29:
Normal.

37:
Corpus luteum.

THYROID: No section.

SKIN: # 1, 25, 34: From areas with grey hairs and slight decrease in hairs. These were taken at random over the back. They show small numbers of follicles which are atrophic. At one edge of # 25 there is an area almost lacking in follicles, glands, and muscle.

5: From "normal" area.
No obvious changes. Very small local questionable area; i.e. area without follicle or glands.

B:
Area definitely beneath grey hairs. There is an abundance of hair and hair follicles. A few scattered follicles are atrophic with associated slightly atrophic glands. The vessels, corium, and dermal tissue are normal. There is slight pigmentation of the corium (basal layer).

Dissecting scope used on the skin:
The grey hairs have no dark bulbs (root bulbs). They are shiny with a dark central core. They pull out about as easily as the normal hairs. In the area of greying there is a decrease in the number of hairs. A few old "dead" dried up hairs are present without roots.

Normal part of skin appears normal. Red hairs have large brown root bulbs. A dark central core can be seen in the few red shafts.

MISCELLANEOUS:
32:
Cotyledon- normal.

26, 33:
Muscle - ? site - normal.

DIAGNOSIS:

1. Abnormal greying and mild diffuse partial epilation on back and sides.
2. Pregnancy.
3. Small epilated, thickened area on ventral abdomen, traumatic, chronic.
4. Chronic inflammation - ? traumatic from foreign body - pyloric mucosa, mild, local.

LULU

MICROSCOPIC SECTIONS
(R. G. METCALF)

1 4 2 a

5258

HEART: Organized old pericarditis. Myocardial abscess, principally an old process surrounding abscess with much fibrous tissue and many plasma cells.

LUNG: # 5, 9, 12:
Normal.

8:
Very slight areas of interstitial collections of blood.

LIVER: # 1, 2:
Normal.

KIDNEY: # 4, 16:
Normal.

SPLEEN: # 10:
Abundant follicles with heavy trabeculations. A normal spleen. Abundant iron by stain.

LYMPH NODE: No section.

BONE MARROW: The marrow is quite cellular. There is a slight predominence of the erythroid series over that of the myeloid series.

PANCREAS: No section.

ADRENAL: # 15:
Normal. The difference in staining of the medullary cells may be due to the Zenkers fixative used for this animal. There is some heavy brown pigment in the cortex.

GUT: No sections.

OVARY: # 11, 13:
Not remarkable.

THYROID: No section.

SKIN: # 6: Few grey hairs.
Corium slightly thickened. Pigment in basal layer is abundant. Towards one end and not readily seen in cross there is a small area lacking in glands, follicles, and muscle.

3: Area almost completely epilated. Few grey hairs. Some "normal hair". Mild decrease in follicles and glands in one area.

7: Rare grey hair - practically normal.
Area skin of back (?) quite normal except for a small depression of epithelium at the base of which is a small amount of round cell infiltration. Vessels normal. Corium thin. Little pigment.

(con't on page 2)

LULU

MICROSCOPIC SECTIONS
(R. G. METCALF)

1 4 2 a

5258

HEART: Organized old pericarditis. Myocardial abscess, principally an old process surrounding abscess with much fibrous tissue and many plasma cells.

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Normal.

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Normal.

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Abundant follicles with heavy trabeculations. A normal spleen. Abundant iron by stain.

LYMPH NODE: No section.

BONE MARROW: The marrow is quite cellular. There is a slight predominence of the erythroid series over that of the myeloid series.

PANCREAS: No section.

ADRENAL: # 15:
Normal. The difference in staining of the medullary cells may be due to the Zenkers fixative used for this animal. There is some heavy brown pigment in the cortex.

GUT: No sections.

OVARY: # 11, 13:
Not remarkable.

THYROID: No section.

SKIN: # 6: Few grey hairs.
Corium slightly thickened. Pigment in basal layer is abundant. Towards one end and not readily seen in cross there is a small area lacking in glands, follicles, and muscle.

3: Area almost completely epilated. Few grey hairs. Some "normal hair". Mild decrease in follicles and glands in one area.

7: Rare grey hair - practically normal.
Area skin of back (?) quite normal except for a small depression of epithelium at the base of which is a small amount of round cell infiltration. Vessels normal. Corium thin. Little pigment.

(con't on page 2)

SKIN (Con't.):

14: Area of Epilation - portion of slide with grey hair.
Under the area of epilation there are almost no follicles or glands. Delicate reticulum presumably replaces areas where glands, follicles, and muscle were placed. Area with total lack is small and the rest of the slide shows a few glands and follicles. Towards the end with more hairs there are more follicles present. Corium is slightly thickened. Mild amount of pigment

B: Normal.
From hind legs right and left: Thin corium, small amount pigment. Follicles normal.

DIAGNOSIS:

1. Spotty epilation, partial and almost complete - skin of back.
2. Abnormal greying hair, back and sides.
3. Pregnancy.
4. Subacute pericarditis with abscess formation.

AUTOPSY ON COW NO. 1

"LULU"

This Hereford cow was obtained from the ranch of Louis Nalda. She was one of the herd grazing in the Chaupedera Mesa that had allegedly been damaged by the Atomic Bomb test on 16, July, 1945. She was chosen for study as she was one of the two cows of this herd that still showed loss of hair of the skin on the back. The other cow (named Bessie) showed loss of hair to an even more marked degree than this cow. The cow was killed by a blow on the head and exsanguinated by severing the jugular vein.

GENERAL APPEARANCE -- The cow was estimated to be five to six years old. Her weight was estimated to be 850 lbs. She appeared in good general condition, except that her nutritional state was rather poor. This was compatible with the grazing conditions on the Nalda Ranch.

SKIN -- The hide was normal in appearance except on the flat portions of the back. As indicated in the accompanying drawing, the epilation was complete in certain areas. The skin appeared quite dry, but there was no actual ulceration. The hairs on the back were abnormal in that they were white hairs mixed with the normally occurring red hairs of this region. In most cases the abnormal hairs were white throughout the entire shaft but in some cases the greying was confined to the tips of the hairs. This hair appeared to be abnormally loosely attached to the skin and could be much more easily pulled off the hide than the normal hair. On the sides, belly, head, and even on the lower portions of the legs immediately above the hoofs the hair and hide appeared normal. Large and small sections of the hide were taken from the affected regions of the back as well as from

the belly and normal areas of the hide for histological study and for radioactive assay.

THORACIC CAVITY -- The cow was opened by a dorsal incision extending from the udder to the xiphoid process. The sternum was then slit exposing the thoracic cavity. The lungs and heart were normal in position. No fluid was observed in either the pleural or pericardial cavities. The lungs were normal in position and appearance. On section they appeared pale except for some frothy sanguinous fluid which could be expressed from certain dependent areas of the lungs. No bronchial lymph nodes were examined. The heart was tightly adherent to the diaphragm and to the anterior portion of the reticulum of the stomach. When the heart was dissected away from the adjacent struotures an abscess measuring about 5 x 3 x 3 cm was found adjacent to the posterior wall of the left ventricle. This abscess cavity contained thick greenish-grey pus. The fibrous wall of the abscess was quite thick. The muscle of the left ventricle adjacent to the abscess had been largely replaced by a thick white scar, which extended almost to the endocardium. This scar has an irregular stellate shape. The heart itself appeared normal except for the localized scar and for thickened edematous pericardium. The muscle had a normal redish-brown color. The valves appeared to be in good shape, and the coronary arteries were not scleroused. The weight of the heart was 1420 grams. Sections were taken for histological study and radioactive assay.

ABDOMINAL CAVITY -- The abdominal organs appeared normal in position, size, and contents. There was no sign of inflammation of the peritoneal surfaces.

LIVER -- The liver weighed 8-1/2 pounds. It measured 17 x 10 x 2-1/2 inches. The capsule was not thickened. The surface of the liver had a normal reddish-brown appearance. No lesions of any type were noted. Sections

were taken for microscopic study and radioactive assay.

SPLEEN -- The spleen was normal in shape but appeared to be smaller and more flattened than usual. It weighed 370 grams and measured 4 x 4 x 3/4 inches. The capsulary membrane was white and opaque. The pulp appeared normal with prominent trabeculation. Sections were taken for microscopic study and radioactive assay.

KIDNEYS -- The kidneys appeared quite normal. The right weighed 370 grams and measured 6 x 3-1/4 x 1-1/2 inches. The left weighed 400 grams and measured 6 x 3-1/2 x 1-3/4 inches. The surfaces of the kidneys appeared normal. The capsule stripped with ease. On section, the organs showed normal structure with no lesions except for one small cyst extending into one of the calyces. This cyst contained a small brown friable concretion. The bladder was normal to palpitation.

ADRENALS -- The adrenals were normal in size and shape and position. Nothing unusual was observed after the organs were sectioned. Sections were taken for histological study.

INTESTINES -- The stomach and intestines were normal as to appearance and contents. The mesenteric lymph nodes appeared normal. Sections were taken of the stomach and from the small intestines for histological study. Exception to the above can be made in the case of the adhesions between the reticular portion of the stomach and the diaphragm.

GENITAL SYSTEM -- The uterus contained a small fetus in the right cornua. The fetus measured 7-3/4 inches from rump to head. The fetus was normal in position and appearance, surrounded by apparently healthy tissues. The cotyledons were normal. The entire fetus was preserved for further study. A preliminary estimate of the age of the fetus is from two to three months.

[redacted]

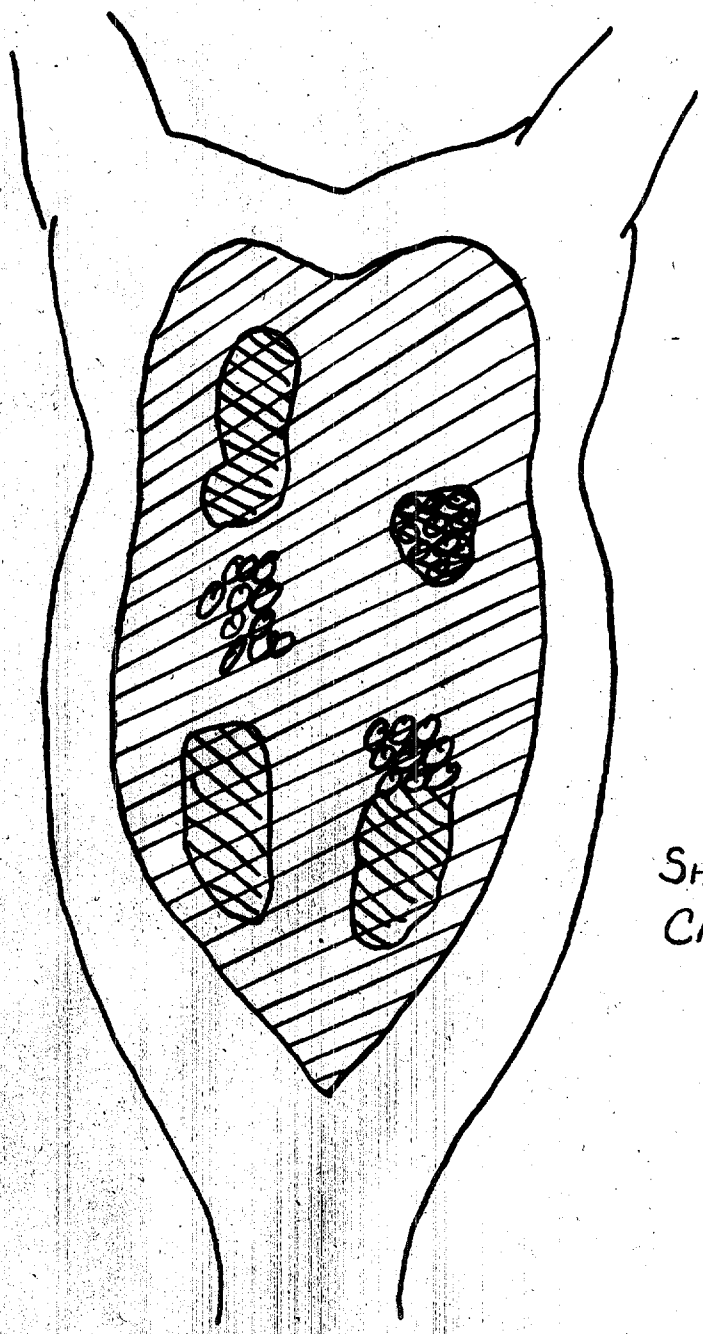
The ovaries appeared normal in size and position. They contained several small cysts and one corpus luteum. The right ovary was saved for histological study.

MUSCLE -- The skeletal system was normal in structure. The marrow of the sternum and vertebra was red and grossly appeared healthy. The shaft of the left femur contained only yellow marrow. There was very little red marrow in the trabeculour portion of the head of the femur. Sections were taken from the sternum, vertebra, and head of the femur for histological study and for radioactive assay. Further samples were taken from the shaft of the femur for radioactive assay. The sternal marrow was aspirated for cytological study.

THYROID -- The thyroid appeared normal. Sections were taken for radioactive assay.

[redacted]

[redacted]



SHADED AREA = GREYING
CROSS HATCH = EPILATION

- LULU -

DORSAL VIEW OF COW #1 "Lulu"

[redacted]

PATHOLOGY REPORT
by
R. C. METCALF

NORMAL (OAKY-DOAK)

5258

BODY: The body is that of a well developed but undernourished Hereford cow about five years old and weighing 800 pounds. There is no abnormal greying of the hairs on the back or sides of the animal. They are the normal red brown color. On the right anterior portion of the back near the shoulder there is a 2" x 3" area which is scaly and does not contain hair. Over the ventral portion of the abdomen there is a 4" x 4" area of thickened skin without hairs. It is scaly. Such lesions are considered to be normal and are attributable to local irritation caused by lying down.

There is a fresh incision over the left carotid through which the animal was bled. The method of killing by a cerebral blow and exsanguination explains the bloodless tissues. The blood clots readily on the floor.

The eyes and mucous membranes of the mouth are not remarkable. There are no petechial or ulcerated areas. An eye is taken for examination of the lense.

Upon section from the udder to the zyphoid the subcutaneous fat is present but not abundant. The peritoneal cavity does not contain fluid. The surfaces are smooth and shiny without petechiae. The principle features are the large uterus and the tremendous (normal) stomach. The right cornu of the uterus contains a living fetus estimated to be about three to four months of age (Dr. Thompsett).

The rest of the viscera are in normal position. The pleural and pericardial spaces do not contain fluid. There are no petechiae.

HEART: 1285 grams. 8" x 5½".
There is little epicardial fat. Over the epicardial surface there are a few grey streaks outlined against a dark brown myocardium. Upon section the chambers appear normal. The endocardium has a delicate grey cast. The valves are not abnormally thickened. They are not distorted. There are no myocardial scars. The coronary vessels are patent without calcification. The aorta has a slightly wrinkled endothelial surface with most of the striations being in a lateral direction.

LUNGS: The lungs are voluminous, pale pink, fluffy, and air containing. There are no petechiae on the pleural surfaces. The trachea and bronchi are normal.

LIVER: Weight 6 lbs. 17" x 10" x 3"
It is deep ebony brown in color. The capsule is not thickened. Upon section the brown smooth surface and the lack of blood make it difficult to outline liver lobules. There are no abnormal findings. The gall bladder is not opened - appears normal.

SPLEEN: 3/7 grams. 10" x 4" x 1"
The organ is flat and thin. It is plastered firmly against the stomach. The capsule is tough and grey. Upon section the surface is deep red with a sprinkling of a large number of small grey dots among the heavy trabeculae. The pulp does not scrape away readily upon the knife. A section is taken for the determination of radioactivity.

PANCREAS: Normal in appearance. The lobulations with a red center are distinct. Islets are not identified.

KIDNEY: Right - 235 grams. 6" x 3" x 1 3/4".
Left - 245 grams. 6" x 3½" x 2".
The surface is smooth and lobulated. There is only a small amount of perinephric fat. The capsule strips readily leaving a smooth red brown lobulated (normal) surface. Upon section the cortex appears normal. The striations are regular and the glomeruli appear as tiny sanded red dots. The pelvis and Calyces are normal. The ureter is not opened to the bladder. The bladder is not opened.

ADRENALS: Normal in size and shape. The cut surface presents a dull grey medulla and deep brown cortex. No evidence of hemorrhage.

OVARIES: Right - 3.8 grams.
Left - 6.5 grams.
The right ovary upon section presents several small yellow areas and small fluid containing cysts. The left ovary presents a large yellow corpus luteum which accounts for most of the mass.

UTERUS: The uterus contains a small viable calf. The cotyledons are normal in appearance. The calf weighs grams. It is estimated to be three - four months of age. Length - 9½"; width at thorax - 1 3/4"; height at thorax - 3"; overall height - 5 3/4"; head, pole to nose - 3½".

BOWEL: Not opened in its entirety. However, examination of representative portions of stomach, small, and large bowel did not reveal any abnormal findings.

LYMPH NODES: These are abundant in the axillary, mesenteric, and hilar regions. Those of the mesentery and axilla have a deep brownish black center with a grey yellow cortical zone. The pulmonary nodes are a homogenous grey.

BONE MARROW: There is no red femoral marrow. It is entirely fat. The sternal rib and vertebral marrow are red in color. Sections of each are taken.

PROVISIONAL ANATOMICAL DIAGNOSIS:

1. Small area of epilation and scaling over right shoulder, probably traumatic.
2. Pregnancy.
3. Small epilated thickened area on ventral abdomen, traumatic, chronic.

OAKY DOAK PART II. MICROSCOPIC SECTIONS

HEART: # 5, 30, 34:
Several oval masses containing a collection of deep blue staining small circular masses. Presumably a parasite of unidentified nature. (Possibly sarcosporidia.)
20:
Aorta normal (poor section).

LUNG: # 7, 33:
Normal.

LIVER: # 38, 39:
Normal.

KIDNEY: # 31, 35:
Normal.

SPLEEN: # 11, 36:
Follicles large and active appearing. Trabeculations heavy. Quite normal in appearance. Abundant iron by stain.

LYMPH NODE: # 3, 8, 15, 17, 27:
Normal.

22:
Normal. (Probably abdominal.)

24:
Considerable brown pigment in the macrophages of the medulla (may cause brown coloration seen in gross).

BONE MARROW: Sternal and vertebral marrow:
There is an abundance of marrow cells with numerous megakaryocytes. The predominant cells seem to be the myeloid series. However, there are many tightly clumped cells of the red series. The marrow is not fibrotic.

PANCREAS: # 18, 23:
Normal.

ADRENAL: # 16:
Normal. The medullary cells are very prominent.

19:
The medullary cells seem to extend into the cortex.

STOMACH: # 9:
Normal.

SMALL BOWEL: # 12:
Relatively large numbers of eosinophiles infiltrating the mucosa. Lymph follicles are small and presumably normal.

LARGE BOWEL: # 6, 25:
Normal.

OVARY: # 4:
Normal.

CORPUS LUTEUM: # 29:
Normal.

SKIN: # 10:
Section from back.
Thin corium with small amount of pigment in basal layer. No atrophic follicles. Small collections of round cells in the derma.

Section A:
From epilated area on back.
There is a greatly thickened corium with a heavy fibrous derma without follicles, or glands, or muscle. Small collections of round cells about the vessels.
Examination of skin under dissection microscope reveals many red hairs with a large brown bulb attached to the end of each hair. They pull out readily.

THYROID: No section.

MISCELLANEOUS:
14:
A section taken (probably) from the chorion.

26:
Placental cotyledon.

DIAGNOSIS:
1. Small area of epilation and scaling over right shoulder, probably traumatic.
2. Pregnancy.
3. Small epilated thickened area on ventral abdomen, traumatic, chronic.
4. Parasitism heart, mild.

Post-mortem examinations were made by Dr. Hempelmann, Captain Metcalf and the undersigned. Date:

Findings made by the other men may be stated in other writings in more technical aspects; however, the writer found the following:

1. All abdominal organs appeared normal grossly with no abnormal abdominal fluids.

2. Urino-genital systems in all four cows found to be normal. Pregnancy was noted in all animals to be from three (3) to five (5) months in gestation. Appearance of fetus and all fetal surroundings appeared normal.

3. Thoracic cavities on all animals macroscopically noted as being normal. Exception can be made in the complete post-mortem of all four animals to animal #1 (Lulu), which animal was found to have had an adhesion between the reticulum and diaphragm and heart musculature and diaphragm. This animal probably had earlier suffered traumatic gastritis and pericarditis. A large lesion was found to appear within the musculature of the heart, penetrating to a distance of within about three-fourths (3/4) centimeter from the endocardium.

4. Abnormalities as to the hair, hair follicles and skin were definitely noted in animals number one (1) and two (2). Histological sections taken by the other examiners may show more definite post-mortem studies. These animals, although experimental, were skinned and dressed after post-mortem to study the quality of the meat and its keeping qualities. Although thin, these animals appeared to be excellent for meat after a liberal hanging and aging within refrigeration.

R.E. THOMPSETT,
CAPTAIN, V.C.

-59-
II-F-4

This document consists of 1 page(s).
Number 1 of 5 copies, Series A

The University of Rochester
School of Medicine and Dentistry
P. O. BOX 287, CRITTENDEN STATION
Rochester 7, N. Y.

5154

26 December 1945.

Captain James Nolan
P. O. Box 1663
Santa Fe, New Mexico

Dear Captain Nolan:

I will transmit the cow protocols to you as soon as they are in form. The conclusions are gathered and are enclosed.

Don't you feel that if there are animals to be done in the future it would be a waste of time to bother with all tissues and a detailed discussion of every animal? I would suggest the following:

Section of:
1. Spleen.
2. Several sections of skin taken from various areas with each done up in gauze and labelled as to whether from a grey area, normal area, or epilated area, etc.
3. Three lymph nodes.
4. Section of lumbar vertebra and sternum.
5. Section of ovary or testis.
6. No attempt to write a protocol.

If only this procedure were done without attempt to do more, several animals could be done at once provided there were enough butchers and cow hands to pull, haul, maul, and exsanguinate.

I heartily recommend the study of a bull or two.

Sincerely yours,

Roger G. Metcalf,
Capt., M. C.

I showed the slides to Dr Hawkins at the medical school and he agreed with my conclusions

RGM:leg
enclosure - 1

12/27/45
mjw

INTER-OFFICE MEMORANDUM

DATE 15 March 1946

TO: Trinity Files

FROM: L.H.Hempelmann

SUBJECT: Radioactivity of Cows from Alamagardo Region autopsied 19, 23, and 24 November 1945

The original records of the measurements taken by J.G.Hoffman, Louis Scivelly and myself on these cows have been lost. Careful readings made on a Watts type Geiger Counter with rate meter of the carcasses of the four cattle showed no increase over background. The measurements were taken at specified distances from the bodies of the cows as well as inside their body cavities.

Beta particle measurements of slices of the various organs including bones placed around beat ray tubes also showed no significant rise in backgroun. The only record of these measurements are those of Scivielly

Hempelmann

Form 25

INTER-OFFICE MEMORANDUM

TO: Dr. Hempelmann DATE: November 20, 1945

FROM: Wm. L. Scivally

SUBJECT: Counts of samples taken from cow killed 13 November 1945.

Cow No. 1 (Lulu)

Count taken with geiger tube (aluminum) in lead pig.

Background = 78 c/min ± 3 %

Sample	Weight	c/min 3%	c/min. less background
Kidney	66.0 grams	82.0	4.0
Spleen	133.5 grams	87.4	5.4
Liver	181.0 grams	89.5	11.5
Bone	8.6 grams	81.5	3.5
Leg Roast	81.5 grams	81.3	3.3

Hide (area 8 x 3 in.)

Count taken with Victoreen survey meter, Model 263, App.#46621

Background = 207 c/min ± 3%

Count = 205 c/min ± 3%

cc/ Captain Nolan
Livestock
J. G. Hoffman
Files

[redacted]

Memo.

To: Trinity Files Date: 10 Feb. 1946

From: LHHH

Subject: Estimate of dose of beta radiation received by cattle.

During his visit to this site last week on his way to California, Dr. Robert Stone saw the cattle alledgedly damaged by the fission products from the nuclear explosion, 16 July 1945. It was his feeling that the skin damage noted in these cattle could have been produced by beta radiation. The dose which would have been required to produce such an effect was estimated by Dr. Stone to be between 4,000 roentgens and 50,000 roentgens, probably about 20,000 roentgens. This estimate was based on the observation of the effect of beta rays on rabbits performed by Curtis and Rapier at Oak Ridge.

Hempelmann

[redacted]

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Hempelmann

[redacted]

1 April 1946

Memo: TO TRINITY FILE

From: L. H. Hempelmann

Subject: Discussion of the Beta Ray Dosage Which Cattle in Contaminated Area Could Have Received as a Result of the Nuclear Explosion 16 July 1946.

For discussion of beta ray doage delivered by the fission products which fell northeast of Alamogordo Bombing Range, see Section X, Health Physics report on Radioactive Contamination Throughout New Mexico, Part II by Joseph G. Hoffman.

[redacted]

[redacted]

II-I

INTER-OFFICE MEMORANDUM

To: Mr. H. J. Collier Date: 7 December 1945

From: Louis H. Hempelmann, MD

Subject: The three cows, "Bessie", "Roannie", and "Oakie Doaks".

The three cows named "Bessie", "Roannie", and "Oakie Doak" purchased by the Project from the Red Canyon Sheep Company, Inc., on 3 November 1945 were butchered for experimental purposes on 13 November 1945.

Louis H. Hempelmann, MD

LHH/mba

cc/files

[redacted]

[redacted]

Part III Reports of survey of cattle in region northeast of the Alamogordo Bombing Range.

[redacted]

INTER-OFFICE MEMORANDUM

DATE November 14, 1945

TO: Memo to the Files

FROM: Dr. L. H. Hempelman

SUBJECT: Trip to Ranches of Ted Coker and Mr. Raitliff on Sunday, November 11, 1945.

A party consisting of Lt. Col. Stewart, Major Neucomb, Captain Whipple, and myself went to the above ranches to investigate alleged damage to livestock caused by the Atomic Bomb Test. Mr. Ted Coker had quite a number of cattle whose appearance had been affected in that the red areas of the hair were now roan in color. These cattle had been grazing west of the Chaupedera Mesa, where his land joins that of Louis Nalda. These cattle, however, did not seem to be nearly as badly affected as were Nalda's. His cattle also appeared to be in much better physical condition than were these of the other ranchers (Nalda, Bwesum) presumably because of superior grazing conditions. Coker stated that he was not aware of this condition until after Nalda mentioned it to him. He observed that no cattle had complete loss of hair or blistering. However, the animals were first observed by him about one month or so after the shot. He noticed that the hairs appeared shorter than normal. Coker's cattle appeared to be in quite good state of nutrition; much better than was the case at the Nalda Ranch. No exact count of the number of cattle affected was made at that time. Both Mr. Coker and his son stated that they believed the appearance of the hide recently was improving as far as color was concerned.

Coker made one interesting statement about an observation made by his ranch hands immediately after the shot. He stated that he was told that the windmill and fences at his ranch appeared to have been "painted white" when observed in the dark of night. This observation is not confirmed by Coker himself.

From Coker's ranch the party went to the Raitliff house in the "Hot Canyon" in the Chaupedera Mesa. Mr. Raitliff and his wife were quite well

Form 25

INTER-OFFICE MEMORANDUM

DATE November 14, 1945

TO:

FROM:

SUBJECT Trip to Ranches of Ted Coker and Mr. Raitliff on Sunday, 11 November 1945 (con't).

except that Mr. Raitliff still complained of being nervous. Both of them appeared to be in good condition, though from the color of Mr. Raitliff's nails and lips it is possible that he might be slightly anemic. The grandson who was mentioned in my last memoranda was no longer living with the Raitliff's. He had left about the first of September to live with another relative in order to continue his schooling. A small niece about two years old is now living with this family. She appeared well except for a u.r.i. Mr. Raitliff's livestock was now in good condition, but had suffered damage in the past. About one month after the shot, even on the occasion of my last visit to this place, the two black house dogs had begun to limp. This progressed for several weeks until their foot pads were raw and bleeding. One of the dogs was so badly affected that she was unable to walk except with extreme difficulty. Their feet have improved to the point where they were almost completely well, except for some tenderness of the pads and slight limp in the case of the bitch. The male dog, however, showed white hairs mixed with the black on the caudad portion of his back. Interestingly enough, this dog at the time of the shot had been tied under a small scrubby tree, whereas the other dog was tied under a fairly well formed scrub pine. Mr. Raitliff also has two other dogs who run with his goat herd. They both showed damage to the skin of their backs and even now one has a small area of epilation. Their feet, however, are not involved. The dogs otherwise were quite healthy.

The only other livestock affected were one milk cow and a heifer. The latter, according to Raitliff shows patchy areas of epilation. The horses, burrows, and turkeys apparently were not affected. Except for the two black dogs, the turkeys and the burrows, none of the damage was witnessed by members of the party.

Form 25

INTER-OFFICE MEMORANDUM

DATE November 14, 1945

TO:

FROM:

SUBJECT Trip to Ranches of Ted Coker and Mr. Raitliff on Sunday, 11 November 1945 (con't)

Mr. Raitliff also told an interesting story of the appearance of the ground immediately after the shot. He stated that the ground and fence posts had the appearance of being covered with light snow, or of being "frosted" for several days after the shot. This was most apparent at sun-down and day-break and was not as obvious in the middle of the night.

Mr. Raitliff also stated that he had heard that some cattle were injured at Claunch but could give no details.

The party also visited the house of R.H. Dean in Bingham in order to investigate a cow who allegedly had lost a large piece of hide as a result of the Atomic Bomb explosion. Mr. Dean was not at home and the cow was not in evidence; however, a large piece of hide about one foot square was observed in the corral, which probably came from this cow. The hair and skin of this specimen appeared normal. Apparently the hide had been neatly dissected below the lower layers of the corium. According to the story told by Coker, this cow did not have gray hair as had all the others. It would seem quite probable that this does not represent the same condition as noticed in the cows in the case of the cattle grazing in the region of the Chaupedera Mesa.

L.H. Hempelmann, M.D.

cc/ J.G. Hoffman
Files

Form 25

Date; 1 December 1945

Memo: TRINITY FILES

From: L.H. Hempelmann

Subject: FOLLOW-UP OF OUTLYING AREA CONTAMINATED BY TRINITY CLOUD

The following is a compilation of the facts which have accumulated in this office since the last memo. (November, 1945) on this subject:

1. After a survey of the area contaminated by fission products from the cloud, Lt. Col. Stewart and Major Newcombe estimate that about 500-600 cattle show the signs of beta rays damage described in other reports. Of these the most seriously injuried appear to be those cattle from the Bursum Ranch which have been grazing near the Smith and Julian tank (on the bombing range). The cattle on the extreme northwestern tip of the land of the Red Canyon Sheep Co. (Nalda Ranch) just north of the Raitliff Ranch showed a lesser effect but have considerable graying with two cases of epilation as noted before (Thompsett report #1). The cattle from the Coker Ranch, just to the west of the Nalda land, also showed skin damage in the form of graying. These cattle, were in a much better state of nutrition than the others presumably because of better forage in this region. From heresay, it is probable that cattle at Bingham were not affected as reported, although these cattle have not been seen by anyone from this project. Some cows at the Wilson Ranch (the position of which is indicated on the maps as Cooper's well northeast of the Raitliff Ranch -- see below) showed mild changes as did a black dog at this ranch. From the above biological information, it might be reasoned that there were two focal areas of high contamination, one on the summit of or to the west of the escarpment at the northeast portion of the Alamagardo bombing range and the second, northeast of the Raitliff Ranch. Fortunately the activity along highway 380 where most of the houses are situated lies between these two "hot" foci.

2. Lt. Col. Stewart and Major Newcombe investigated a hitherto undiscovered ranch in approximately the location marked "Unknown" on the monitor's maps. The only entrance to this ranch is from the Smith (Harvey) Ranch or by means of a road near the Maxwell Ranch which goes south from highway 161. Until recently, it was though that the "unknown ranch" referred to the Raitliff ranch. A man and wife named Wilson live alone at this ranch. The damage done to their cattle would indicate that the deposition of active dust from the cloud was not nearly as great as that at the Raitliff Ranch. Monitors from this site will be sent down to measure the activity. 1 January 1946 -- for measurements at the Wilson Ranch, see location marked Cooper Well on the monitoring trip of Buckland and Reinert on 11 December 1945 in the Hoffman report. They found that the activity in this region is about three quarters that at the Raitliff Farm.)

3. The animals which have been found to show the beta ray burns described previously are cows, dogs (on their backs and foot pads) and cats. Horses, burros, angora goats, and fowl in the same areas have shown no evidence of damage. Some lambs near the Maxwell Ranch showed blistering of their backs but this is thought to have occurred before 16 July 1945 and was believed by the sheep herder to be due to the fact that these animals had rubbed their backs against a salt rack.

4. The news release which has received nationwide circulation concerning the rancher whose beard turned gray has not been investigated by members of this project. According to the neighbors, however, this man, Bill Wrye, is a relatively young man who is turning gray prematurely. When teased about "getting old," early in the spring of 1945, he attributed the change in color of his beard to the fact that he had accidently rubbed "dehorning paste" on his face. When the cattle began to show the effects of beta radiation, he changed his story and attributed the color change to the atomic bomb. According

to the neighbors, Mr. Wrye is having fun at the expense of the newspapers. Since the radiation levels in the region of the Wrye Ranch are quite low, it has been decided not to investigate the story further.

5. According to Captain Thompsett, on November 10, 1945, a milk cow in Las Vegas was pointed out to him as having developed gray spots on her back since last summer. The presence of gray spots at this time has been verified by Captain Thompsett.

Memo: 9 December 1945

To: Trinity Follow-up Files

From: LHH

Subject: Trip to vicinity of Trinity to purchase cattle alledgedly damaged by the atomic bomb.

On December 4, 1945, Lt. Col. Stanley Stewart and I left this site at 1:30 PM to visit the ranchers in the vicinity of the Alamagordo Air Base in order to purchase cattle alledgedly damaged by the nuclear explosion, 16 July 1945. Our instructions from Washington were to buy all damaged cattle that the ranchers wanted to sell. Approximately seventy five head of cattle were bought - five from the Mr. Ted Coker ranch and the remainder from Mr. Homer Bursum, manager of the Bursum Ranch. The fourteen animals from the Bursum ranch showing the most extensive damage and three from the Coker ranch were brought to this site by truck. The remainder were shipped by rail to Oak Ridge.

In the course of this trip, the following information was obtained:

(1) The Bursum cattle which had apparently been trespassing on the Alamagordo bombing range near the Smith and Julian tank(about 10 - 15 miles northeast of zero) showed even more damage than the Nalda cattle (Red Canyon Sheep Co.) already described (See Thompsett Report #1). The graying was more noticible and at least 10-15 animals showed epilation with scab formation more severe than that observed in the two Nalda cattle studied previously at this site. It was interesting that the calves in this herd seemed to be more severely affected than the full grown animals. This had not been the case in the Nalda herd. (see previous memo). The cattle showing skin injury did not appear to be in poorer physical condition than did the unaffected animals. Bursum, however, felt that the animals which were sold to us were less healthy than the normal cattle cattle. He also thought that several of these animals had the "sniffles". All of the cattle on this particular section of the Bursum ranch were poorly nourished.

2. Bursum told the following story. He observed nothing unusual until 2-3

weeks after the shot. At this time, while driving south on a road to the Smith tank he noticed one calf that "looked as if it had fallen in a mud hole" because of the "slick" or wet appearance of its hide. He thought no more of this until about one week later when he found a calf near the Smith tank with a festering ulcerating back that looked as if "it were being eaten by flies". The apparent good general health of the animal was against such a diagnosis. Shortly after this, Bursum saw some "roan" calves, i.e. cattle with gray hairs interspersed with the red hairs of the back. He thought that there must be a bull of poor stock in this section of the ranch which was siring these calves. He was puzzled by these observations but did not associate the changes in his cattle with the nuclear explosion until Nalda spoke to him in August 1945.

3. A saddle horse at Buck's place showed a few small patches of white hair on its rump. This horse had been at this ranch at the time of the shot.

4. The cattle at the Coker ranch seemed to have improved insofar as the color of the hair; they seemed less gray than on our last visit. One of the cows which was bought showed very little graying but was bleeding from both nostrils. This is a very unusual symptom for cattle from this area. Other than this, the cow appeared to be in good condition.

5. The Nalda ranch was visited late at night. We were unable therefore to see his cattle. According to his statement, however, one of the two bulls which showed graying had lost a considerable amount of weight and had to be brought to the ranch headquarters to be fed soybean cake. Since this bull was given added feedings, his weight improved.

III - D

Final report on cattle in area contaminated by fission products produced by the nuclear explosion, 1945. (This report will be issued when it is received as LA - 638-A.)

III - E

Hematology of Normal Cows at Las Cruces, New Mexico Agricultural School

In January, 1945 the blood of normal cows at the New Mexico agriculture School at Las Cruces was studied. Group I was kept at the school farm under very good conditions with regard to feed and sanitation. Group II was kept on the experimental ranch with no supplimentary feed other than a mixture of spent bone black and salt. The latter animals seemed more docile, sluggish and less excitable than those maintained under optimum conditions.

Group II showed lower total white counts, 4,400, 5,150, 7,157, 5,325, 4,633 4,950, 6,050, with an average of 5,381. White counts in Group I were higher with an average of 10,367. The lymphocyte counts were lower in Group I: 36.6% in Group I; 43.2% in Group II. The range cows have more and larger red cells than the farm group.

Coagulation tests were done on the two groups. (The normal for the human being 20 minutes.) Those animals on the range had a clotting time averaging one hour while those on the farm had an average of ½ hour. The times were very close in each group with a deviation of only 5 minutes.

There is great difficulty in determining the normal blood picture of cows as can be seen by the discrepancy on the accompanying chart.

HEMATOLOGICAL RECORD

NAME Las Cruces Group I Farm Animals
Date 1-31-46

DATE	RBC	%	GMS	RETIC	PLATELETS	WBC	M/L	P/L	REMARKS
Cow #1	6.80		11.7		1,374,000	10,099			
Cow #2	5.31		11.7		828,000	10,450			
Cow #3	5.05		12.7		838,000	9,550			
Cow #4	6.20		11.0		918,000	13,750			
Cow #5	6.07		12.0		1,044,000	9,238			
Cow #6	6.50		10.7		1,274,000	9,114			

SUPRAVITAL ~~WRIGHT'S STAIN~~

DATE	EOS	BAS	PMN				LYMPHOCYTES			MONOCYTES			REMARKS
			MYEL	META	STAB	SEGS	SMALL	INT	YOUNG	ACT	YOUNG	STIM	
Cow #1	7	2			4	28	48			3		8	
Cow #2	3	2			2	33	50	1		2		7	
Cow #3	19				5	33	30			4		9	
Cow #4	2				2	32	48	1		5		10	
Cow #5	2	5			1	40	40			6		6	
Cow #6	3	1			3	32	43			5		13	

FORM 501 1M--2-46

HEMATOLOGICAL RECORD

NAME Las Cruces Group II Range Animals
Date 1-29-46

DATE	RBC	%	GMS	RETIC	PLATELETS	WBC	M/L	P/L	REMARKS
Cow #134	7.98		12.7	----	1,548,000	7,157			
Cow #155	5.34		11.7		1,068,000	4,400			
Cow #320	7.79		12.7		1,620,000	5,150			
Cow #394	5.07		14.2		963,000	5,325			
Cow #395	7.50		14.2		982,000	4,638			
Cow #438	7.60		11.7		1,353,000	4,950			
Cow #577	7.98		12.0		1,093,000	6,050			

SUPRAVITAL WRIGHTS STAIN

DATE	EOS	BAS	PMN				LYMPHOCYTES			MONOCYTES			REMARKS
			MYEL	META	STAB	SEGS	SMALL	INT	YOUNG	ACT	YOUNG	STIM	
Cow #134	34	1				29	26	1		6		3	
Cow #155	13	4			2	31	38	1		8		3	
Cow #320	10	1			7	47	27			8			
Cow #394	13				2	35	42	2		6			
Cow #395	8	1			2	29	46			12		2	
Cow #438	16	2				27	40			12		3	
Cow #577	18				2	36	37			5		2	

GROUP II 1-29-46	Actual Packed RBC	RBC Count	Hemoglobin	Mean Corp Vol.	Mean Corp HB	Mean Corp HB Conc
Cow #134	45%	7.98	12.7 gm	56.4 cu microns	15.9	28.2%
Cow #155	40%	5.34	11.7 gm	74.9	21.9	29.3
Cow #320	41%	7.79	12.7	52.6	16.3	31.0
Cow #394	44%	5.07	14.2	86.8	28.0	32.3
Cow #395	44%	7.50	14.2	58.7	18.9	23.2
Cow #438	40%	7.60	11.7	52.6	15.4	29.3
Cow #577	42%	7.98	12.0	52.6	15.0	28.6
Average	42.29	7.04	12.74	60.09	18.10	30.13
GROUP I 1-31-46						
Cow #1	34	6.80	11.7	50.0	17.2	34.4
Cow #2	35	5.31	11.7	65.9	22.0	33.4
Cow #3	35	5.05	12.7	69.3	25.1	36.3
Cow #4	34.5	6.20	11.0	55.6	17.7	31.9
Cow #5	35	6.07	12.0	57.7	19.8	34.3
Cow #6	34.5	6.50	10.7	53.1	16.5	31.0
Average	34.67	5.99	11.63	57.89	19.42	33.55

HEMATOLOGICAL RECORD

NAME Normal Averages

No. of Animals	DATE	RBC	%	GMS	RETIC	PLATELETS	WBC	Cell Volume MM	P/L	REMARKS
6	Group I	5.99		11.63	0	1,046,000	10,367	34.67		
7	Group II	7.04		12.74	0	1,232,000	5,381	42.29		
56	W. T. Miller	6.33					8,616			
2	Wintrobe	6.96		13.50				40.00		
11	Dulaune	7.55					10,450			
219	Kushner	8.75								

WRIGHT'S STAIN

	DATE	EOS	BAS	PMN				LYMPHOCYTES			MONOCYTES			REMARKS
				MYEL	META	STAB	SEGS	SMALL	INT	YOUNG	ACT	YOUNG	STIM	
6	Group I	6	1.67			2.83	33	43.17		.33	13			
7	Group II	16	1.29			2.14	33.43	36.57		.57	10			
56	W.T. Miller	6.1	0.5			←--18.9---→		←----------73.9----------→						
2	Wintrobe	0.5				←---3.5---→		96.0			0			
11	Dulaune	5.2	0			←--22.5---→		61.3			10.1			
118	Nevodov	3.5	0			←--13.5---→		←----------83.0----------→						
200	Kracke	4	0.5			←--34.5---→		←---------- 61.7 ----------→						

SECRET

Part IV Clinical studies of seventeen "gray" cattle from Bursum and Coker Ranches.

SECRET

REPORT #4 ON SECOND GROUP OF GRAY CATTLE

On 4 December 1945, seventeen Hereford cattle, alledgedly damaged by the nuclear explosion 16 July 1945, arrived here by truck from the area north of the Alamogordo Test Site. These animals were the most severely affected of a group of 75 purchased on 4 December 1945 by Lt. Col. S.L. Stewart and Dr. L.H. Hempelmann. The other 61 animals were shipped by rail to Oak Ridge, Tenn. Fourteen of the cattle were bought from Mr. Homer Bursum and three from Mr. Ted Coker. The group consisted of seven cows and ten calves.

The appearance of the cattle was similar to that of the Nalda cattle previously described. (See color photographs). The loss of hair of the backs of these cattle was somewhat more extensive than that noted previously. (The two cows from the Coker Ranch, however, showed only mild graying). The hide of the backs of many of the cows and calves showed extensive scab formation; several showed raw, bleeding lesions probably due, in part, to trauma incurred during transit. The graying of the hair of the calves was more noticeable and extensive than was that of the cows but they showed about the same degree of epilation and scabbing. One cow (from Coker) showed evidence of a bloody mucoid discharge from both nostrils. All cows were in a poor state of nutrition on arrival. The calves were in somewhat better physical condition but were also quite thin. Most of the calves had not been weaned.

These cattle will be observed carefully during the next six months. Complete blood counts and color photographs will be taken as soon as possible. Throughout the winter they will be fed a diet approximating that which they would have had if they had remained on the range. In the spring, the diet will be increased in an effort to fatten the cattle. They will be treated then as animals in the feed lot and an attempt will be made to remove parasites and to treat the skin. One year after exposure, in July 1946, the blood counts and photographs

will be repeated and the changes noted. After this study has been completed the cattle will be turned out on the range and will be followed for an indefinite period.

R. Thompsett

L.H. Hempelmann

Date: 9 December 1945

HEMATOLOGY REPORT ON 17 COWS

Seventeen cows and calves exposed to radiation were brought up on the hill in the middle of December. One of the cows died of colic; unfortunately an autopsy was not performed.

Difficulty has been encountered in marking cows in such a way as to know from one week to the next which animals have been examined. Hence the results discussed below should be considered as a statistical study of a group.

The average white count of the 6 cows was 4,214. The average white count of the 10 calves was 8,444. The average percentage of lymphocytes was 39.2 for the cows and 49.1 for the calves. The average percentage of the lymphocytes which contained neutral red granules was 27.6%. The average for the calves was 19.1%. The average red count of the cows was somewhat lower (6.72 million cells per cubic millimeter) than that of the calves which was 9.15 million cells per cubic millimeter. The cell volumes were 38.3 for the cows and 42.8 for the calves.

The platelet counts all appeared normal and there was only one reticulocyte seen on all the preparations. This reticulocyte was found on cow #4.

The red cells seemed to show an increase in size rather than in number after the animals had been here for three months.

Coagulation studies were done because cow #4 was bleeding from the gums. Cow number 4 had a coagulation time of one hour and fifteen minutes, which seems very much prolonged. This cow was then taken off the alfalfa and after a week the clotting time was 30 minutes. The prothrombin time, platelet count and clot retraction remained normal. The other cows in this group also had what seemed to be a prolonged coagulation time. The average being about one hour. The other factors of coagulation characteristics were normal.

Annamae Dickie
Annamae Dickie

Date _____

HEMATOLOGICAL RECORD

NAME Cows

DATE	RBC	%	GMS	RETIC	PLATELETS	WBC	Cell M/L Volume	P/L	REMARKS
Cow #1	4.98		9.2	0	938,000	3,766	30.3		
Cow #2	7.62		12.3	0	1,227,000	4,419	45.5		
Cow #3	6.81		11.2	0	3,045,000	3,246	36.3		
Cow #4	6.97		12.6	0	1,214,000	4,150	38.1		
Cow #9	7.01		13.8	0	1,150,000	4,600	38		
Cow #10	6.97		13.9	0	930,000	5,105	42		
Average	6.72		12.1	0	1,417,300	4,214	38.3		

SUPRAVITAL ~~WRIGHT'S STAIN~~

DATE	EOS	BAS	PMN				LYMPHOCYTES			MONOCYTES			REMARKS Granules
			MYEL	META	STAB	SEGS	SMALL	INT	YOUNG	ACT	YOUNG	STIM	
Cow #1	9.3	1.0			4.3	45.0	29.3	1.0		5.0	0.3	4.6	23.5%
Cow #2	5.5	1.0			5.5	32.5	33.0	4.0	1.0	12.5	0.5	4.5	42.0%
Cow #3	8.6	0.7		0.7	5.6	40.7	31.3	0.7		6.6	0.3	5.0	18.0%
Cow #4	7.3	1.0		0.3	2.7	25.0	52.3	1.0	1.3	5.6	0.7	2.7	32.0%
Cow #9	3.0					27.0	47.0	1.0		3.0		19.0	14.0%
Cow #10	4.5	2.0			4.5	40.0	42.5	1.0		5.0	0.5		36.0%
Average	6.36	0.95		0.17	3.76	35.0	39.2	1.45	0.38	6.18	0.38	5.96	27.6%

FORM 201 14--2-46

HEMATOLOGICAL RECORD

NAME Calves

DATE	RBC	%	GMS	RETIC	PLATELETS	WBC	Cell Volume	P/L	REMARKS
Calf #5	10.105		15.3	0	1,600,000	9,337	46		
Calf #7	11.275		12.6	0	2,486,000	7,482	39		
Calf #8	8.94		13.7	0	1,440,000	8,300	43		
Calf #11	8.34		14.8	0	1,313,000	8,715	44.5		
Calf #12	7.48		13.1	0	1,215,000	8,450	38.5		
Calf #13	9.00		14.4	0	972,000	6,750	40.5		
Calf #14	8.95		15.0	0	1,260,000	8,850	40.5		

SUPRAVITAL WRIGHTS STAIN

DATE	EOS	BAS	PMN				LYMPHOCYTES			MONOCYTES			REMARKS
			MYEL	META	STAB	SEGS	SMALL	INT	YOUNG	ACT	YOUNG	STIM	Granules
Calf #5	7	1			1	17	61	1		9	3		14%
Calf #7	6	2			1	26	55			9	1		32%
Calf #8	8				3	34	41	1		5		8	0%
Calf #11		0.5			3	18.5	71	0.5		5.5		1	15%
Calf #12	1				1.5	26	53	2		16		0.5	1%
Calf #13	4	1			12	45	29		1	8			22%
Calf #14	6	3			4	19	50	2		15	1		38%

HEMATOLOGICAL RECORD

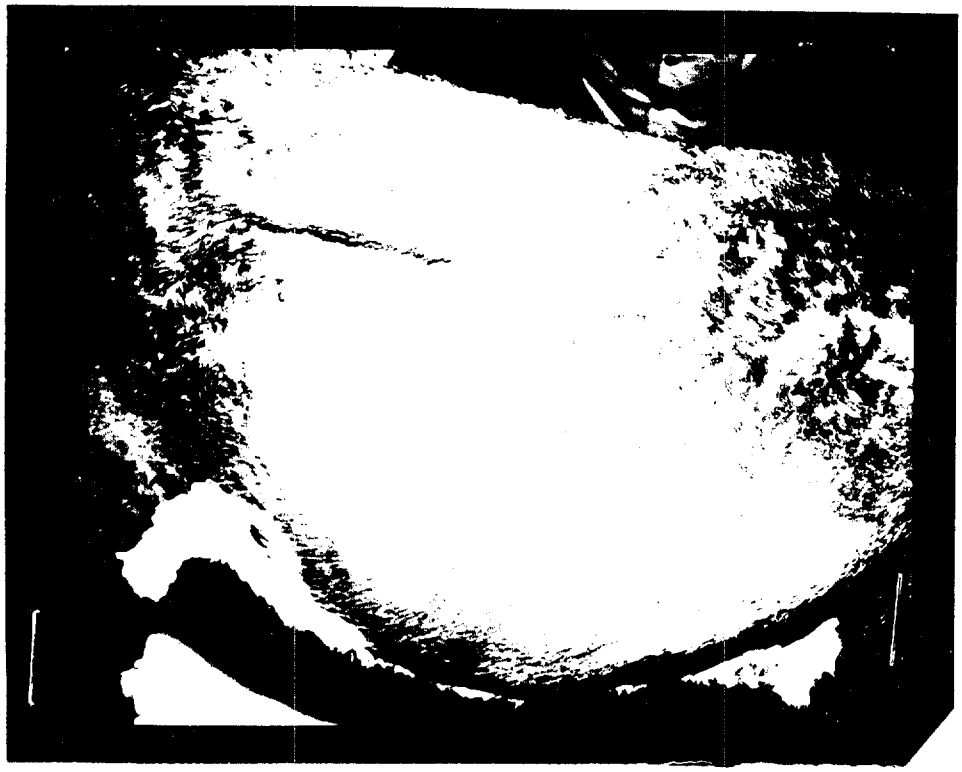
NAME Calves (Con't)

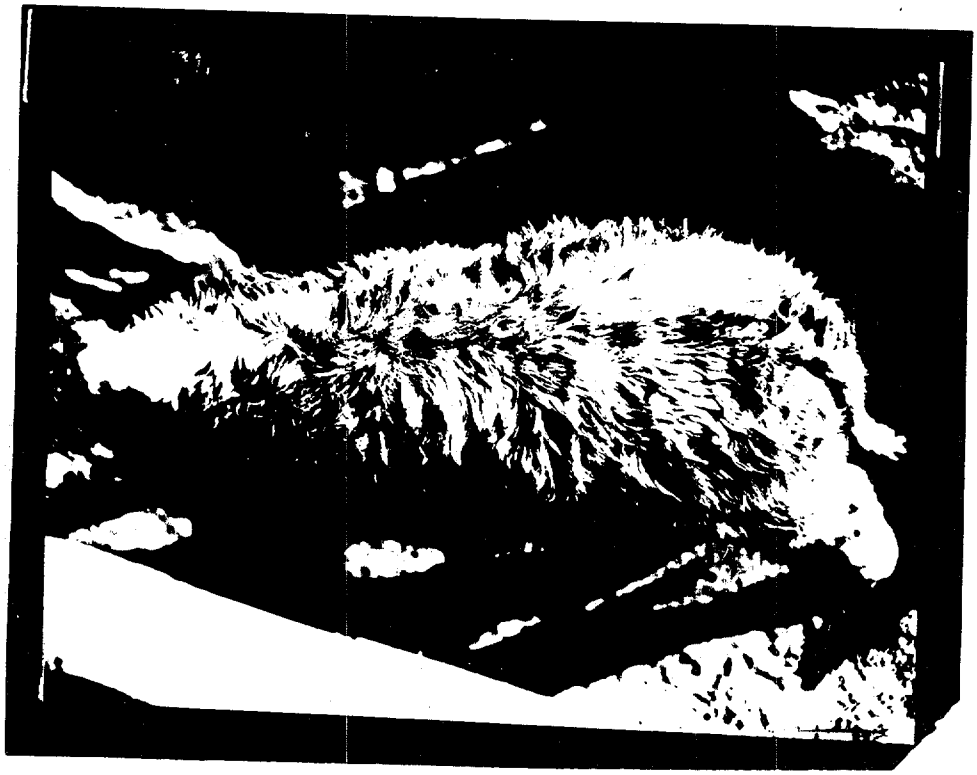
DATE	RBC	%	GMS	RETIC	PLATELETS	WBC	Cell Volume	P/L	REMARKS
Calf #16	10.468		12.2		2,171,000	8,444	38.5		
Calf #19	8.79		11.5		1,936,000	9,712	43.5		
Calf #20	8.13		10.8		1,870,000	8,400	48.5		
Average	9.147		13.3		1,626,000	8,444	42.75		

SUPR. VITAL WRIGHT'S STAIN

DATE	EOS	BAS	PMN				LYMPHOCYTES			MONOCYTES			REMARKS
			MYEL	META	STAB	SEGS	SMALL	INT	YOUNG	ACT	YOUNG	STIM	Granules
Calf #16	1.5	0.5			1	32.5	53	0.5	0.5	6.5	0.5	3.5	17%
Calf #19	6	2			8	41	35			5		5	24%
Calf #20	2	3			3	35	43	2		3	9		28%
Average	4.1	1.3			3.75	29.4	49.1	0.9	0.15	8.2	1.45	1.6	19.1%

	Cell Volume	RBC Count	Hemoglobin	Mean Corp. Vol.	Mean corp. Hb	Mean Corp. Hb Conc
				cu microns		
Cow #1	30.3	4.98	9.2	60.8	18.4γγ	30.3%
Cow #2	45.5	7.62	12.3	59.7	16.1	27.0
Cow #9	38	7.01	13.8	54.2	19.6	36.3
Cow #10	42	6.97	13.9	60.2	19.8	33.0
Cow #4	38	6.97	12.6	54.5	18.0	33.1
Cow #3	36	6.81	11.2	52.8	16.4	31.1
Average	38.3	6.72	12.1	57.0	18.0	31.8
Calf #5	46	10.11	15.3	45.5	15.1	33.2
Calf #7	39	11.28	12.6	34.5	11.1	32.3
Calf #8	43	8.94	13.7	48.0	15.3	31.8
Calf #11	44.5	8.34	14.8	53.3	17.7	33.2
Calf #12	38.5	7.48	13.1	51.4	17.5	34.0
Calf #13	40.5	9.00	14.4	45.0	16.0	35.5
Calf #14	40.5	8.95	15.0	45.2	16.7	37.0
Calf #16	38.5	10.47	12.2	36.7	11.6	31.6
Calf #19	48.5	8.79	11.5	55.1	13.0	23.7
Calf #20	48.5	8.13	10.8	59.6	13.2	22.2
Average	42.8	9.15	13.3	47.4	14.7	31.5





[redacted]

INTER-OFFICE MEMORANDUM

To: A. R. Johnson

Date: January 25, 1946

From: James F. Nolan

Subject: Death of Hereford cow 10

On January 2, 1946, Hereford cow 10, one of the lot of seventeen cows and calves purchased from the Carrizozo area, expired. The diagnosis of Captain R. E. Thompsett, Post veterinarian, was traumatic gastritis. The cow was disposed of by incineration.

James F. Nolan, M.D.

JFN:mfh

[redacted]

CLINICAL REPORT #5

Hereford cow #10, one of the lot of seventeen (17) cows and calves purchased from the Carrizozo area, was found to be sick 1630 January 2, 1946.

This animal as well as the rest had been examined by the writer at 1000 and 1400 the same day and all had appeared normal. At 1630 a member of the veterinary detatchment reported that one cow would not get up to go into the stables with the rest to be fed. The writer examined this animal where she was reclining and found the symptoms typical of traumatic gastritis. The animal evidenced much pain with decided pain in the stomach upon palpation. A slight mucous secretion was seen in the nostrils containing a slight amount of bright blood. The lung sounded very normal with the use of the stethescope. The temperature of the animal was normal (101.5) at 1630 and the membranes clear and bright. A sedative was given and the animal was made comfortable with straw and blankets. At 1730 the temperature was again normal (101.5) and the animal in slightly less pain. The membranes were still of normal appearance. The heart was slightly accelerated (55 PM).

At 1800 the animal again was restless and the temperature was 101.2. The membranes indicated a poor circulation as they were pale. The animal died within twenty minutes (1820).

The clinical diagnosis was traumatic gastritis.

The writer was unable to contact the office of Dr. Hempelmann that evening, January 2. Dr. Hempelmann's office was contacted at 0930 and again at 1100 to report the death of this animal. The writer desired to have an observation of the post-mortem and the animal was held in a cool room all day (January). No report was made as to who would observe a post-mortem that day. The writer again called Dr. Hempelmann's office January 4 and the doctor in charge recommended that we not make a post-mortem due to the decomposition that had started in the animal. The veterinary personnel moved the carcass at 1300 January 4 to the incinerator to be burned.

R.E. THOMPSETT,
CAPTAIN, V.C.

To: Dr. Louis H. Hempelman

From: Wm. L. Scivally

Subject: Survey of contaminated cows. December 27th, 1945.

The instrument used in all cases was a Victoreen Survey Meter, Model 263.

Cow No. 11

Back-rump	0.000028 R/hr.
Back-center	0.000050 R/hr.
Back-shoulder	0.000019 R/hr.
Right side-rump	0.000019 R/hr.
Right side-center	0.000019 R/hr.
Right side-shoulder	0.000012 R/hr.
Face	0.000033 R/hr.

Cow No. 12

Back-rump	0.000050 R/hr.
Back-center	0.000028 R/hr.
Back-shoulder	0.000028 R/hr.
Right Side-Rump	0.000019 R/hr.
Right Side-Center	0.000019 R/hr.
Right Side-Shoulder	0.000019 R/hr.

Cow No. 13

Back-Rump	0.000019 R/hr.
Back-Center	0.000019 R/hr.
Back-Shoulder	0.000013 R/hr.
Right Side-Rump	0.000028 R/hr.
Right Side-Center	0.000019 R/hr.
Right Side-Shoulder	0.000013 R/hr.
Belly-Center	0.000006 R/hr.
Belly-Rear	0.000006 R/hr.
Belly-Front	0.000006 R/hr.

Cow No. 14

Back-Rump	0.000013 R/hr.
Back-Center	0.000025 R/hr.
Back-shoulder	0.000013 R/hr.
Right Side-Rump	0.000007 R/hr.
Right Side-Center	0.000007 R/hr.
Right Side-shoulder	0.000007 R/hr.

Subject: Survey of contaminated cows. December 27th, 1945.

Cow No. 15

Back-rump	0.000009 R/hr.
Back-Center	0.000009 R/hr.
Back-shoulder	0.000009 R/hr.
Left side-rump	0.000000 R/hr.
Left side-center	0.000000 R/hr.

Cow No. 16

Back-rump	0.000010 R/hr.
Back-center	0.000014 R/hr.
Back-shoulder	0.000010 R/hr.
Left side-rump	0.000007 R/hr.
Left side-center	0.000007 R/hr.

Cow No. 17

Back-rump	0.000018 R/hr.
Back-center	0.000050 R/hr.
Back-shoulder	0.000034 R/hr.
Left side-rump	0.000018 R/hr.
Left side-center	0.000018 R/hr.

REPORT ON GRAY CATTLE. #4. MARCH 15, 1946

On Dec. 4, 1945 the Veterinary Hospital received 17 Hereford cattle from the area north of the Alamagordo Test Site. These animals allegedly had been affected by the nuclear explosion, 16 July 1945. A description of these cattle has been made previously. A report on these animals is in order since this is the end of the first experimental period.

One cow died Jan. 2, 1946 after a short illness. The diagnosis was traumatic gastritis and pericarditis. Typical symptoms of traumatic peracarditis were noted in the late afternoon and death occured within two hours. A separate report has been made on this animal.

The remainder of the 10 calves and 6 cows have been under careful observation at the Veterinary Hospital. Their diet has been very light to simulate that which would be obtained on the range. The diet included local prarie hay (2/3) and alfalfa (1/3). A small amount of concentrate (oil meals, corn, etc.) was given to the cows to make up for the food lost to the sucking calves. (On the range the calves and cows would have been separated and this problem would not have existed.) The animals have obviously "wintered" very well on this near-starvation diet.

Although no weights have been registered, the calves have gained very well. Most of them were thin on arrival but now are well rounded calves. The fact that they were sucking has made their gains easily explained.

The cows also had no weights registered but observation has indicated substantial increases in weight.

To conclude the writer desires to offer a few observations on these cattle in addition to their ability to survive a light or range diet.

1. The lesions on their backs have not appreciably improved. Although they

are not bleeding from the lesions as they did upon arrival, the sizes of the lesions are about the same. It is the opinion of the writer that the amount of grayness has not decreased. (Photographs may show differences however.) Hair has not reappeared in most of the epilated areas.

2. Physically the animals appear normal in every respect except for epistaxis on exercise. It is noted that when the animals are moved rapidly and are handled for laboratory bleeding, they bleed easily from the nose. Herefords on ranches are handled very rough in comparison to the handling here and the ranch animals rarely bleed. In the opinion of the writer these animals are abnormal in this respect.

3. All of these animals have been found to be infested with ear ticks and cattle lice. No treatment of any kind has been administered up to this time.

4. These animals have not responded the way most Herefords respond in the feed-lot. With all the handling and association these animals have had, they should not be shy at this time. However, at times when anyone enters the stockade, the animals have a crazed expression and appear very wild. It is only an impression that these animals are not normal mentally.

At the present time the animals are to be treated as they might be in a feed-lot. They are being de-loused and the ticks are being removed from the ears. To date the animals have been treated and fed as if they were range animals. Now every opportunity will be given to see if these animals will fatten normally. We will gradually increase the diets to a fattening schedule.

Permission has been given to this department to treat the backs of the animals. The veterinary staff will make local applications of different drugs on the left sides of the backs of all animals. A comparison at a later date

can then be made to see if treatment has been of value. A report will be made in the summer to show progress in weight, general condition and appearance.

R. Thompsett

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