

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 19 60

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): **HATCH, 27, GASTROINTESTINAL PARASITES OF RUMINANTS (S-21) - Various Misc. Gifts.**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Animal Industry and Regional S-21 Project**
3. PERSONNEL: **E. G. Batte; J. C. Osborne, W. T. Parker; W. E. Dorsey**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

An organic-phosphate compound (Ruelens®) was significantly better than phenothiazine in removing gastro-intestinal parasites of sheep in critical trials. A series of compounds were evaluated as anthelmintics. One of the compounds was effective within a safe therapeutic dose.

The danger in allowing cattle and swine to occupy the same pasture was emphasized by the mortality and pathology produced when calves were given infective swine kidney worm larvae.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

The occurrence of phenothiazine-resistant parasites necessitates the search for effective, safe compounds. The data from these trials indicate a group of compounds to be explored further.

6. WORK PLANNED FOR NEXT YEAR:

Further work will be done on compounds showing promise as anthelmintics. A pure culture of Hemonchus contortus has been established in calves for studies on pathology and larvae survival.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

"The Pathology of Single Infections of Ostertaria ostertagi in Calves" in the CORNELL VETERINARIAN (In Press).

8. Prepared by _____ Approved _____
(Director).

Date March 10, 1960 Date _____

DEPARTMENT of ANIMAL INDUSTRY

H-27

Date January 6, 1961

MEMORANDUM TO: Dr. R. L. Lovvorn, Director of Research, Experiment Station
 FROM: Dr. E. G. Batte, Head, Veterinary Section
 SUBJECT: Miscellaneous Gifts - Deposits and Budgeting

Please deposit attached check (s) to: FUND: Station-Miscellaneous Gifts
 Check # 793 \$ 1,600.00 DEPT: Animal Industry

This check is per: MEMORANDUM OF UNDERSTANDING with - Hess & Clark
 GRANT # - to support Project H-27 for studies on
 "Internal Parasites of Swine."

\$ _____

Budgeted this Fiscal Year

\$ _____

Replacing Budgeted Funds (in lieu of funds anticipated and already budgeted which will not be received during fiscal year)

\$ _____

Not to be Budgeted this Fiscal Year

\$ 1,600.00

To be Budgeted this Fiscal Year as follows: (Bread-down by Object & Line No.)

\$ _____ Line #2301 EPA Salaries
 \$ _____ Line #2302 SPA Salaries
 \$ _____ Line #2303 TEMP Salaries
 \$ _____ Line #2304 Travel
 \$ _____ Line #2305 Transportation
 \$ _____ Line #2306 Communications
 \$ _____ Line #2307 Rents
 \$ _____ Line #2308 Printing
 \$ _____ Line #2309 Contractual
 \$ 1,600.00 Line #2310 Supplies
 \$ _____ Line #2311 Equipment

APPROVED

 HEAD, DEPARTMENT OF ANIMAL INDUSTRY

MEMORANDUM OF UNDERSTANDING

Between the

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION OF N. C. STATE COLLEGE

And

HESS AND CLARK

Ashland, Ohio

1. PROJECT TITLE: Internal Parasites of Swine
2. PROJECT LEADER: E. G. Batte, Veterinary Section, Animal Industry Department, N. C. State College, Raleigh
3. OBJECTIVE: To determine the effects of selected drugs with anthelmintic properties upon internal parasites of swine.
4. PROCEDURE: Naturally infected swine will be given a drug following fecal examination to determine degree of infection. The animals will be sacrificed and intestinal tract examined for parasites.

RESPONSIBILITIES OF COOPERATING AGENCIES:

A. The North Carolina Agricultural Experiment Station agrees to provide such laboratory and office space and supplies as may be needed and may be available. They further agree to furnish the personnel necessary to properly plan and conduct the research work and to make periodic progress reports to Hess and Clark.

B. Hess and Clark agrees to place at the disposal of North Carolina Agricultural Experiment Station funds in the amount of \$1500.00 to be disbursed in accordance with the fiscal regulations of North Carolina Agricultural Experiment Station in support of these investigations.

C. It is mutually agreed that rights to publication or formal release of the data obtained will be retained by the North Carolina Agricultural Experiment Station, and prior to publication or formal release by the North Carolina Agricultural Experiment Station, no publication or formal release of the data shall be made without its knowledge or consent. Hess and Clark may use results of investigations conducted under the provisions of this memorandum as it may elect, except that the name of North Carolina Agricultural Experiment Station at North Carolina State College shall not be used in commercial advertising.

This memorandum shall become effective January 1, 1961, and shall be effective for a period of one year.

Dec 16, 1960
Date

Dec. 16, 1960
Date

12/16/60
Date

12/23/60
Date

Edwards Batte
Project Leader

George H. Hays Jr.
Head, Department of Animal Industry

Shoover
Director, N. C. Agricultural Exp. Sta.

Paul H. Harwood
Hess and Clark

As per our telephone conversation of December 22, \$100.00 additional cost is included for an additional 7 days post-treatment observation.

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 19 61
(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): H-27 (S-21), GASTROINTESTINAL PARASITES OF RUMINANTS.
2. DEPARTMENTS AND COOPERATING AGENCIES: Animal Industry & Regional S-21 Project
3. PERSONNEL: E. G. Batts, W.T. Parker (Jan.-Sept.) R. D. McLamb (Sept.-Dec.)
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked): Preliminary work indicated that 2-2'-dihydroxi 5-5'-dichlorophenylmethane potentiated the action of phenothiazine as a mixture of equal parts of each was equivalent in efficacy to an equal volume of phenothiazine. The test mixture and phenothiazine suspension were compared in critical studies in sheep, weight gain studies in sheep and feeder calves. A series of compounds were evaluated as anthelmintic in sheep. Two formulas of an organic phosphate compound (Ruelens^(R)) was found to be highly effective as an anthelmintic.
Pure infection of Haemonchus contortus has been established in calves. Larvae survival under different climatic condition, soil type and ground cover is being determined. The pathology, blood cytology and immunophoretic response following multiple doses of infective larvae are being investigated.

7. cont.

J. C. Osborne, E. G. Batts, & Karel R. Bell, THE PATHOLOGY FOLLOWING SINGLE INFECTIONS OF OSTERTAGIA OSTERTAGI IN CALVES, The Cornell Veterinarian, Vol. 1; No. 3, July, 1960. pp. 223-235.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

A drug that will increase the effectiveness of phenothiazine or be a substitute will aid in the control of phenothiazine resistant parasites.

6. WORK PLANNED FOR NEXT YEAR:

Monoclonic studies on Haemonchus contortus larvae will be continued. Immunophoretic response of calves to multiple doses will be used to define the self cure reported in animals.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

J. C. Osborne, E. G. Batts & W. R. Murley, RAISE WORM-FREE CALVES ON PASTURE, Research & Farming, N. C. Agricultural Experiment Station, Vol. XVIII: No. 3, p. 14, Winter, 1960.
T. C. Blalock & E. G. Batts, CONTROLLING WORMS IN DAIRY CATTLE, N. C. Agricultural Extension Service, Extension Folder No. 184, June, 1960.

8. Prepared by E. G. Batts Approved _____ (Director).

Date March 24, 1961 Date _____

7. cont.

1. STATE 2. PROJ. NO. 3. DEPT. 4. ABBREV. TITLE
 7. TITLE, PROJECT OBJECTIVES AND DESCRIPTION OF WORK PROPOSED

5. REF.
 6. X-REF.

GASTROINTESTINAL PARASITES OF RUMINANTS -- Determine effects of selected drugs with anthelmintic properties upon gastrointestinal parasites of ruminants. Study pathology caused by a single species of parasite when present in pure infection. Study bionomics of free-living stages of selected species.

DESCRIPTION OF WORK

Naturally infected sheep will be given drugs following fecal examinations to determine degree of infection. The animals will be sacrificed with an examination being made for parasites to be identified and catalogued. Bull calves are reared parasite free in air-lock isolation units and at 6 weeks of age infected with a pure culture of larvae. Blood samples collected at weekly intervals are examined for cytological and electrophoretic changes. Histopathological examinations are made of intestinal tract. Eggs and larvae from animals with pure and mixed infections are placed on different soil types and under different ground cover. Samples are taken to determine percentage and stage of survival in relation to climatic conditions.

8. INDICATE TYPE OF PROJECT	HATCH	RRF	AMA	NON-FED.	NEW	REV.	MAR-KETING	9. DURA-TION	10. COOPERATION	11. APPROVAL DATES	12. X-REF.
	X	S-21						63		7-12-54 1-4-60 7-5-56	
13. STATE	14. PROJ. NO.	15. DEPT.	16. ABBREV. TITLE					17. REF.			
N C	27	Anim Indus	Gastrointestinal Parasites of Ruminants								

18. RECOMMENDED FOR APPROVAL

TITLE	SIGNATURE	DATE
SECTIONS 18, 19, AND 20 NOT APPLICABLE FOR PROJECTS PREVIOUSLY APPROVED BY SESD		

19. APPROVAL OF DIRECTOR, AGRICULTURAL EXPERIMENT STATION

SIGNATURE _____ DATE _____

20. FEDERAL-GRANT PROJECTS ONLY-TO BE APPROVED BY STATE EXPERIMENT STATIONS DIVISION, WASHINGTON, D. C.

SIGNATURE _____ DATE _____

INSTRUCTIONS: Complete items 1, 2, 3, 7, 8, 9, 10, 18, and 19. Under item 7, show title in CAPS, itemize objectives and leave space between the objectives and description of work proposed. Forward original of this form with required number of project outlines to State Experiment Stations Division, Washington, D. C. (See reverse side for Essentials of an Experiment Station Project Outline.)

SES Form 20
 Dec 1960

U. S. DEPARTMENT OF AGRICULTURE
 AGRICULTURAL RESEARCH SERVICE
 STATE EXPERIMENT STATIONS DIVISION

PROJECT ACTION NOTIFICATION FORM

DEPARTMENT: **Animal Industry**

PROJECT NO. **H-27 (revised)**

PROJECT TITLE: **Gastro-Intestinal Parasites of Ruminants**

ACTION TAKEN: **Approved by SESD of USDA - 12-31-59**

DATE: **12-31-59**

COMMENTS:

This project is a revision of RM-37 and is supporting to S-21.

cc: **Dr. Steward
Accounting Office
Animal Industry Dept.
Dr. Lovvorn**

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
PROJECT OUTLINE

Project No.	H-27(revised)(S-21)
Date	
Submitted	May 21, 1959
Approved	
Revised	12-31-60

1. Title

Gastrointestinal Parasites of Ruminants (contributing to S-21)

2. Objective(s)

- (a) To determine the effects of selected drugs with anthelmintic properties upon gastrointestinal parasites of ruminants.
- (b) To study the pathology caused by a single species of parasite when present in pure infection.
- (c) To study the bioecology of the free-living stages of selected species.

3. Reasons for undertaking Investigations*

Temperate winter climates and adequate year-around rainfall that provides continuous grazing have brought large increases in livestock populations in the southeastern United States. As an example, the cattle population in North Carolina increased from 737,000 in 1951 to 964,000 in 1958. This expanded livestock production has been accompanied by corresponding losses due to parasitic infection. The mild climate and long growing season that make pastures available the year around are favorable for the survival of the free-living and infective stages of gastrointestinal parasites.

Aside from mortality losses, other losses from parasitic infections result from condemnation of carcasses; reduced yield and quality, inefficient utilization of pasture, interference with breeding and reproduction, and lowered resistance to diseases. Numerous estimates have been made of the cost of parasitism to the livestock producer. The Agricultural Marketing Service of the United States Department of Agriculture estimated this loss to livestock and poultry producers at \$430,000,000 in 1955.⁽¹⁾

The University of Georgia made an analysis of the cost of internal parasitism in 271 cattle submitted as clinical cases. According to the value of the animals at the time of the analysis, there was an estimated total loss of \$6,625 due to death, loss of weight, or stunting of growth. There was an

* Including economic justification

3. Reasons for undertaking investigations, cont.

additional cost of \$1,029 for anthelmintics, animal hospitalization and control medication, making a total loss estimated at \$7,654, or an average loss of \$28.47 per animal.(2)

Many reports on the efficiency of drugs now in common usage and new drugs being investigated as anthelmintics are based on field studies and under conditions that are not typical of average conditions in North Carolina. Conditions under which animals are exposed influence the response of such animals to anthelmintics and to parasitic infections. Controlled and critical trials are necessary before we can recommend any new anthelmintic for use by the livestock producer.

The occurrence of phenothiazine resistant helminths emphasizes the necessity of testing and selecting other compounds possessing anthelmintic properties for use in ruminants.

The first report on the resistance of intestinal helminths to phenothiazine in sheep was from Kentucky in 1953.(3) Since then, investigators in several states have collaborated in the study of this phenomenon and have reported it as occurring in cattle.

Practically all animals naturally infected with parasites harbor two or more species. Because of these mixed infections, it is impossible to determine the pathology caused by the individual species of parasites in naturally infected ruminants. A knowledge of the pathology caused by the various parasites would indicate the sequence of further study for each species.

The livestock producer derives more financial benefit from the prevention of parasitic infections than from treating infections already established. It will greatly reduce losses suffered by producers if a method can be found to reduce the number of parasites harbored by animals. The length of survival of the free-living stages under our climatic conditions and various types of soil and ground cover would be a guide in making recommendations concerning pasture rotation, management of soils, cover crops, or other husbandry practices to prevent the ingestion of large numbers of infective stages.

4. Previous work and present status of investigations in the field of this project:

In studies conducted in North Carolina about a decade ago, it was determined that parasites were mainly a problem in calves, yearlings, and young adults. Fecal samples from 508 dairy cattle in twenty-three herds and 173 beef cattle in six herds revealed that 97 per cent of the parasitized animals were in the six to twelve month old age group. (Grinnells, 1950, Research and Farming, p. 38, N. C. Agricultural Experiment Station.) Grinnells reported that fecal samples were negative for parasite eggs in dairy cattle five years old or older.

Bell collected viscera from 181 animals at time of slaughter in nineteen localities throughout North Carolina. (4) The parasites in the abomasum, small intestines, cecum, and large intestine were catalogued. About nine out of ten animals examined were infected by one or more species of parasites. One animal harbored 196,347 parasites of several species. The average was about 11,000 per infected animal, with calves and yearlings harboring the largest numbers. *Ostertagia* spp were present in the largest percentage (74%) of animals and in the largest numbers.

Many reports are available of efficiency of anthelmintics in the control of gastrointestinal parasites of cattle. (5,6,7,8,9,10) Most of these indicate that certain drugs are effective when used properly. Recently, it was reported that, although phenothiazine retarded the development of parasite eggs, it did not favorably affect the weight gain of the animals in the trial. More information is needed on the effect of various anthelmintics on growth and development

5. Outline of Procedure:

(Cont. p. 2A)

To attain Objective (a):

Naturally infected sheep will be utilized to determine efficacy of selected drugs. Based on background information obtained with other species of animals, a suggested dose of the drug will be given to a sheep following fecal examinations to determine degree of infection. Parasites passed in feces during the test period will be identified and tabulated. On the fourth day, the animal will be sacrificed. Intestinal tract and contents examined for parasites will be identified and catalogued. The efficacy of the compound is evaluated by the relationship of the parasites passed during the test period to the total worm burden. (Those passed and those at autopsy.) The drug level given to sheep will be increased until toxic symptoms are produced to indicate margin of safety.

To attain Objective (b):

A group of bull calves of a single dairy breed will be obtained at birth and raised parasite free in isolation units. After the animals reach six weeks of age, all calves in a group will be infected with a pure culture of larvae of one of the following: *Haemonchus contortus*, *Cooperia punctata*, *Trichostrongylus axei*, or *Oesophagostomum radiatum*. These animals will be infected by culturing ova from the feces of a donor calf. After a given period, the calves will be sacrificed and detailed gross examination made of the gastrointestinal tract for any gross pathology present. Histopathological examination will be made of the intestinal tract at various points throughout the tract, with emphasis on the portion where the parasite being studied usually locates. These sections will be stained with standard and special histological stains. The number of

4. Previous work and present status of investigations in the field of this project, cont.

of normal parasitized animals. It has been demonstrated that particle size influences the efficiency of phenothiazine in the control of helminths. (12)

Information on the pathology caused by a pure infection of a selected species of gastrointestinal parasites of cattle is not complete. The pathology due to Ostertagia ostertagi after repeated oral infections has been described by Threlkeld (13), and that of Trichostrongylus axei by Doran. (14)

The survival on pasture of larvae of gastrointestinal nematodes of cattle has been studied by several workers. (15,16,17) Monnig has shown that a few weeks of summer dryness are sufficient to kill the infective larvae of Trichostrongylus colubriformis on heavy soils, because the larvae are not able to migrate to sufficient depth for adequate protection. (18) Seghetti found that Haemonchus contortus survived under winter conditions in Montana. (19)

The proposed study would determine the time required for natural factors to reduce the number of parasite eggs and larvae on pastures under North Carolina conditions.

The number of animals used will be determined by preliminary information, indicating significant periods to be emphasized. Weight gains and feed efficiency records will be kept and compared with controls held under the same condition.

To attain Objective (c):

Eggs and larvae from animals with pure and mixed infections will be placed on different soil types and under different ground cover. Grids on different soil types and under different ground cover will be contaminated and at weekly intervals, samples will be taken for bacterianization to determine percentage and stage of survival. Records of temperature, relative humidity, and rainfall will be related to survival time of each species included in this study.

6. Probable Duration of Project: Three years

7. Date of Initiation: January 1, 1960

8. Personnel:

Name	Department	Relation to Project
E. G. Batte	Animal Industry	Leader
J. C. Osborne	Animal Industry	Co-leader
Warren Parker	Animal Industry	Research Asst.
Reinard Harkema	Zoology	Advisor
E. R. Barrick	Animal Industry	Advisor

9. Coöperation:

a. Interdepartmental

b. Other Agencies

REFERENCES

1. Schwartz, Benjamin and H. H. Vegors. Livestock Parasites and Grass. The Scientific Monthly. 84(5), 229-236, 1957.
2. Cooperrider, Donald E. Losses in Cattle Due to Internal Parasitism. North Amer. Vet., 35(5), 350-351, 1954.
3. Drudge, J. H.; S. Leland, Jr.; Z. M. Wyant; and G. W. Elam. Observations on the Effectiveness of Phenothiazine in the Control of Gastrointestinal Nematodes of Sheep. Ann. Report. Direct., Kentucky Agri. Exp. Sta. (1954), 56.
4. Bell, R. R. A Survey of the Gastrointestinal Parasites of Cattle in North Carolina. Am. Jour. of Vet. Res. 18(67), 292-294, 1957.
5. Cauthen, G. E. Low-level Phenothiazine Administration in a Cow and Calf Program. Vet. Med. 53, 131, 1958.
6. Herlich, Harry and D. A. Porter. Control of Internal Parasites of Cattle by Free-Choice Administration of Phenothiazine. Vet. Med. XLIX (3), 103-106, 1954.
7. Herlich, Harry; Frank W. Douvres; and T. B. Stewart. Trials with Phenothiazine Variously Administered to Cattle. Vet. Med. XLIX (12) 503, 1954.
8. Cauthen, G. E. The Effect of Small Daily Doses of Phenothiazine on the Development of Larvae of the Gastrointestinal Parasites of Cattle. Amer. Jour. of Vet. Res. 14(50), 30-32, 1953.
9. Shelton, G. C.; D. E. Rodabaugh, and Cecil Elder. Some Results of Feeding Phenothiazine as a Means of Controlling Gastrointestinal Parasites of Calves. Vet. Med. 51, 551, 1956.
10. Swanson, L. E.; William M. Stone; and A. E. Wade. Efficacy of Piperazine Citrate in Removing Worms from the Alimentary Canal of Cattle. Jour. of Amer. Vet. Med. Asso. 130(6), 252-254, 1957.
11. Dennis, W. R.; L. E. Swanson; and W. M. Stone. Experimental Feeding of Low-level Phenothiazine to Florida Cattle. Vet. Med. L(9), 379, 1955.
12. Douglas, J. R.; N. F. Baker; and W. M. Longhurst. The Relationship Between Particle Size and Anthelmintic Efficiency of Phenothiazine. Amer. Jour. of Vet. Res. 17(63), 318-323, 1956.
13. Threlkeld, W. L. and E. P. Johnson. Operation on the Pathogenicity and Viability of Ostertagia ostertagi. Vet. Med. 48(11), 446-452, 1948.
14. Doran, B. J. The Course of Infection and Pathogenic Effect of Trichostrongylus axei in Calves. Amer. Jour. Vet. Res. 16(60), 401-409, 1955.

REFERENCES, cont.

15. Goldberg, A. and Robert Rubin. Survival on Pasture of Larvae of Gastrointestinal Nematodes of Cattle. Proc. of Helminth. Soc. of Wash. 23(1), 1956.
16. Drudge, J. H.; S. E. Leland, Jr.; E. N. Wyant; and J. W. Rust. Winter Survival of Some Cattle Parasites on a Kentucky Pasture with Observations on the Effects of Low-level Phenothiazine Treatment. Jour. Para. 44(4), 434, 438.
17. Kates, K. C. Survival on Pasture of Free-Living Stages of Some Common Gastrointestinal Nematodes of Sheep. Proc. Helminth. Soc. Wash. 17(2), 39-58, 1950.
18. Monnig, H. L. Studies on Bionomics of Free-Living Stages of Trichostrongylus spp. and Other Parasitic Nematodes. 16th Rep. Direc. Vet. Serv. and Ani. Ind. Union S. Africa, 175-198, 1930.
19. Seghetti, Lee. The Effect of Environment on the Survival of the Free-Living Stages of Trichostrongylus colubriformis, and Other Nematodes Parasite to Range Sheep in Southeastern Montana. Amer. Jour. Vet. Res. 12(1), 52-60, 1948.

10. Financial Support:

a. Proposed Budget ... 1959 ... to ... 1960 .

Items	ALLOCATION OF FUNDS				
	Hatch	Regional Research	State	Other	Total
1. Salaries	\$1,000	5,000	\$8,095	500	14,595
2. Labor				945	945
3. Travel	200				200
4. Equipment & Supplies	2,050			550	2,600
5. All Other	250				250
Total	\$3,500	5,000	\$8,095	1,995	18,590

b. Proposed Future Budgets:

Year	Salaries	Total Expenditures	Estimated Income
1960-1961	\$14,595	\$18,590	--
1961-1962	\$14,595	\$18,590	--

11. General Remarks:

SIGNATURES OF APPROVAL

1. Approval of Project Leaders

Date *Dec 9, 1959**Edwards Batt*Title *Prof. Parasitologist*Date *Dec 9, 1959**John C. Osborne*Title *Co-leader - Pathologist*

Date

Title

2. Approval of Heads of Departments or Coöperating Agencies

Date *DEC 10 1959**Worcester Hyatt Jr.*Head, *HEAD OF ANIMAL INDUSTRY*

Date

Head,

Date

Head,

3. Approval of Director

Date *Dec 16, 1959**H. G. Stewart*
*acting*Director, North Carolina Agricultural
Experiment Station

4. Approval of U. S. D. A.

Date *Dec 31, 1959**James C. Grandstaff*

Chief, Office of Experiment Stations

ACTING DIRECTOR

STATE EXPERIMENT STATIONS DIVISION

AGRICULTURAL RESEARCH SERVICE

North Carolina

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 19 58

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): Hatch H-27 (S-21), GASTRO-INTESTINAL PARASITES OF RUMINANTS.
2. DEPARTMENTS AND COOPERATING AGENCIES: North Carolina Agricultural Experiment Station and other Stations cooperating in Regional S-21 project.
3. PERSONNEL: E. G. Batts, Project Leader; W. E. Frazier, Research Technician; J. C. Osborne, Cooperator.

4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked): A total of 20 parasite free calves were given infective larvae of *Ostertagia ostertagi* and posted at various intervals following infection. These intervals ranged from 3 hours to 320 days. The characteristic gross lesion is found on the mucosa of the abomasum and consists of a circumscribed, raised, whitish plaque with a gray to dark pencil point center. The number of gross lesions appeared to have a direct relationship to the numbers of infective larvae administered. On microscopic examination, it was found that the larvae had entered the lumen of the gastric mucosa glands as early as 3 hours following infection. As the larvae grew, it caused the glands to dilate and resulted in flattening the cells lining the gland. There was a remarkable absence of a significant cellular response in the early period following infection. A marked leukocytic infiltration is seen in the mucosa adjacent to parasitized gastric glands after the 19th day.

Two parasite free calves were given infective larvae of *T. axei* in doses of 10,000 and 30,000. Eggs were observed in the feces on the 24th day following infection. Post-mortem examinations were made on the 27th and 84th days following infection. There was extensive submucosal edema with ringworm-like lesions on much of the mucosal surface. The ringworm-like lesions had reddened margins with a whitish center.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

The tissue invading stage of the parasites, perhaps, explains the failure of present anthelmintics to control infections. When the larvae are in the tissue, they are shielded from compounds in the lumen of the abomasum.

6. WORK PLANNED FOR NEXT YEAR: An article on detailed histopathology will be prepared for publication concerning *Ostertagia*. Other species of gastro-intestinal parasites in pure culture will be given to calves and slides made on histopathology.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

(1) A Survey of the Gastrointestinal Parasites of Cattle in North Carolina, R. R. Bell. Amer. Jour. Vet. Res. Vol. XVIII No. 67, April 1957, pps. 292-294.

(2) More Cattle = More Parasites, R. R. Bell. Research and Farming. N. C. Agri. Exper. Sta. Vol. XVI No. 2 Autumn 1957 p. 14.

8. Prepared by _____ Approved _____

(Director).

Date February 17, 1958

Date _____

North Carolina

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 1958

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): **Match H-33 (S-29), DEVELOPMENT OF A BREED OF SHEEP ADAPTED TO EASTERN NORTH CAROLINA**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Animal Industry**
3. PERSONNEL: **Lemuel Goode, E. R. Barrick and E. U. Dillard**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

Inter se matings at the Central Research Station have continued from original Dorset-Hampshire reciprocal crosses. Twenty ewes were bred to lamb during the 1957 lambing season. Eighty percent of the ewes lambed and weaned a 70% lamb crop, averaging 75.3 lbs. at 120 days. The average lambing date was Feb. 2. The average breeding date of purebred Dorset ewes receiving similar treatment was Dec. 15 and the Dorset ewes weaned a 92% lamb crop. The average lambing date of purebred Hampshire ewes was Feb. 15.

At the Tidewater Research Station a group of Dorset x Hampshire crossbred ewes are being compared with a group of purebred Hampshire ewes. During a three year period there has been little difference between groups in the average breeding and lambing dates.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

This project has demonstrated that it is possible to breed within a closed flock for several years without sacrificing total performance.

6. WORK PLANNED FOR NEXT YEAR:

The project will be revised to include the development and testing of the polled Dorset starting with the 1958 breeding season.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

None

8. Prepared by _____ Approved _____
(Director).

Date _____ Date _____

Close out

~~new authentic~~ 0

No

H-34

OES—Form 8
(June 6, 1950)

North Carolina

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 19 58

(Three copies to be given to the OES examiner)

1. PROJECT: (Fund, number, and title): Hatch H-34 (S-30), A STUDY OF SOME OF THE PHYSIOLOGICAL, SEROLOGICAL AND IMMUNOLOGICAL PROPERTIES OF VIBRIO FETUS.
2. DEPARTMENTS AND COOPERATING AGENCIES: Other stations participating in the Southern Regional Project S-30.
3. PERSONNEL: J. C. Lecce, Leader
4. NATURE OF RESEARCH AND PRINCIPAL RESULTS OF THE YEAR (Confidential information should be so marked): The reduction of triphenyl tetrazolium chloride (TTC) in a Thunberg tube by resting cells of a typical strain of Vibrio fetus in the presence of Na lactate was chosen as a model system that was standardized with respect to the following optima: harvest time, pH of reduction reaction, TTC concentrations, cellular concentration and substrate concentration. Under these standard conditions other substrates were tested for their electron donating capacity. This yielded a pattern of oxidative activity for 1 strain. The pattern for this strain was compared to the pattern of 26 other strains examined in like manner. It was determined that the oxidative capacity of vibrios isolated from farm animals was quite similar regardless of whether they were isolated from different hosts, different anatomical locations, or different H₂S-catalase types from the same host and same anatomical location. Only lactate, formate, pyruvate, ketoglutarate and succinate out of 31 substrates tested served as electron donors with each strain.
5. APPLICATION OF FINDINGS (expressed in terms of measurable public benefits if and when justified): An aid in further defining the species V. fetus.
6. WORK PLANNED FOR NEXT YEAR: Termination of project.
7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR: A study of some of the metabolic properties of Vibrio fetus and other related vibrios isolated from animals. In manuscript.

8. Prepared by _____ Approved _____
(Director).

Date March 5, 1958 _____ Date _____

North Carolina Agricultural Experiment Station

FINAL REPORT, FEDERAL-GRANT PROJECTS

(Send 3 copies to State Experiment Stations Division, ARS, at time of closing)

1. PROJECT (Fund, number and title): (H-34) RRS-30 A Study of Some of the Physiological, Serological, and Immunological Properties of Vibrio Fetus.
2. STATION DEPARTMENTS AND COOPERATING AGENCIES (e.g., USDA, TVA, etc.): Other stations participating in the Southern Regional Project S-30.
3. MAJOR PERSONNEL: J. G. Lecce, Leader
4. DATE BEGUN: March 14, 1956 DATE COMPLETED: End of (If discontinued without completion state reasons): this fiscal year.
5. ESTIMATED TOTAL COST BY FUNDS (Federal-grant and others):
\$8,752.00
6. THE PROBLEM (Briefly restate its nature, importance, and economic significance): One of the abortion problems of cows and sheep is due to a bacterium, Vibrio fetus. It has been stated that breeding difficulties due to this specific microorganisms accounts for a loss of 172 million dollar a year to U. S. cattleman. It is possible that this estimate is inaccurate since present diagnostic procedures do not afford an accurated and reliable means of definitely establishing the problem as vibriosis. Perhaps the enigma associated with diagnosis is due to lack of fundamental information concerning the bacterium per se. Thus, our work has been directed at further defining the species, V. fetus.

7. ABSTRACT MAJOR RESULTS AND CONCLUSIONS: The reduction of triphenyl tetrazolium chloride (TTC) in a Thunberg tube by resting cells of a typical strain of Vibrio fetus in the presence of Na lactate was chosen as a model system that was standardized with respect to the following optima: harvest time, pH of reduction reaction, TTC concentrations, cellular concentration and substrate concentration. Under these standard conditions other substrates were tested for their electron donating capacity. This yielded a pattern of oxidative activity for 1 strain. The pattern for this strain was compared to the pattern of 26 other strains examined in a like manner. It was determined that the oxidative capacity of vibrios isolated from farm animals was quite similar regardless of whether they were isolated from different hosts, different anatomical locations, or different H₂S-catalase types from the same host and same anatomical location. Only lactate, formate, pyruvate, (Over) α ketoglutarate and succinate out of 31 substrates tested served as electron donors with each strain.

The growth in heart infusion broth of 11 out of 12 bovine catalase positive strains was inhibited by the addition of 0.8% glycine while none of 5 ovine catalase positive strains were inhibited. Up until 1955 motile, micro-aerophilic vibrio isolated from either aborted bovine and ovine fetuses, or bovine and ovine genital tracts were regarded as members of the genus and species, *V. fetus*. Since then these vibrios have been divided into 2 categories: (1) catalase positive-H₂S negative vibrios were considered pathogenic, true, *V. fetus*, (2) catalase negative-H₂S positive vibrios were considered saprophytes belonging to a yet unnamed vibrio species. It is proposed in the light of recent data cited above that catalase and H₂S activity in genital vibrio is too tenuous a characteristic to differentiate a species.

8. USEFULNESS OF FINDINGS (Present or potential - to other scientists - farmer acceptance - economic value to agriculture - other): Findings aid in further defining the species. A meaningful definition of the species would add accuracy to diagnosis. More accurate diagnosis of course means better control of disease.

9. CITATION OF PUBLICATIONS (Issued and/or in manuscript form): A study of some of the metabolic properties of Vibrio fetus and other related vibrios isolated from animals. In manuscript.

10. Prepared by James G. Lee Approved _____
(Sign original only) (Director)

Date March 5, 1958

Date _____

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 19 59

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): HATCH H-143, A STUDY OF AN INFECTIOUS, ABACTERIAL POLYSEROSITIS WITH ARTHRITIS SYNDROME OF SWINE.
2. DEPARTMENTS AND COOPERATING AGENCIES: Animal Husbandry Section, Dept. of Animal Industry.
3. PERSONNEL: J. G. Lecce, A. J. Clawson
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked): Examination of field cases consistently revealed the following symptoms: pericarditis; pleuritis; peritonitis; arthritis; anorexia; pyrexia; hemorrhagic gastro-enteritis; cystitis; and death. It has been determined with the use of "disease-free", colostrum-free pigs in isolation since birth, that a fastidious pleuropneumonia-like organism had the capacity to inflame serosal and synovial membranes leading to the polyserositis with arthritis. Another agent, Hemophilus influenzae-suis was responsible for the anorexia, pyrexia, hemorrhagic gastro-enteritis and death. It was felt that fastidious pleuropneumonia like organisms similar to the above, were responsible for infections synovitis in chickens.
5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science): Logical control of this disease using recognized chemotherapeutic, immunological, and management techniques.
6. WORK PLANNED FOR NEXT YEAR: Determine effect of other infectious agents, i.e. viral, bacterial, helminthic on pathogenesis of the above disease. Characterize the factor(s) present in fresh yeast extract, required for the growth of these fastidious PPLO.
7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR: Porcine polyserositis with arthritis--Isolation of a fastidious pleuropneumonia-like organism and Hemophilus influenzae-suis. Annuals N. Y. Academy of Science. Jan. 1959. (In press).
8. Prepared by _____ Approved _____
Date February 17, 1959 Date _____
(Director)

SES—Form 8
(June 12, 1957)

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 19 60

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): **HATCH, 143, A STUDY OF AN INFECTIOUS, ABACTERIAL, POLYSEROSTITIS WITH ARTHRITIS SYNDROME OF SWINE**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Veterinary Section, Dept. of Animal Industry**
3. PERSONNEL: **J. C. Lecca; A. J. Claxson**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

From a study of natural field cases of polyserositis with arthritis and from experiments using pigs exposed for various periods of time to natural pig-environment, it was determined that the initial lesion or event that leads to the full expression of this disease was not the presence of the pathogenic microorganism, Haemophilus influenzae suis and PPLO, in the environment but the manner in which the piglets were raised. It seems that piglets constantly exposed to these pathogens, while being passively protected by maternal antibodies, develop a strong and lasting resistance to these pathogens. Thus, under existing management procedures, the pathogens and the pigs have worked out a modus vivendi, and there is relatively little trouble with the disease.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science): **Control of the disease.**
These results become, in a practical sense, increasingly meaningful as pig-husbandry moves more and more in the direction of the "disease-free" pig. The "disease-free" pig is extremely susceptible to this disease.
6. WORK PLANNED FOR NEXT YEAR:
Determine under artificial conditions the means by which piglets become resistant to polyserositis under natural conditions.
7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:
"The Significance of Husbandry, Pleuropneumonia-like Organisms and Haemophilus influenzae suis In the Pathogenesis of Porcine Polyserositis with Arthritis"

8. Prepared by _____ Approved _____
(Director)

Date _____ Date _____

North Carolina

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 1958
(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): ⁴⁻¹⁴³ Hatch ~~66~~, A STUDY OF AN INFECTIOUS, ABACTERIAL, POLYSEROSITIS WITH ARTHRITIS SYNDROME OF SWINE.
2. DEPARTMENTS AND COOPERATING AGENCIES: Animal Husbandry Section, Dept. of Animal Industry, N. C. State College.
3. PERSONNEL: J. G. Lecce, A. J. Clawson

4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked): It has been determined that the polyserositis syndrome as seen in the field is complicated with gastro-enteritis, cystitis and death. An agent now definitely identified as belonging to the pleuropneumonia group (PPLO) is capable of reproducing the symptoms of polyserositis but not the gastro-enteritis and cystitis leading to death of the animal. The PPLO isolated from these cases is more fastidious in its growth requirements than other PPLO. Methods of selective isolation have been worked out for this organism, as well as effective treatment. The agent(s) responsible for the gastro-enteritis, cystitis, and death has been isolated. Methods of therapy and control for this gastro-enteritis agent have been determined.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science): Control of the disease
6. WORK PLANNED FOR NEXT YEAR: Identify the agent(s) responsible for the gastro-enteritis, cystitis, and death and determine its ecological niche.
7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:
Isolation of Fastidious Pleuropneumonia-Like Organisms from an Arthritis Disease in Chickens and Swine.

8. Prepared by Jameto Lecce Approved _____ (Director).
Date March 4, 1958 Date _____

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 19 61

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): ^{H-} 143, A STUDY OF AN INFECTIOUS, ABACTERIAL, POLYSEROSTITIS WITH ARTHRITIS SYNDROME OF SWINE.
2. DEPARTMENTS AND COOPERATING AGENCIES: Animal Husbandry Section, Dept. of Animal Industry, N. C. State College
3. PERSONNEL: J. G. Lecce, A. J. Clawson
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

It was shown by us that the manifestation of symptoms of polyserositis was not dependent on the presence of pathogens (PFLO and H. influenzae suis) in the environment but rather the disease was mediated by the manner in which the piglet was raised (husbandry). Those piglets denied colostrum and reared in isolation were extremely susceptible throughout their life time to polyserositis.

Armed with this information, our present research emphasis is directed to the study of the mechanism of colostrum absorption by the piglet. To this end, we are studying the time limit of absorption, and the selectivity of absorption. High molecular weight, plastic, polymers, as well as egg and bovine proteins, have proved extremely useful in this investigation. Thus far, the absorption mechanism appears to be non-selective.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

This study is anticipating the problems inherent in the newest vogue in porcine husbandry - namely, the use of colostrum-free, specific-pathogen-free pigs.

6. WORK PLANNED FOR NEXT YEAR:

Continue investigating the mechanisms of absorption of high molecular weight compounds by the neonatal piglet's gut.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

Lecce, J. G., Matrone G., and Morgan, D. O., "Porcine Neonatal Nutrition: Absorption of Unaltered Non-porcine Proteins and Polyvinylpyrrolidone from the Gut of Piglets and the Subsequent Effect on the Maturation of the Serum Protein Profile." J. Nutrition, Vol. 73, No. 2, Feb., 1961, pp. 158-166.

8. Prepared by _____ Approved _____

(Director).

Date March 27, 1961 Date _____

N C H-143 AnimIndus Infectious, Abacterial, Polyserositis with Arthritis Syndrome of Swine

1. STATE
2. PROJ. NO.
3. DEPT.
7. TITLE, PROJECT OBJECTIVES AND DESCRIPTION OF WORK PROPOSED

4. ABBREV. TITLE

5. REF.
6. X-REF.

A STUDY OF AN INFECTIOUS, ABACTERIAL, POLYSEROSTITIS WITH ARTHRITIS SYNDROME OF SWINE -- Characterize the etiological agent of infectious, abacterial, polyserositis with arthritis syndrome of swine. Determine the pathogenesis of this disease in order to learn methods of control.

DESCRIPTION OF WORK

It was shown by us that the manifestation of symptoms of polyserositis was not dependent on the presense of pathogens (PPLO and H. influenzae suis) in the environment but rather the disease was mediated by the manner in which the piglet was raised (husbandry). Those piglets dennied colostrum and reared in isolation were extremely susceptible throughout their life time to polyserositis.

Armed with this information, our present research emphasis is directed to the study of the mechanism of colostral absorption by the piglet. To this end, we are studying the time limit of absorption, and the selectivity of absorption. High molecular weight, plastic, polymeres, as well as egg and bovine proteins, have proved extremely useful in this investigation. Thus far, the absorption mechanism appears to be non-selective.

8. INDICATE TYPE OF PROJECT	HATCH X	RRP	AMA	NON-RED.	NEW	REV.	MAR-KETING	9. DURATION 58	10. COOPERATION	11. APPROVAL DATES 6-8-56	12. X-REF.	
13. STATE N C	14. PROJ. NO. H-143	15. DEPT. AnimIndus	16. ABBREV. TITLE Infectious, Arthritis Syndrome of Swine					17. REF.		18. RECOMMENDED FOR APPROVAL		
TITLE			SIGNATURE					DATE				
<p>SECTIONS 18, 19, AND 20 NOT APPLICABLE FOR</p> <p>PROJECTS PREVIOUSLY APPROVED BY SESD</p>												
SIGNATURE										19. APPROVAL OF DIRECTOR, AGRICULTURAL EXPERIMENT STATION		DATE
SIGNATURE										20. FEDERAL-GRANT PROJECTS ONLY--TO BE APPROVED BY STATE EXPERIMENT STATIONS DIVISION, WASHINGTON, D. C.		DATE

INSTRUCTIONS: Complete Items 1, 2, 3, 7, 8, 9, 10, 18, and 19. Under Item 7, show title in CAPS, itemize objectives and leave space between the objectives and description of work proposed. Forward original of this form with required number of project outlines to State Experiment Stations Division, Washington, D. C. (See reverse side for Essentials of an Experiment Station Project Outline.)

SES Form 20
Dec 1946

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
STATE EXPERIMENT STATIONS DIVISION

COVER-ABSTRACT-SIGNATURE PAGE FEDERAL-GRANT & NON-FEDERAL PROJECTS

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
PROJECT OUTLINE

1. TITLE

PESTICIDE RESIDUES IN OR ON FORAGE CROPS AND IN PRODUCTS FROM ANIMALS
FED THESE FORAGES, H-146 (S-22). (REVISED APRIL, 1960)

2. OBJECTIVES

- A. TO EVALUATE, MODIFY AND ADAPT METHODS OF ANALYSIS FOR PESTICIDES USED ON FORAGE CROPS FOR USE IN DETERMINING THEIR PLANT AND ANIMAL METABOLISM AND THEIR RESIDUES IN RELATION TO THE EFFECTIVE USE OF THESE CHEMICALS IN CONTROLLING CROP PESTS.
- B. TO DETERMINE WHETHER FEEDING OF FORAGE BEARING RESIDUES WILL CONTAMINATE ANIMAL PRODUCTS.

3. REASONS FOR UNDERTAKING THE WORK

THE RECENT TREND IN NORTH CAROLINA TOWARD A MORE BALANCED AGRICULTURAL ECONOMY HAS SEEN THE DEVELOPMENT OF A PROGRESSIVE LIVESTOCK AND DAIRYING INDUSTRY. THE CONTINUED PROGRESS OF THIS INDUSTRY IS DEPENDANT UPON ITS ABILITY TO MARKET PRODUCTS OF HIGH QUALITY AND SAFETY TO THE CONSUMER. THE INTRODUCTION OF NEW DESTRUCTIVE PESTS ATTACKING FORAGE CROPS HAS MADE THE APPLICATION OF PESTICIDES NECESSARY FOR THE PRODUCTION OF ADEQUATE SUPPLIES OF LIVESTOCK AND DAIRY FEEDS.

UNDER PUBLIC LAW 518, THE MILLER PESTICIDE RESIDUE AMENDMENT TO THE FEDERAL FOOD, DRUG AND COSMETIC ACT, THERE IS AN INCREASED AND CONTINUING NEED FOR BASIC INFORMATION ON PESTICIDE RESIDUES FOLLOWING APPLICATION TO FORAGE CROPS OF CHEMICALS FOR THE CONTROL OF INSECT PESTS. THE RELATIONSHIP BETWEEN PESTICIDE USAGE ON FORAGE CROPS AND THE APPEARANCE OF UNDESIRABLE RESIDUES IN FOOD PRODUCTS FROM ANIMALS, NEEDS ACTIVE INVESTIGATION IF NORTH CAROLINA FARMERS ARE TO TAKE FULL ADVANTAGE OF BENEFITS POSSIBLE THROUGH THE APPLICATION OF PESTICIDES.

4. PREVIOUS WORK AND PRESENT OUTLOOK

SINCE THE INCEPTION OF THE PESTICIDE RESIDUE LABORATORY OF THE DEPARTMENT OF CHEMISTRY ON JULY 1, 1953 A FEW STUDIES HAVE BEEN CARRIED OUT, IN COOPERATION WITH THE DEPARTMENT OF ENTOMOLOGY, ON PESTICIDE RESIDUES ON FORAGE.

SUCH STUDIES WERE UNDERTAKEN AS PART OF STATE PROJECT S-145, "TECHNIQUES FOR THE CHEMICAL DETERMINATION OF PESTICIDE RESIDUES AND THEIR APPLICATIONS IN RESEARCH WITH PLANTS, SOILS AND ANIMALS." THESE STUDIES WERE LIMITED, IN THE MAIN, TO THE DETERMINATION OF DDT ON PEANUT FORAGE; TOXAPHENE ON SOYBEAN FORAGE; MALATHION AND DIELDRIN ON ALFALFA. THE RESULTS OF THESE STUDIES ARE REPORTED IN THE ANNUAL PROGRESS REPORT FOR 1955 AND 1956, DEPARTMENT OF CHEMISTRY, NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION. MORE RECENT STUDIES INITIATED UNDER OUR PRESENT H-146 PROJECT DEAL WITH THE RESIDUES OF THE INSECTICIDE THIODAN ON TREATED PASTURE GRASS HAY.

HOLSTEIN AND HEREFORD MALE CALVES WERE FED THIODAN TREATED MIXED PASTURE GRASS HAY. THE HAY FROM THE 0.2 LB./A. TREATMENT AVERAGED 6 PPM THIODAN DURING FEEDING, WHILE THE HAY FROM THE 3.0 LB./A. TREATMENT AVERAGED 31 PPM THIODAN. ALL THREE CALVES ON THE LOW DOSAGE SURVIVED FEEDING FOR 95 DAYS WITH NO APPRECIABLE DIFFERENCE AS TO WEIGHT GAIN, FEED CONSUMPTION, OR TISSUE HISTOLOGY FROM THE CONTROL ANIMALS. ALL SIX CALVES ON THE HIGH DOSAGE EXHIBITED TOXIC SYMPTOMS DURING THE THIRD WEEK OF FEEDING AND DEATH OCCURRED. GROSS NECROPSY AND HISTOPATHOLOGICAL STUDIES INDICATED THAT DEATH WAS PROBABLY DUE TO LIVER DAMAGE INCURRED DURING ATTEMPTED DETOXIFICATION. ALSO DEGENERATIVE CHANGES IN HEART TISSUE WERE NOTED. THE DAILY MEAN THIODAN INTAKE PER KG. OF BODY WEIGHT OF A CALF ON THE LOW DOSAGE DURING THE ENTIRE FEEDING WAS 0.1 MG./KG., WHILE AT THE HIGH DOSAGE IT WAS 0.4 MG./KG. THUS, THERE IS ONLY A NARROW MARGIN OF SAFETY WHEN FEEDING THIODAN TREATED HAY WITH RESIDUES IN THE 15 PPM RANGE. HOWEVER, TIME STUDIES HAVE SHOWN THAT WHEN FORAGE IS TREATED WITH THE RECOMMENDED DOSAGE OF 1 LB./A., RESIDUES ARE BELOW 0.5 PPM IN 10 DAYS. THIS GIVES A SAFETY MARGIN OF 30X. TISSUE ANALYSIS FOR THIODAN (T) AND THE SUSPECT DEGRADATION PRODUCT, THIODAN ALCOHOL (TA) WERE ESSENTIALLY NEGATIVE AT THE SENSITIVITY LEVEL OF 0.1 PPM FOR T AND 0.5 PPM FOR TA. RECOVERIES OF KNOWN AMOUNTS OF T AND TA ADDED TO CONTROL MUSCLE, HEART, LIVER, SPLEEN, KIDNEY, INTERNAL AND EXTERNAL FAT AVERAGED 94% FOR T AND 65% FOR TA.

A VAST POOL OF INFORMATION CONCERNING THE EFFECTIVENESS OF ECONOMIC POISONS FOR CONTROL OF OUR IMPORTANT FORAGE, CROP AND LIVESTOCK PESTS IS AVAILABLE IN THE LITERATURE. IN ORDER TO REALIZE THE FULL POTENTIAL OF THESE

PESTICIDAL MATERIALS FEDERAL REGISTRATION IS REQUIRED, BUT BEFORE THIS CAN BE ACCOMPLISHED EXPERIMENTS MUST BE SET UP TO DETERMINE THE METABOLISM AND RESIDUES ASSOCIATED WITH APPLICATION OF ANY ONE CHEMICAL TO OUR CROPS OR LIVESTOCK. THE FEDERAL FOOD AND DRUG ADMINISTRATION IS BECOMING INCREASINGLY RELUCTANT TO ALLOW A MARKET LABEL FOR NEW PESTICIDES UNTIL KNOWLEDGE CONCERNING THE NATURE AND TOXICITY OF THE POSSIBLE METABOLIC PRODUCTS AND RESIDUES IS OBTAINED AND SUBSTANTIATED. MANY OF THE COMMONLY USED CHEMICALS ON DAIRY AND BEEF ANIMALS HAD TO BE WITHDRAWN FROM THE MARKET BASED ON MORE RECENT RESIDUE INFORMATION.

COMPOUNDS INVESTIGATED RECENTLY WITH RESPECT TO METABOLISM AND RESIDUES ON PLANTS AND ANIMALS INCLUDE PHOSDRIN, DELNAV, MALATHION, DIMETHOATE, THIMET, RONNEL, METHOXYCHLOR, DIELDRIN, HEPTACHLOR AND THIODAN. STUDIES WITH THIMET (O, O-DIETHYL S-ETHYLTHIO METHYL PHOSPHORODITHIOATE) (1) IN PLANTS INDICATE THAT IT IS RAPIDLY METABOLIZED TO FORM A VERY POTENT ANTICHOLINESTERASE AGENT. WHEN USED AS A SYSTEMIC INSECTICIDE FOR SEED TREATMENT FOUR MAJOR PRODUCTS ARE PRODUCED, TWO OF WHICH ARE TOXIC TO INSECTS AND MAMMALS. RADIOISOTOPE TECHNIQUES WITH THIMET GAVE RESIDUE INFORMATION FOR SIX VEGETABLE CROPS AND INDICATED THE PRESENCE OF TOXIC AGENTS IN PLANT TISSUE SEVERAL DAYS AFTER FOLIAGE OR SOIL TREATMENT AT PRACTICAL LEVELS OF THE INSECTICIDE. DELNAV (2, 3, P DIOXANE DITHIOL S, S-BIS (O,O DIETHYL PHOSPHORODITHIOATE) WAS STUDIED TO HELP EXPLAIN THE NATURE OF PERSISTENT RESIDUES ON THE FOLIAGE OF PLANTS (2). METABOLISM STUDIES ON PLANTS SHOWED A LONG PERSISTENCE OF THE MAJOR COMPONENTS OF DELNAV (CIS AND TRANS) ON THE LEAF SURFACE BUT A RAPID DEGRADATION TO MORE NONTOXIC POLAR PRODUCTS FOLLOWING ABSORPTION WITHIN THE PLANT SYSTEM. TOTAL RESIDUES ON ALFALFA USING COLORIMETRIC PROCEDURES WITH DIELDRIN, HEPTACHLOR AND THE ORGANOPHOSPHATE MALATHION INDICATED THE LARGER PERSISTENCE OF THE CHLORINATED INSECTICIDES OVER THE COMMONLY USED PHOSPHATE PESTICIDE (3). FROM FIELD RESIDUE STUDIES SUCH AS THESE IT IS GENERALLY NOTED THAT THE CONTACT ORGANOPHOSPHATE INSECTICIDES OFFER NEITHER THE RESIDUAL PROTECTION NOR THE RESIDUAL HAZARD OF THE CHLORINATED HYDROCARBON INSECTICIDES. IN METABOLISM STUDIES WITH THE TRICHLORO DIMETHYL PHENYL PHOSPHORO-THIOATE ANIMAL SYSTEMIC, RONNEL, A COMPLEX METABOLIC SCHEME WAS ESTABLISHED BASED ON HYDROLYSIS OF RONNEL OR ITS OXYGEN ANALOG AT EITHER THE PHOSPHORUS OXYGEN-PHENYL BOND OR THE PHOSPHORUS-OXYGEN-METHYL BOND. (4) THIS INSECTICIDE WAS SECRETED AT HIGH

LEVELS IN THE MILK OF DAIRY CATTLE AND HIGH LEVELS WERE ALSO FOUND IN MANY TISSUES 7 DAYS AFTER ORAL ADMINISTRATION AT 100 MG/KG. IN A STUDY WITH DIMETHOATE (O,O-DIMETHYL S-METHYL CARBAMOYL METHYL PHOSPHORODITHIOATE) (5), IT WAS FOUND THAT THE COMPOUND WAS VERY UNSTABLE WITHIN THE BOVINE ORGANISM BUT THAT INITIALLY A HIGHLY TOXIC OXYGEN ANALOG PRODUCT WAS PRESENT IN THE BLOOD AND THAT IT WAS THE RESPONSIBLE AGENT FOR CONTROL OF INSECTS INFESTING THE ANIMAL BODY. TISSUE RESIDUES WERE UNDER 02 PPM 12 DAYS AFTER FEEDING COWS AT 10 MG/KG AND MILK RESIDUES WERE BELOW THIS LEVEL WITHIN 32 HOURS OF FEEDING.

IT SHOULD BE NOTED THAT MANY OF THE NEW ORGANOPHOSPHATE INSECTICIDES ARE CONVERTED ON THE PLANT OR ANIMAL BODY TO MORE TOXIC AGENTS THAN THE INSECTICIDE PER SE. THIS FACT COUPLED WITH A COMPLEX METABOLIC PATHWAY MAKES IT MORE IMPERATIVE THAN EVER TO CONTINUE STUDIES REGARDING THE METABOLISM AND RESIDUES ASSOCIATED WITH APPLICATION OF CHEMICALS THAT BECOME AVAILABLE FOR USE EACH YEAR. MANY OF THE OLDER COMMONLY USED CHLORINATED MATERIALS NEED MORE INVESTIGATION REGARDING METABOLISM IN PLANTS AND ANIMALS UTILIZING NEW METHODOLOGY SUCH AS THE RADIOTRACER TECHNIQUE. NEW METHODOLOGY FOR ORGANOPHOSPHATES THAT HAVE NO CHEMICAL METHOD CURRENTLY AVAILABLE FOR DETECTION OF RESIDUES WILL BE NECESSARY TO COMPARE PRESENT RESIDUES BASED ON THE RADIOISOTOPE TECHNIQUE. IT IS PART OF OUR CURRENT PURPOSE TO DETERMINE NOT ONLY THE NATURE OF THE DEGRADATION PRODUCTS RESULTING FROM METABOLISM ON OR IN PLANTS AND ANIMALS BUT THE STABILITY AND TOXICITY OF THESE PRODUCTS SINCE THEY OFTEN CONSTITUTE THE ONLY DETECTABLE RESIDUE BY RADIOMETRIC ANALYSIS. SINCE MANY OF THESE METABOLIC PRODUCTS ARE CURRENTLY NOT DETERMINED BY RECOMMENDED COLORIMETRIC PROCEDURES AND IF THESE METABOLITES PROVE TO BE THE TOXIC RESIDUAL AGENTS AS FORMED IN PLANTS AND ANIMALS THEN MODIFICATION WILL BE NECESSARY IN CURRENT RESIDUE METHODOLOGY.

REPRESENTATIVES OF THE ANIMAL INDUSTRY DEPARTMENT ARE BEING QUESTIONED MORE AND MORE AS TO THE SAFETY OF FEEDING PESTICIDE TREATED FORAGE AND THE GRAZING OF PESTICIDE TREATED PASTURE. ENTOMOLOGISTS AND PLANT PATHOLOGISTS ARE FINDING IT INCREASINGLY DIFFICULT TO MAKE RECOMMENDATIONS INVOLVING ANY OF THE NEWER PESTICIDES WITHOUT ADEQUATE RESIDUE DATA BEFORE THEM. AMONG THE NEWER MATERIALS PROVING EFFECTIVE AGAINST FORAGE PESTS ARE THE CHLORINATED HYDROCARBONS, THIODAN, SHELL 4402; THE ORGANOPHOSPHATES, DIMETHOATE, DELNAV

AND CYANAMID 18, 133; AND THE CARBAMATE, SEVIN. A CONCISE KNOWLEDGE OF THE PATHWAY OF PESTICIDE DEGRATION IN PLANT AND ANIMAL, AND THE TOXICITY OF THE VARIOUS METABOLITES, BECOMES ESSENTIAL TO INSURE THE SAFETY OF TREATED CROPS OR ANIMAL PRODUCTS FOR HUMAN CONSUMPTION.

5. PROCEDURE

A SERIES OF TESTS WILL BE SET UP WITH THE COOPERATION OF THE DEPARTMENTS OF ENTOMOLOGY, PLANT PATHOLOGY AND ANIMAL INDUSTRY TO DETERMINE THE MAGNITUDE AND PERSISTENCE OF PESTICIDE RESIDUES ON FORAGE CROPS AND IN PRODUCTS FROM ANIMALS FED PESTICIDE TREATED FORAGE. WHERE FEASIBLE, CONCURRENT STUDIES USING CHROMATOGRAPHIC, RADIOTRACER AND ANTIESTERASE TECHNIQUES WILL BE UNDERTAKEN TO OBTAIN INDICATIONS OF THE NATURE OF THE FORMED METABOLITES PRESENT IN BIOLOGICAL MEDIA OF PLANT AND ANIMAL TISSUES AND FLUIDS. FROM THE PRODUCTS FOUND IN THE VARIOUS MEDIA IT MAY BE POSSIBLE TO POSTULATE A METABOLIC PATHWAY FOR THE PARTICULAR PESTICIDE UNDER TEST AND COMPARE DIFFERENCES, IF ANY, IN THE MECHANISM OF METABOLISM IN PLANTS AND ANIMALS. THE USE OF RADIOLABELLED ORGANOPHOSPHATE INSECTICIDES SHOULD ALSO GREATLY AID IN THE IDENTIFICATION OF THE MATERIALS PRESENT IN THE TISSUES FOLLOWING RESIDUE ANALYSIS METHODS. OF PARTICULAR INITIAL INTEREST IN THE PLANT AND ANIMAL STUDIES AS OUTLINED BELOW WILL BE THE CHLORINATED HYDROCARBON INSECTICIDE, THIODAN (HEXACHLORO-HEXAHYDRO-METHANO-2, 4, 3-BENZODIOXATHIEPIN OXIDE), THE ORGANOPHOSPHATE NEMATOCIDE, CYANAMID 18,133 (O,O-DIETHYL O-2-PYRAZINYL PHOSPHOROTHIOATE).

PLANT STUDIES

IT IS PROPOSED THAT STUDIES WILL BE CONDUCTED, WHERE FEASIBLE, ON THE TRANSLOCATION, METABOLISM AND RESIDUE ASSOCIATED WITH THE TREATMENT OF FORAGE CROPS (E.G. ALFALFA, PEANUTS) WITH THIODAN AND CYANAMID 18,133. INITIAL SMALL SCALE EXPERIMENTS IN THE GREENHOUSE WILL BE INSTITUTED TO GAIN SOME TENTATIVE IDEAS CONCERNING THE NATURE OF METABOLIC PATHWAY OF THE MATERIALS UNDER TEST. RADIOTRACER TECHNIQUES WOULD GREATLY AID IN THESE PRELIMINARY TESTS AND WILL BE USED WHENEVER POSSIBLE. LARGE SCALE FIELD PLOTS WILL BE ESTABLISHED BY A STANDARD PRESCRIBED METHOD FOR THE MORE EXTENSIVE RESIDUE PHASE OF THE STUDIES. RESIDUE DETERMINATIONS ON ALFALFA, PEANUTS AND PEANUT HAY WILL BE DETERMINED FOLLOWING APPLICATION TO FORAGE AT VARIOUS CONCENTRATIONS USING SEVERAL TYPES

OF TREATMENT SUCH AS FOLIAGE OR SOIL APPLICATION. SAMPLES TAKEN AT VARIOUS TIMES AFTER APPLICATION WILL BE ANALYZED FOR TOTAL RESIDUE BY PRESCRIBED CHEMICAL METHODS AND/OR BY RADIOTRACER TECHNIQUES WHERE NO CHEMICAL METHOD IS PRESENTLY AVAILABLE.

ANIMAL STUDIES

FEEDING STUDIES WITH DOMESTIC FARM ANIMALS WOULD BE INSTITUTED USING ALFALFA FOLIAGE, PEANUT HAY OR GRAIN TREATED WITH LABELLED OR NON-LABELLED THIODAN AND CYANAMID 18,133. IN CERTAIN INSTANCES TESTS WOULD BE SET UP TO COMPARE A SINGLE ACUTE DOSAGE TREATMENT WITH A CHRONIC INTERVAL TREATMENT OF THE CHEMICAL IN THE FEED OR BY CAPSULE. WHEN IT IS POSSIBLE TO USE A RADIO-LABELLED MATERIAL IN LARGE ANIMALS, SAMPLES OF BLOOD, URINE, FECES, MILK (DAIRY ANIMAL) AND FAT (BIOPSY) WILL BE TAKEN AT CERTAIN INTERVALS POST TREATMENT TO DETERMINE QUANTITATIVE ABSORPTION AND EXCRETION OF THE MATERIAL. CHROMATOGRAPHY OF BLOOD EXTRACTS AND WHOLE URINE WOULD AID IN DETERMINATION OF A SCHEME OF DEGRADATION OF THE INSECTICIDE. AT SPECIFIED TIMES AFTER TREATMENT THE ANIMAL(S) WILL BE SACRIFICED AND TISSUE SAMPLES TAKEN FOR DETERMINATION OF THE RESIDUE(S) OF THE PESTICIDE AND DEGRADATION PRODUCTS. SIGNS OF PESTICIDE TOXICITY TO THE ANIMAL(S) WILL BE OBSERVED VISUALLY AND BY PATHOLOGICAL TISSUE SECTION SLICES. APPROPRIATE NUMBERS OF ANIMALS WILL BE USED IN THE PROPOSED STUDIES ALONG WITH ADEQUATE NUMBERS OF ANIMALS TO SERVE AS CONTROLS. DUE TO THE NEGATIVE DATA OBTAINED UPON TISSUE ANALYSIS IN THE 1959 THIODAN STUDIES THE LOCALE OF THIODAN DEPOSITION IS NOT KNOWN. THEREFORE, AN EXCRETION-RETENTION-HISTOPATHOLOGY STUDY USING HEREFORD STEERS IS NOW UNDERWAY (APRIL 1960) WITH ACCOMPANYING ANALYSIS OF BLOOD, URINE, FECES AND TISSUES.

6. PROBABLE DURATION AND DATE OF INITIATION

FIVE YEARS, JULY 1, 1960

7. PERSONNEL

PESTICIDE RESIDUE LABORATORIES

T. G. BOWERY - - LEADER
P. E. GATTERDAM - - CO-LEADER

DEPARTMENT OF ENTOMOLOGY

W. V. CAMPBELL - - Co-WORKER

DEPARTMENT OF PLANT PATHOLOGY

J. N. SASSER - - Co-WORKER

DEPARTMENT OF ANIMAL INDUSTRY

M. B. WISE - - Co-WORKER

E. G. BATTE - - Co-WORKER

T. C. CARUTHERS, R.S.O. - ADVISOR

8. COOPERATION

A. PESTICIDE RESIDUE LABORATORIES

(1) GENERAL PLOT LAYOUT

(2) SAMPLING SCHEDULE

(3) RESIDUE ANALYSIS

B. DEPARTMENTS OF ENTOMOLOGY AND PLANT PATHOLOGY

(1) SPECIFIC PLOT LAY OUT

(2) SAMPLING

(3) CONTROL DATA

C. DEPARTMENT OF ANIMAL INDUSTRY

(1) ANIMAL FEEDING

(2) SAMPLING

(3) ANIMAL RESPONSE DATA

THIS IS A CONTRIBUTING PROJECT TO THE SOUTHERN REGIONAL RESEARCH PROJECT S-22, "PESTICIDE RESIDUES OF PLANT AND ANIMAL PRODUCTS AND SOILS", COOPERATING WITH ARKANSAS, FLORIDA, GEORGIA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, TEXAS AND VIRGINIA.

LITERATURE CITED

1. BOWMAN, J. S. AND J. E. CASIDA. 1957. METABOLISM OF THE SYSTEMIC INSECTICIDE, O,O-DIETHYL S-ETHYLTHIOMETHYL PHOSPHORODITHIOATE (THIMET) IN PLANTS. J. AGR. AND FOOD CHEM. 5(3): 192-197.
2. CASIDA, J. E. AND MOSTAFA KAMAL AHMED. (IN PRESS) MECHANISM OF RESIDUE LOSS OF DELNAV COMPONENTS ON PLANT FOLIAGE.
3. DOGGER, J. R. AND BOWERY, T. G., 1958. A STUDY OF SOME COMMONLY USED INSECTICIDES ON ALFALFA. J. ECON. ENTOMOL. 51(3): 392-94.
4. PLAPP, F. W. AND J. E. CASIDA. 1958. BOVINE METABOLISM OF ORGANOPHOSPHORUS INSECTICIDES. METABOLIC FATE OF O,O-DIMETHYL O-(2, 4, 5-TRICHLOROPHENYL) PHOSPHOROTHIOATE IN RATS AND A COW. J. AGR. AND FOOD CHEM. 6(9): 662-67.
5. DAUTERMAN, W. C., J. E. CASIDA, J. B. KNAAK, AND TADEUSZ KOWALEZYK. 1959. ANIMAL METABOLISM OF INSECTICIDES, BOVINE METABOLISM OF ORGANOPHOSPHORUS INSECTICIDES. METABOLISM AND RESIDUES ASSOCIATED WITH ORAL ADMINISTRATION OF DIMETHOATE TO RATS AND 3 LACTATING COWS. J. AG. AND FOOD CHEM. 7(3): 188-93.

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 19 60
(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): **Hatch, H-193, "Nutrition and Diseases of the Neonatal Pig"**
No funds in the Veterinary Section
2. DEPARTMENTS AND COOPERATING AGENCIES: **Animal Industry Department**
3. PERSONNEL: **J. G. Lecce; G. Matrone; E. Thomason; F. Lane; B. Ledbetter; E. Dorsey**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

Neonatal serum protein patterns from unfed pigs were compared with serum from mature pigs. This yielded a profile of an immature serum protein pattern and a mature pattern. The capacity of 4 diets to augment and influence changes from the immature to the mature serum protein pattern was determined.

It was found with pigs nursing the sow that there were not only rather intense and immediate changes in serum proteins, but also a continuous and rapid alteration toward the mature serum protein pattern. Pigs fed otherwise had little ability to promote normal changes associated with this serum protein maturation.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

Learn to circumvent problems inherent in the critical first two weeks of the piglet's life.

6. WORK PLANNED FOR NEXT YEAR:

Continue characterizing the maturation process.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

"Porcine Neonatal Nutrition: The Effect of Diet on Blood Serum Proteins and Performance of the Baby Pig." Jour. of Nutr., Vol. 70, No. 1, Jan. 1960.

8. Prepared by _____ Approved _____
(Director).
Date _____ Date _____

ANNUAL PROGRESS REPORT FOR STATE SUPPORTED PROJECTS
OF THE
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
(Three copies to be submitted to Director's Office)

1. PROJECT: (Fund, number, and title): **3-75 INVESTIGATION OF THE ETIOLOGICAL AGENT(S)
MODE OF INFECTION AND CONTROL OF INFECTION DISEASES OF POOR FEEDING
ANIMALS**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Department of Animal Industry**
3. PERSONNEL: **J. C. Osborne, H. S. Fernsbaugh**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked): **This project has been closed out and close out forms submitted.**

5. USEFULNESS OF FINDINGS(Benefits to Agriculture and the general public and contributions to science):

6. WORK PLANNED FOR NEXT YEAR:

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

Please refer to close out forms

8. Prepared by **E. C. Satts**

Approved _____
Director

Date **Feb. 12, 1959**

Date _____

5-98

Close out A+C
Review rest

new projects
to be developed

ANNUAL PROGRESS REPORT

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION PROJECTS

1. PROJECT: (Fund number, and title): **5-78 INVESTIGATION OF THE ETIOLOGICAL AGENT(S) MODE OF INFECTION AND CONTROL OF INFECTIOUS DISEASES OF FOOD PRODUCING ANIMALS**
2. DEPARTMENTS AND COOPERATING AGENCIES: **VETERINARY SECTION, DEPARTMENT OF ANIMAL INDUSTRY**
3. PERSONNEL: **J. C. OSBORN, E. R. H. FERNEYHOUGH**
4. NATURE OF RESEARCH AND PRINCIPAL RESULTS OF THE YEAR (*Confidential information should be so marked*):

SUBPROJECTS A AND C HAVE BEEN ACTIVE DURING THIS FISCAL YEAR AND ARE BEING CLOSED OUT AT THE END OF THIS FISCAL YEAR. ATTACHED FINAL REPORTS GIVE NATURE OF RESEARCH AND PRINCIPAL RESULTS. SUBPROJECT B HAS BEEN INACTIVE DURING THE YEAR AND IS NOW BEING REVISED.

5. APPLICATION OF FINDINGS (*expressed in terms of measurable public benefits if and when justified*):

SEE ATTACHED REPORTS

6. WORK PLANNED FOR NEXT YEAR: **THIS PROJECT IS BEING REVISED AT THE PRESENT TIME AND NEW OUTLINES WILL BE SUBMITTED FOR 58/59.**

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

SEE ATTACHED REPORTS

8. Prepared by E. G. BATTE Approved _____ (Director).

Date MARCH 10, 1958 _____

North Carolina Agricultural Experiment Station

FINAL REPORT, FEDERAL-GRANT PROJECTS

(Send 3 copies to State Experiment Stations Division, ARS, at time of closing)

1. PROJECT (Fund, number and title): **S-78, sub-project C, A Study of Leukocytogenic and Leukopenic Agent with Special Reference to Swine Cholera Immunology.**
2. STATION DEPARTMENTS AND COOPERATING AGENCIES (e.g., USDA, TVA, etc.): **None**
3. MAJOR PERSONNEL: **J. C. Osborne, R. H. Fernsytough**
4. DATE BEGUN: **1953** DATE COMPLETED: **1956**
(If discontinued without completion state reasons):
5. ESTIMATED TOTAL COST BY FUNDS (Federal-grant and others):
Federal-grant - none; State - \$4290.
6. THE PROBLEM (Briefly restate its nature, importance, and economic significance): **It was sought in this experiment to evaluate the genus Hemophilus pertussis as an agent to offset the leukopenia that is seen following hog cholera virus vaccination of the young porcine. And to see if this agent had any influence on the developing viral immunity following vaccination. It has been stated that the leukopenia following vaccination with hog cholera virus is an undesirable sequelae following hog cholera virus vaccination. Post vaccination death losses from hog cholera vaccination are very considerable in many areas and any information leading to a reduction of this loss would be of considerable value to the swine industry.**
7. ABSTRACT MAJOR RESULTS AND CONCLUSIONS: **The findings of this study have demonstrated that Hemophilus pertussis is a potent agent for elevating the total leukocyte count in the weanling porcine when used alone. It was further demonstrated that the leukopenia following the vaccination with modified hog cholera virus can be offset by appropriately timed inoculations with Hemophilus pertussis. The findings further demonstrated that the use of H. pertussis following inoculation with modified hog cholera virus in some manner interfered with the development of an immunity that would be sufficiently strong to withstand a standard challenge dose of virulent hog cholera virus.**

(Over)

8. USEFULNESS OF FINDINGS (Present or potential - to other scientists - farmer acceptance - economic value to agriculture - other): It was a disappointing finding to see that rather than potentiating immunity, the H. pertussis inoculations seemed to interfere with the development of immunity. Therefore, the findings would not have practical, immediate application. It is conceivable that these findings may eventually be helpful in the explanation of the full process of acquired immunity.

9. CITATION OF PUBLICATIONS (Issued and/or in manuscript form):

A manuscript entitled "The Successful Control of Hog Cholera Virus Leukopenia with Haemophilus pertussis Bacterin" has been prepared and as soon as it has been properly reviewed will be submitted for publication.

10. Prepared by _____ Approved _____ (Director)

(Sign original only)

Date March 6, 1958 Date _____

North Carolina Agricultural Experiment Station

FINAL REPORT, FEDERAL-GRANT PROJECTS

(Send 3 copies to State Experiment Stations Division, ARS, at time of closing)

1. PROJECT (Fund, number and title): S-78, sub-project A, Studies on the Pathogenesis and Control of Vibriosis in the Bovine.
2. STATION DEPARTMENTS AND COOPERATING AGENCIES
(e.g., USDA, TVA, etc.): N. C. Agricultural Experiment Station, Animal Industry Department.
3. MAJOR PERSONNEL: J. C. Osborne, R. H. Fernyhough.
4. DATE BEGUN: October 1950 DATE COMPLETED: 1957
(If discontinued without completion state reasons): (project has been inactive or partially inactive during part of this period).
5. ESTIMATED TOTAL COST BY FUNDS (Federal-grant and others):
Federal-grant - none; State funds - \$14,500.
6. THE PROBLEM (Briefly restate its nature, importance, and economic significance): Since the isolation of vibrio fetus in 1918 in this country, the disease has become wide spread among the bovine and the ovine species. This bacterial disease of the reproductive system has been reported by several States as being the most important problem effecting reproduction among their dairy cattle. It is also being reported as frequently involved in infertility problems of the beef breeds. Losses from this disease have been estimated to run into the millions each year.
7. ABSTRACT MAJOR RESULTS AND CONCLUSIONS: Evaluation of the agglutination test on the blood serum has been fully evaluated as a diagnostic test. It is concluded that the blood serum agglutination test is a useful guide when used on a herd basis in the diagnosis of vibriosis, but can be relied upon as a single test when it is negative. Evaluation of the agglutination test on the mucous from the cervix indicates that this is a reliable test but will make its appearance at some time later after infection than does the positive blood serum test. The use of a purified protein derivative of the vibrio fetus microorganisms as an allergic test on the skin of animals infected with vibriosis gave negative results and it is concluded such a skin test is of no value in the diagnosis of vibriosis. A living vaccine prepared from vibrio fetus organisms after they had been attenuated or modified on laboratory media and passes through chick embryos indicated that such a vaccine gave some protection to

(Over)

animals vaccinated with it. However, it was concluded that the percentage efficacy of such a vaccine was too low to be of practical use in the field. The use of a vibrio fetus bacterin when evaluated in control conditions as well as in field trials shows considerable promise as an aid in eliminating the reproductive failures in herds known to be infected with vibrio.

8. USEFULNESS OF FINDINGS (Present or potential - to other scientists - farmer acceptance - economic value to agriculture - other): Hundreds of blood samples have been tested in our laboratory since this project was initiated and these findings should have been useful to the herd owners in establishing the cause of the reproductive failures in their herds. Evaluation of diagnostic tests are necessary in order to have a laboratory means of diagnosis for experimental procedures on this disease as well as affording the livestock owner a means of identifying the causive agent in a disease outbreak relating to reproduction. Evaluation of biologics for the control of a disease will aid the scientists in future research in this area, and should they be adopted for field use, should offer some assistance in the overall control problem.

9. CITATION OF PUBLICATIONS (Issued and/or in manuscript form):

Osborne, J. Clark. Avianized Vibrio Fetus Vaccine and Preliminary Observations on Its Use. A.V.M.A. 80-9th Annual Meeting 1952. pp. 112-115.

Osborne, J. Clark. Vibriosis and Its Relation to Sterility. The Southeastern Veterinarian, Vol.IV. No. 4 1953. pp.14-15.

Osborne, J. Clark. Vibrionic Abortion May Strick Your Herd. Research and Farming, N. C. Agri. Exper. Sta., Nov. 1953.

Osborne, J. Clark, Bourdeau, F., Stimulated Growth of Vibrio Fetus by Use of Hormones. Jour. of Bact., 70-250 Aug. 1955.

Manuscript in preparation. The Use of Vibrio Fetus Bacterin. J. C. Osborne, R. H. Ferneyhough.

10. Prepared by _____ Approved _____
(Sign original only) (Director)

Date March 6, 1958 Date _____

North Carolina

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 1961

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): **S-184, An Investigation of the Biology, the Pathogenicity and the Control of the Swine Kidney Worm (*Stephanurus dentatus*)**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Animal Industry Department and U. S. D. A.**
3. PERSONNEL: **E. G. Batts, W.T. Parker(Jan.-Sept.), R. D. McLamb (Sept.-Dec.)**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked): **Infective *S. dentatus* larvae were given to parasite-free pigs at 6 weeks of age at the rate of 10,000 orally. Weekly blood samples were taken and blood studies made. Eosinophilia appeared at the second week and reached a peak at the fifth week. At the fifth week the sedimentation rate increased, reaching a peak at nine weeks.**
Infective larvae were given weekly to pregnant sows to determine if prenatal infection occurred. Lesions indicative of kidney worm infection were present after 3 months. Animals are being maintained to determine if a patent infection results.

Small grid plots were infected at the rate of 10,000 ova per square ft. These grids were on red clay with a gross cover of fescue and Bermuda. The average summer temperature killed the larvae in 14 days. None of the larvae survived freezing temperature.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

Fall pigs are less likely to have swine kidney worms than spring pigs as freezing temperature kills the free living stage.

6. WORK PLANNED FOR NEXT YEAR: **Parasite free pigs have been infected with larvae and weekly blood samples taken for electrophoresis and immunophoresis studies.**

Grid plots on different soil types and ground cover are being infected to determine influences of rainfall, humidity, and temperature on larvae survival. Some drugs will be evaluated as larvicides and anthelmintic.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

**"Observations on the Life Cycle and Pathogenicity of the Swine Kidney Worm."
E. G. Batts, R. Harkness, and J. C. Osborne. Jour. of the A.V.M.A., Vol. 136,
No. 12, June 15, 1960, pp. 622-625.**

8. Prepared by Edwards Batts Approved _____ (Director).

Date March 24, 1961 Date _____

ANNUAL PROGRESS REPORT

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION STATE PROJECTS

5-184

1. PROJECT:(Fund, number, and title): **An Investigation of the Biology, the Pathogenicity and the Control of the Swine Kidney Worm (Stephanurus dentatus)**
 2. DEPARTMENTS AND COOPERATING AGENCIES: **North Carolina Agricultural Experiment Station and U.S.D.A. Animal Disease and Parasite Research Division**
- PERSONNEL: **E. G. Batte, Project Leader; Earle Frazier, Technician; Reinard Harkema, Cooperator.**

RESEARCH ACCOMPLISHMENTS OF THE YEAR(Confidential information should be so marked):

Studies were made of the influence of various climatic conditions on ova and larvae. It was found that the optimum temperature was 27.5°C, maximum was 37.5°C and minimum was 15°C for ova to hatch. Temperature of 40°C was lethal to larvae within 24 days but larvae survived 27.5°C for 88 days. Sunlight was lethal to larvae at 27.5°C. Regardless of the humidity, larvae required a film of moisture to survive. In soil studies, larvae were found only in top $\frac{1}{2}$ inch of soil indicating little migration.

A total of 25 pigs were infected orally, cutaneously or by infected earthworms. A detail study of histopathology is being made. Two calves were given 30,000 larvae orally. A calf posted after 2 months, had severe liver damage with 3 sexually mature S. dentatus recovered.

5. USEFULNESS OF FINDINGS(Benefits to agriculture and the general public and contributions to science.): **There is a close correlation between climatic environment and endemic areas of kidney worms. Low temperature and sunshine aid in control of kidney worms. Some of the pathology found in the liver of cattle probably is due to migration of kidney worms.**
6. WORKED PLANNED FOR NEXT YEAR: **Four groups of 10 pigs each will be infected orally, cutaneously and by infected earthworms and study made on pathology, blood chemistry, feed utilization, time required for potency of parasite and survival time of parasite.**
7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR: **none**

8. Prepared by _____

Approved _____
(Director)

Date February 17, 1958

ANNUAL PROGRESS REPORT FOR STATE SUPPORTED PROJECTS
OF THE
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
(Three copies to be submitted to Director's Office)

1. PROJECT: (Fund, number, and title): 3-184, An investigation of the Biology, the Pathogenicity and the Control of the Swine Kidney Worm (*Stojarovirus dentatus*)
2. DEPARTMENTS AND COOPERATING AGENCIES: North Carolina Agricultural Experiment Station and U.S.D.A. Animal Disease and Parasite Research Division
3. PERSONNEL:

4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):
A group of 40 pigs, divided into lots of 10 each, were used to study the pathogenicity, life cycle, and pathology of swine kidney worms by oral administration, infected earthworms and skin penetration. The route of migration was observed to be through the liver. Most of the larvae which left the liver vacated it between 6 and 7 months. The most consistent lesion observed have been in the liver with the visceral surface showing whitish, tan lesions about 1/16" in diameter and slightly raised. Regeneration of the liver tissue seems to replace the necrotic tissue, so that after 45 days the lesions tend to disappear. Eggs were observed in urine of sow given infected earthworms 5-1/2 months previously.

The pathogenicity of swine kidney worms to cattle was established by deaths of calves following infection with 85,000 larvae 5 weeks previously. Extensive fibrosis and necrosis of the liver was observed.

It has been established that pigs can become infected by contact with run-off from infected premises.

5. USEFULNESS OF FINDINGS(Benefits to Agriculture and the general public and contributions to science): The danger of grazing cattle and kidney worms infected hogs in the same pasture should be emphasized. Our work in which we have given infective larvae of the swine kidney worm to cattle and produced a serious impairment to weight gains and calves in constant condition should be high-lighted. This points to the danger that, in many cases, where calves are found to be in poor condition in apparently good grazing area and upon post-mortem examination nothing outstanding has been found, it might be beneficial to check these calves to see if the swine kidney worm larvae are present in the liver & pancreas.
6. WORK PLANNED FOR NEXT YEAR: Two of the infected pigs will be retained as long as ova is observed in urine to determine longevity of the parasite. Parasite-free pigs will be infected with encysted eggs and kidney worm larvae and studies made on serum proteins, aptology and blood chemistry along with pathology of pure infection. Larvae survival time will be determined under N.C. climate conditions and on different soil types and pasture cover.
7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

8. Prepared by _____

Approved _____
Director

Date _____

Date _____

**ANNUAL PROGRESS REPORT
OF RESEARCH PROJECTS**

INSTRUCTIONS: Three copies are to be retained by CSESS Examiner and the Experiment Station. See CSESS-OD 1006, "Suggestions for Preparing Annual Progress Reports."

1. NAME OF AGRICULTURAL EXPERIMENT STATION
NORTH CAROLINA

2. PROJECT SUPPORTED BY
 FEDERAL GRANT

3. YEARLY REPORT

NON-FEDERAL AMA-TITLE II 1961

4. PROJECT (Number and title)

S-184: An Investigation of the Biology, the Pathogenicity and the Control of the Swine Kidney Worm (Stephanurus dentatus).

5. DEPARTMENTS AND COOPERATING AGENCIES

USDA, Animal Disease and Parasite Research Division

6. PERSONNEL (Indicate leader)

E. G. Batte, Leader; R. D. McLamb

7. PROGRESS OF PRINCIPAL RESEARCH ACCOMPLISHMENTS OF THE YEAR AND USEFULNESS OF SUCH FINDINGS TO AGRICULTURE AND THE GENERAL PUBLIC (Confidential information should be so marked)

Two sows reared in a kidney worm-free area were given 500 infective S. dentatus larvae weekly. These doses began 3 weeks before breeding and continued throughout gestation. Post mortem examinations were made of these pigs at 3, 6, and 12 months of age. At the 3 and 6 month examinations, lesions resembling those caused by kidney worms were observed. One gilt at the 12 month examination had 4 S. dentatus in the adipose tissue adjacent to the kidneys near the ureters. This work would indicate that a prenatal infection could result from sows contacting infective larvae during the pregnancy.

A series of compounds have been screened for an agent to remove a patent infection in sows. No satisfactory compound has been found that will stop ova production within a safe level of medicant.

8. WORK PLANNED FOR NEXT YEAR

Sows reared in air lock isolation units will be infected before breeding and during gestation to substantiate prenatal infection. Other compounds will be screened as possible control measures for kidney worm.

9. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR

None

10. PREPARED BY

E. G. Batte

10A. DATE PREPARED

February 19, 1962

11. DIRECTOR'S SIGNATURE OF APPROVAL

11A. DATE APPROVED

ANNUAL PROGRESS REPORT FOR STATE SUPPORTED PROJECTS
OF THE
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
(Three copies to be submitted to Director's Office)

1. PROJECT: (Fund, number, and title): **State 198, Calf Scours I. Studies on Chemotherapy.**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Animal Industry (Financial support from Eaton Laboratories, Norwick, N. Y.)**
3. PERSONNEL: **J. C. Osborne, R. D. Mocherie, Barbara Ledbetter**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked): **Sixty-five male, day old Holstein calves made up 13 replications for study of calf scours. All calves received colostrum. A replication of calves included one untreated two treated when scours existed, and two given prophylactic medication in the ration twice daily. The medication used was nitrofurazone compounded with two different levels of bismuth. Bacteriological culture of feces and blood serology before, during and after scours was included. *Escherichia coli* was the predominant organism encountered in scouring calves. *Salmonella* sp. was encountered but rarely. Calves that had a significant titre against *E. Coli* upon arrival at our barn (day-old) did not, as a rule, develop scours for about a week to ten days later. Others scoured usually within the first week after entering the barn. The prophylactic and therapeutic procedures were efficacious under the conditions of the study. Daily prophylactic feeding with furazone and the higher level of bismuth gave best results.**
5. USEFULNESS OF FINDINGS (Benefits to Agriculture and the general public and contributions to science): **These findings provide ample evidence of the efficaciousness of the antidiarrheal furazone. Thus, we have available another proven effective chemotherapeutic agent for use in the battle to control calf scours.**
6. WORK PLANNED FOR NEXT YEAR: **The project has run its full projected duration of two years and will either be closed or another project drawn leading into the area of immunity.**
7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:
 - (a) Osborne, J. Clark. Calf Scours--Clinical and Laboratory Studies, Proc. of First Regional Conference on the Nitrofurans in Vet. Med. 6-5-58
 - (b) Osborne, J. Clark. Microbiological & Therapeutic Aspects in Calf Enteritis. JAVMA (in press)
8. Prepared by _____ Approved _____
J. C. Osborne Director
Date 2-11-59 Date _____

ANNUAL PROGRESS REPORT FOR STATE SUPPORTED PROJECTS
OF THE
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION
(Three copies to be submitted to Director's Office)

1. PROJECT: (Fund, number, and title): State 190. Studies on Gastro-Intestinal Helminths of Dairy Calves.

2. DEPARTMENTS AND COOPERATING AGENCIES: ANIMAL INDUSTRY

3. PERSONNEL: J. E. Osborne, E. G. Bette, W. H. Hurley

4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

Nine male, day-old calves of the dairy breeds were raised in the parasite free environment of the Animal Isolation housing at the Disease Laboratory until approximately 3 months of age. They were moved to a virgin pasture on the college farm that was prepared by clearing woodland on a hill crest. Three calves were found to be parasite free at necropsy after approximately 3 months on pasture. (age about 6 mo.)

Three more calves were necropsied after remaining on pasture about 6 months (age near 9 months). Two were parasite free and one harbored 2 Setaria and 2 Cooperia carticei.

The remaining 3 calves were necropsied after having been on pasture about 9 months (age near 12 months) and these harbored no more than 4 helminths.

5. USEFULNESS OF FINDINGS (Benefits to Agriculture and the general public and contributions to science):

These findings lend encouragement to the basic plan of raising dairy calves on pasture after 2 or 3 months of age rather than keeping them housed until a much older age. Combining these practices with the use of soil fumigants the ideal of a parasite-free farm, populated with parasite free cattle, could become a reality.

6. WORK PLANNED FOR NEXT YEAR: Continuation of work as outlined in the project and initiation of preliminary trials on freeing pastures of cattle helminth parasites.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

None

8. Prepared by J. E. Osborne

Approved _____
Director

Date 2-10-59

Date _____

ANNUAL PROGRESS REPORT

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION STATE PROJECTS

1. PROJECT: (Fund, number, and title): S-190 Studies on the Gastro-Intestinal Helminths of Dairy Calves.
2. DEPARTMENTS AND COOPERATING AGENCIES: N. C. Agricultural Experiment Station
3. PERSONNEL: J. C. Osborne, Leader; E. G. Batte, Cooperator; W. R. Murley, Advisor.
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

The project was begun late in the calendar year and therefore the progress to date is limited. A virgin pasture has been prepared and seeded from land that was bulldozed and the experimental calves are being raised in the isolation units at the Animal Disease Laboratory for the first three months of their life. These calves are periodically checked for presence of parasite ova in the feces and if they remain free of any evidence of parasites then they will be transported to the virgin pastures for the completion of the study outlined.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science.):
The potential use to science of parasite-free calves is limited to their use in experimental procedures where such a calf would be desired. The usefulness of this type of parasite-free calf in the agriculture of the state would be very great providing that a parasite-free herd could be developed and maintained as such.
6. WORK PLANNED FOR NEXT YEAR:
Completion of the project as outlined, analysis, and publication of results.
7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:
None
8. Prepared by J. Clark Osborne Approved _____
(Director)

Date March 5, 1958

ANNUAL PROGRESS REPORT

July 1, 1959 to June 30, 1960

1. Project

S-184 - An Investigation of the Biology, the Pathogenicity and the Control of the Swine Kidney Worm (Stephanurus dentatus)

2. Cooperating Agencies

North Carolina Agricultural Experiment Station and U. S. D. A. Animal Disease and Parasite Research Division

3. Personnel

E. G. Batte and W. T. Parker

4. Nature of Work and Principal Results of the Year

a. Longevity of adult parasite

A sow was purchased at a local abattoir that was positive for kidney worm ova in urine. She was confined on a concrete floor which was washed daily. After 12 months the ova content of urine exceeded 10,000 per liter of urine.

b. Parasite-free studies

A sow from an area known to be free of kidney worms was purchased and placed in an air-lock isolation unit. An anthelmintic was given each 3 weeks until feces were negative for parasitic ova on two consecutive counts.

Pigs from this sow were negative for parasites when moved into other air-locked isolation units.

Infective S. dentatus larvae were given to pigs at 6 weeks of age at the rate of 10,000 orally. Weekly blood samples were taken and a differential count made, as well as other studies.

Eosinophilia appeared at the second week and reached a peak at the fifth week. At the fifth week the sedimentation rate increased, reaching the peak at nine weeks.

c. Larvae survival

The concentration of ova in urine from an infected sow was determined. Small grid plots were infected at the rate of 10,000 ova per square foot. These grid plots were on red clay soil with a cover of a grass mixture of fescue and Bermuda.

One week after infection, soil samples were taken and Baermanized to determine level of infection. Weekly samples were taken to determine the survival rate of larvae on this soil type and ground cover in relation to humidity, rainfall, and air temperature.

Viable larvae were collected 37 days after soil infection. Negative cultures were made 43 and 60 days after infection.

d. Pre-natal infection

Sows from areas known to be free of kidney worms are being given 500 infective S. dentatus larvae weekly. These doses began 3 weeks before breeding and continuing through the gestation period. Pigs from these sows will be autopsied at 3, 6, and 9 months of age to determine if pre-natal infection occurs after confinement with no access to kidney worm infection.

5. Application of Findings

A natural infection has persisted in a sow in excess of 12 months. Infection in parasite-free pigs produce a marked eosinophilia and increased sedimentation rate.

6. Work Proposed for Next Year

A group of 8 parasite-free pigs have been infected, with blood samples taken weekly for studies on electrophoresis, cytology, and blood chemistry.

Two sows are being given 500 infective larvae weekly prior to breeding and during gestation to determine if pre-natal infection occurs.

Grid plots on different soil types and ground covers are being infected and harvested to determine the influence of rainfall, humidity, and temperature on larvae survival.

7. Publications Issued or Manuscripts Prepared During the Year

"Observations on the Life Cycle and Pathogenicity of the Swine Kidney Worm." E. G. Batte, R. Harkema, and J. C. Osborne. Jour. of the A.V.M.A., Vol. 136, No. 12, June 15, 1960, pp. 622-625. (Reprints on order).

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 1960

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): **S-184, An Investigation of the Biology, the Pathogenicity and the Control of the Swine Kidney Worm (*Stephanurus dentatus*)—Misc. Gifts U.S.D.A. and Lilly**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Animal Industry Department and U. S. D. A.**
3. PERSONNEL: **E. C. Batts, W. T. Parker, Reinard Harbans**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

Eggs were demonstrated in the urine of experimentally infected animals 9 months after infected earthworms were given and 15 months after oral infection. A naturally infected sow produced viable eggs for 23 months.

Studies on blood chemistry, cytology, and electrophoretic pattern are made on parasite-free pigs given infective larvae.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

The longevity of parasites was found to be in excess of 2 years. Other phases of the life cycle is being defined.

6. WORK PLANNED FOR NEXT YEAR:

Further work on electrophoretic patterns, cytology, and blood chemistry is planned. Pregnant sows will be given large doses of infective larvae to determine if prenatal infection occurs. Larvae survival under different ground can well be determined.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

"Observations on the Life Cycle and Pathogenicity of the Swine Kidney Worm (*Stephanurus dentatus*)". JOURNAL OF THE A.V.M.A. (In Press); Given at National Meeting of the A.V.M.A.

8. Prepared by _____ Approved _____
(Director).

Date March 10, 1960 Date _____

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL GRANT PROJECTS, 19____

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): **S-190, Studies on Gastro-Intestinal Helminths of Dairy Calves**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Animal Industry**
3. PERSONNEL: **J. C. Osborne; E. C. Batts, L. R. Hurley**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

Fifteen parasite-free calves as indicated by fecal egg counts, age about 3 months, were run on virgin woodland pasture, various intervals, up to 9 months. The maximum number of helminths found in any calf was 4 in the abomasum and 5 in the intestines. Three calves were helminth free after 3 months on pasture, and two calves were helminth free after 6 months on pasture. Three control calves carried between 3100 and 6700 helminths after 3 months grazing on an ordinary infected pasture.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

One can conclude that essentially helminth free dairy calves can be raised by this method. It would appear practical for the dairy farmer to provide this type pasture for his young dairy animals so that they could go on pasture

6. **at such a younger age than is usually the case, thus reducing the cost of raising a calf to 1 year of age.**

Project closed out. Leader entering on one year leave of absence for advanced post-doctoral study.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

Raising Helminth Free Dairy Calves (in preparation)

8. Prepared by _____ Approved _____ (Director).

Date **March 10, 1960** _____ Date _____

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
STATE EXPERIMENT STATIONS DIVISION

AGRICULTURAL EXPERIMENT STATION

PROJECT TERMINATION REPORT

INSTRUCTIONS: For Federal-grant projects, send 3 copies to State Experiment Stations Division, ARS, at time of closing.

PROJECT NUMBER

S-190

FUND

Station-State

1. TITLE

Studies on the Gastro-Intestinal Helminths of Dairy Calves

2. DATE OF

ORIGIN

July 1, 1957

LAST REVISION

None

COMPLETION

December 31, 1959

3. REASON FOR TERMINATION

PROJECT COMPLETED LEADER LEAVING FUNDS TERMINATED LACK OF PRODUCTIVITY OTHER (Specify)

4. ESTIMATE OF TOTAL PROJECT COST (given by sources of funds and amounts)

Station - State \$4,400.00

5. INITIATING DEPARTMENT, OTHER DEPARTMENTS AND AGENCIES COOPERATING

Animal Industry Department

6. PROFESSIONAL PERSONNEL

Drs. J. Clark Osborne, E. G. Batte, and W. R. Murley

7. CRITICAL APPRAISAL OF DEGREE TO WHICH PROJECT OBJECTIVES WERE ACCOMPLISHED

Project objectives were satisfactorily accomplished.

8. MAJOR RESULTS AND CONCLUSIONS, INCLUDING FUNDAMENTAL & PRACTICAL BENEFITS DERIVED (use back page if necessary)

Fifteen parasite free calves as indicated by fecal egg counts, age about 3 months, were run on virgin woodland pasture, various intervals, up to 9 months. The maximum number of helminths found in any calf was 4 in the abomasum and 5 in the intestines. Three calves were helminth free after 3 months on pasture, and two calves were helminth free after 6 months on pasture. Three control calves carried between 3100 and 6700 helminths after 3 months grazing on an ordinary infected pasture. (See back of page)

9. PUBLICATIONS ISSUED AS A DIRECT OR INDIRECT RESULT OF WORK DONE ON THIS PROJECT (use back page if necessary)

"Raising Helminth Free Dairy Calves" (in preparation)

10. PREPARED BY

Dr. J. Clark Osborne

11. APPROVED (Director)

12. APPROVED (Department Chairman)

13. DATE

6. Continued

One can conclude that essentially helminth free dairy calves can be raised by this method. It would appear practical for the dairy farmer to provide this type pasture for his young dairy animals so that they could go on pasture at a much younger age than is usually the case, thus reducing markedly the cost of raising a calf to one year of age.

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL-GRANT PROJECTS, 19 _____

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): **S-198, Calf Scours I. Studies on Chemotherapy - Misc. Gifts, Eaton Labs.**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Animal Industry Department and Eaton Labs, Norwich, N. Y.**
3. PERSONNEL: **J. C. Osborne and R. D. Mocherie**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

Frozen colostrum from cows hyperimmunized with E. coli microorganisms isolated from calves with diarrhea was fed as a basal diet for 20 colostrum-free (Group A) calves for 24 hours after birth (3 feedings). Twenty other calves (Group B) were allowed to nurse their dams for approximately one day. Both groups subsequently were fed 2 times a day on water reconstituted dried skim milk fortified with Vitamins A & D for a total experimental period of 21 days.

Five calves in Group A and 6 calves in Group B did not survive the 21-day period. Calves that died in Group A survived an average of 10 days. Calves that died in Group B survived an average of 5.4 days, and none of the 6 dead calves survived more than 9 days.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

These findings indicate that E. coli bacterium may have specific value in hyperimmunizing cows so as to get a colostrum with higher protective properties against diarrhea.

6. WORK PLANNED FOR NEXT YEAR:

Project is being closed out. Leader is entering upon a one year leave of absence for advanced post doctoral study.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

Manuscript in preparation.

8. Prepared by J. C. Osborne Approved _____ (Director).

Date March 10, 1960 Date _____

March 11, 1960

Dr. R. L. Lovvorn
107 Patterson Hall
Campus

Dear Doctor Lovvorn:

We would request that state project S-198, Calf Scours - Studies on Chemotherapy, be terminated on March 31, 1960, and the funds assigned to this project be transferred to Veterinary Administration account.

This project is supported with a budget amount of \$2,200 State and a Misc. Gift from Eaton Laboratories. Following is listed the amount we would like to request transferred to Veterinary Administration:

<u>From</u>	<u>To</u>
S-198	Vet. Ad.
Osborne - \$500 (1/2 of \$2,000)	Osborne - \$500 (1/2 of \$2,000)
McLamb - 50 (1/2 of \$200)	McLamb - 50 (1/2 of \$200)
Eaton:	Eaton:
Supplies - \$718.56	Supplies - \$718.56
Travel - 76.74	Travel - 76.74

The amount in Eaton Labs Supplies of \$718.56 represents the amount received from the sale of experimental animals surviving the study.

Sincerely yours,

Edward G. Batte, D.V.M.
Head, Veterinary Section

EGB/jby

Approved: _____
George Hyatt, Jr., Head
Animal Industry Department

PROJECT TERMINATION REPORT

NORTH CAROLINA

INSTRUCTIONS: For Federal-grant projects, send 3 copies to State Experiment Stations Division, ARS, at time of closing.

PROJECT NUMBER

FUND

S 198

1. TITLE

Calf Scours I. Studies on Chemotherapy

2. DATE OF	ORIGIN	LAST REVISION	COMPLETION
3/26/1960	3/26/58	None	12/31/59

3. REASON FOR TERMINATION

PROJECT COMPLETED LEADER LEAVING FUNDS TERMINATED LACK OF PRODUCTIVITY OTHER (Specify)

4. ESTIMATE OF TOTAL PROJECT COST (given by sources of funds and amounts)

Eaton Labs., Norwich, N. Y., \$5,700.00; State - \$2,200.00

5. INITIATING DEPARTMENT, OTHER DEPARTMENTS AND AGENCIES COOPERATING

Animal Industry Department; Eaton Labs.

6. PROFESSIONAL PERSONNEL

J. Clark Osborne and R. D. Mocherie

7. CRITICAL APPRAISAL OF DEGREE TO WHICH PROJECT OBJECTIVES WERE ACCOMPLISHED

Project objectives were studied and accomplished as set forth in the project outline.

8. MAJOR RESULTS AND CONCLUSIONS, INCLUDING FUNDAMENTAL & PRACTICAL BENEFITS DERIVED (use back page if necessary)

The incidence of coliform bacteria in calf diarrhea is near 100%. Coliform isolates are near 100% sensitive to the nitrofurans as well as a few antibiotics. They were near 100% resistant to the sulfonimides tested in this study. Furazone, a nitrofurantoin, was efficacious in both therapy and prophylaxes for calf diarrhea under the conditions of this experiment.

9. PUBLICATIONS ISSUED AS A DIRECT OR INDIRECT RESULT OF WORK DONE ON THIS PROJECT (use back page if necessary)

Calf Scours - Clinical and Laboratory Studies. Proc. of the First Regional Conference on the Nitrofurans in Veterinary Medicine, Wilmington, Delaware, June 5, 1958; Microbiology, Serology, and Therapy of Calf Enteritis. Proc. of the Second Regional Conference on the Nitrofurans in Veterinary Medicine, Madison, Wisconsin, May 28, 1959; "Microbiological and Therapeutic Aspects in Calf Enteritis," JOUR. OF THE A.V.M.A., Vol. 134, No. 4, pp. 173-177, Feb. 15, 1959.

10. PREPARED BY

J. Clark Osborne

12. APPROVED (Department Chairman)

11. APPROVED (Director)

13. DATE

NORTH CAROLINA

AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, FEDERAL GRANT PROJECTS, 19 60

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): **S-216, Internal Parasites of Swine -
Misc. Gifts, Messengill**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Animal Industry Department**
3. PERSONNEL: **E. C. Bette, Warren T. Parker**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

Anthelmintic activity was indicated when Temoctin[®] was given to pigs in rations for thirteen days. Feed efficiency and weight gains were not adversely affected.

5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

A new type of compound was found to have anthelmintic activity against parasites of swine.

6. WORK PLANNED FOR NEXT YEAR:

Other compounds will be evaluated.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

None

8. Prepared by _____ Approved _____
(Director).

Date **March 10, 1960** _____ Date _____

Department of Animal Industry
NORTH CAROLINA STATE COLLEGE

5-218

MEMORANDUM

To Dr. H. A. Stewart

Attached is the Memorandum of Understanding between the N. C. Agricultural Experiment Station and Merck, Sharp & Dohme which Dr. Batte discussed with you.

Please advise Dr. Batte when this has been approved by the Director.

ATTACHED PAPERS

- Please note and return.
- Return with recommendations.
- For your records.
- Speak to me concerning.
- Please handle.
- Please answer.
- Needs your signature.
- For your approval.
- Please give me all data.
- Note and pass to next person.
- Please reply, sending me a copy.

Date July 11, 1961

Signed: Melvin S. Bennett
Department of Animal Industry

MEMORANDUM OF UNDERSTANDING
Between the
NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION OF N. C. STATE COLLEGE
and
MERCK, SHARP, & DOHME
Rahway, New Jersey

1. PROJECT TITLE: Internal Parasites of Ruminants
2. PROJECT LEADER: E. G. Batts, Veterinary Section, Animal Industry Department, N. C. State College, Raleigh, N. C.
3. OBJECTIVE: To determine the effect of selected drugs with anthelmintic properties upon gastrointestinal parasites of ruminants.
4. PROCEDURE: Naturally infected sheep will be given a dose of the drugs following fecal examinations to determine degree of infections. Animals will be weighed at the beginning and at 30-day intervals to determine the effects upon weight.

RESPONSIBILITIES OF COOPERATING AGENCIES:

A. The North Carolina Agricultural Experiment Station agrees to provide such laboratory and office space and supplies as may be needed and may be available. They further agree to furnish the personnel necessary to properly plan and conduct the research work and to make periodic progress reports to Merck, Sharp, & Dohme.

B. Merck, Sharp, & Dohme agrees to place at the disposal of North Carolina Agricultural Experiment Station funds in the amount of \$500.00 to be disbursed in accordance with the fiscal regulations of North Carolina Agricultural Experiment Station in support of these investigations.

C. It is mutually agreed that rights to publication or formal release of the data obtained will be retained by the North Carolina Agricultural Experiment Station, and prior to publication or formal release by the North Carolina Agricultural Experiment Station, no publication or formal release of the data shall be made without its knowledge or consent. Merck, Sharp, & Dohme may use results of investigations conducted under the provisions of this memorandum as it may elect, except that the name of North Carolina Agricultural Experiment Station at North Carolina State College shall not be used in commercial advertising.

This memorandum shall become effective July 10, 1961, and shall be effective for a period of one year.

July 10 1961
Date

July 10 / 1961
Date

Date

Date

Edmunds Ball
Project Leader

George August J.
Head, Dept. of Animal Industry

Director, N. C. Agric. Exper. Sta.

Merck, Sharp, & Dohme

ANTHELMINTIC EVALUATION PROCEDURE

1. Naturally infected native sheep will be purchased through the auction sales.
2. Pre-treatment fecal counts will be made and will serve as base for allocation for treatment. The sheep will be maintained in a common pasture grazing on native grass, orchard grass, and ladino clover. They will be penned each evening in a dog-proof holding area.
3. All animals will be weighed at initiation and termination of the trial, and at 30-day intervals.
4. Animals will be treated as follows:
 - a. Thiabendazole 30 sheep
 - b. Microfine Phenothiazine 30 sheep
 - c. Control 30 sheepTotal - 90 sheep
5. Fecal samples will be taken at the initial treatment and at intervals during the period between treatments to determine parasitic burden.
6. Data from this trial will be submitted to the Statistics Department for analysis.

North Carolina AGRICULTURAL EXPERIMENT STATION

ANNUAL PROGRESS REPORT, ~~FEDERAL GRANT~~ PROJECTS, 19 61

(Three copies to be given to the SES examiner)

1. PROJECT (Fund, number, and title): **9-218, Internal Parasites of Swine**
2. DEPARTMENTS AND COOPERATING AGENCIES: **Animal Industry Department**
3. PERSONNEL: **E. G. Batte, W.T. Parker (Jan.-Sept.) R. D. McLamb (Sept.-Dec.)**
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked):

Naturally infected pigs were utilized in anthelmintic studies on derivatives of cadmium. Cadmium anthranilate was slightly more effective than cadmium p-tolvene in removing ascarids and nodular worms. Feed efficiency and weight gains were not adversely affected by either.

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5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science):

A new cadmium derivative was evaluated as a swine anthelmintic with favorable results.

6. WORK PLANNED FOR NEXT YEAR:

A series of compounds will be evaluated as swine anthelmintics.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

None

8. Prepared by Edmunds Batte Approved _____

(Director).

Date March 24, 1961 Date _____

U. S. DEPARTMENT OF AGRICULTURE
COOPERATIVE STATE EXPERIMENT STATION SERVICE

**ANNUAL PROGRESS REPORT
OF RESEARCH PROJECTS**

INSTRUCTIONS: Three copies are to be retained by CSESS Examiner and the Experiment Station. See CSESS-OD 1006, "Suggestions for Preparing Annual Progress Reports."

1. NAME OF AGRICULTURAL EXPERIMENT STATION

NORTH CAROLINA

2. PROJECT SUPPORTED BY

FEDERAL GRANT

NON-FEDERAL

AMA-TITLE II

3. YEARLY REPORT

19 **61**

4. PROJECT (Number and title)

S-216: Internal Parasites of Swine

5. DEPARTMENTS AND COOPERATING AGENCIES

6. PERSONNEL (Indicate leader)

D. J. Moncol, Leader; E. G. Batte; Margaret Knight

7. PROGRESS OF PRINCIPAL RESEARCH ACCOMPLISHMENTS OF THE YEAR AND USEFULNESS OF SUCH FINDINGS TO AGRICULTURE AND THE GENERAL PUBLIC (Confidential information should be so marked)

Two replicates were made of trials using Cadmium anthranilate in comparison to cadmium p-toluene sulfonate. Cadmium anthranilate was an effective anthelmintic against ascarids. The weight gain response of the group receiving cadmium anthranilate was superior to the other two groups.

Investigations were begun using x-irradiated and cobalt 60 radiated ova, after which the ova were fed to parasite and colostrum free pigs to determine resistance to subsequent infection by non-treated ova.

8. WORK PLANNED FOR NEXT YEAR

Determine the level of cadmium anthranilate to be most effective as anthelmintic and weight gain factor.

To define the level of irradiation and infection to produce greatest immunological response in parasite and colostrum free pigs.

9. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR

10. PREPARED BY

Daniel J. Moncol
Daniel J. Moncol

10A. DATE PREPARED

February 21, 1962

11. DIRECTOR'S SIGNATURE OF APPROVAL

11A. DATE APPROVED

U. S. DEPARTMENT OF AGRICULTURE AGRICULTURAL RESEARCH SERVICE STATE EXPERIMENT STATIONS DIVISION		AGRICULTURAL EXPERIMENT STATION	
PROJECT TERMINATION REPORT		NORTH CAROLINA	
INSTRUCTIONS: For Federal-grant projects, send 3 copies to State Experiment Stations Division, ARS, at time of closing.		PROJECT NUMBER S 198	FUND
1. TITLE Calf Scours I. Studies on Chemotherapy			
2. DATE 3/Mar/1966	ORIGIN 3/26/58	LAST REVISION None	COMPLETION 12/31/59
3. REASON FOR TERMINATION <input checked="" type="checkbox"/> PROJECT COMPLETED <input type="checkbox"/> LEADER LEAVING <input type="checkbox"/> FUNDS TERMINATED <input type="checkbox"/> LACK OF PRODUCTIVITY <input type="checkbox"/> OTHER (Specify)			
4. ESTIMATE OF TOTAL PROJECT COST (given by sources of funds and amounts) Eaton Labs., Norwich, N. Y., \$5,700.00; State - \$2,200.00			
5. INITIATING DEPARTMENT, OTHER DEPARTMENTS AND AGENCIES COOPERATING Animal Industry Department; Eaton Labs.			
6. PROFESSIONAL PERSONNEL J. Clark Osborne and R. D. Mocherie			
7. CRITICAL APPRAISAL OF DEGREE TO WHICH PROJECT OBJECTIVES WERE ACCOMPLISHED Project objectives were studied and accomplished as set forth in the project outline.			
8. MAJOR RESULTS AND CONCLUSIONS, INCLUDING FUNDAMENTAL & PRACTICAL BENEFITS DERIVED (use back page if necessary) The incidence of coliform bacteria in calf diarrhea is near 100%. Coliform isolates are near 100% sensitive to the nitrofurans as well as a few antibiotics. They were near 100% resistant to the sulfonimides tested in this study. Furazone, a nitrofurantoin, was efficacious in both therapy and prophylaxes for calf diarrhea under the conditions of this experiment.			
9. PUBLICATIONS ISSUED AS A DIRECT OR INDIRECT RESULT OF WORK DONE ON THIS PROJECT (use back page if necessary) Calf Scours - Clinical and Laboratory Studies. Proc. of the First Regional Conference on the Nitrofurans in Veterinary Medicine, Wilmington, Delaware, June 5, 1958; Microbiology, Serology, and Therapy of Calf Enteritis. Proc. of the Second Regional Conference on the Nitrofurans in Veterinary Medicine, Madison, Wisconsin, May 28, 1959; "Microbiological and Therapeutic Aspects in Calf Enteritis," JOUR. OF THE A.V.M.A., Vol. 134, No. 4, pp. 173-177, Feb. 15, 1959.			
10. PREPARED BY J. Clark Osborne J. Clark Osborne		11. APPROVED (Director) R. Hoover	
12. APPROVED (Department Chairman) George Hyatt		13. DATE March 21, 1960	

ANNUAL PROGRESS REPORT

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION STATE PROJECTS

1. PROJECT: (Fund, number, and title): Miscellaneous Gifts (Eaton Laboratories). Calf Scours in Dairy Calves.
2. DEPARTMENTS AND COOPERATING AGENCIES: N. C. Agricultural Experiment Station, Supported by a Grant of \$3500 from Eaton Laboratories.
3. PERSONNEL: J. C. Osborne, R. H. Mocherie, K. Prestwood, and E. G. Batte.
4. RESEARCH ACCOMPLISHMENTS OF THE YEAR (Confidential information should be so marked);
Approximately 80 calves have been obtained and studied during the course of the year. Calves are obtained from local farmers and the college dairy herds and placed in our facilities within 24 hours after birth. The calves are fed and handled in a manner similar to that of local farm conditions except that we do make no effort to clean pails except washing out in cold water, and the milk when it is fed is not brought to a standard temperature. In this manner of management, we had natural scours occurring in a very high percentage of all calves coming into our facilities within the first week of their stay. Rectal temperatures were recorded on the calves daily, and as soon as a calf was observed to be scouring a bacteriological culture was obtained by means of a glass speculum from the rectum and coliform-type organisms isolated. The calves were then assigned to a replication of treatments as follows: 1 calf to neocide, which is considered a reputable scours medicant, and the second calf to entefur, and a third calf was the untreated control. These calves were assigned to these treatments as the scours made their appearance without any manner of selection whatsoever. The treatments were given in the form of one bolus, morning and night, for two days and then discontinued and the calves were dropped from the experiment at the end of 21 days. A preliminary analysis of data shows that of 66 calves that came through the study of which 42 were Holsteins, 15 were Guernseys, and 9 were Jerseys that there was a breed difference in the ability of calves to withstand scours since 7 of the 9 Jerseys failed to survive, 3 of the 15 Guernseys failed to survive, and 7 of the 42 Holsteins failed to survive the 21 day experiment. The placebo or untreated calves in many cases where the calf survived the 21 days his condition was such at the end of 21 days that one would have to consider him a loss as far as a reasonably good prospect of raising this calf on out for further use. The genus *Escherichia* represented a very high percent of the coliform organisms isolated from the cultures taken via the rectum in the scouring calf. In vitro sensitivity test to the various antibiotics and chemotherapeutic agents that were tested revealed a surprising ineffectiveness of the sulfa drugs. Drugs showing good inhibition in vitro were chloromycetin, tetracycline, and related antibiotics, albamycin, Neomycin, and the nitro-furans. The nitro-furans as a group were highly effective in vitro and one of them, furazalone, that was administered to the calves, compared very favorable to or was slightly superior to the neocide that was used in the studies as a comparison in the control of calf scours.
5. USEFULNESS OF FINDINGS (Benefits to agriculture and the general public and contributions to science.):
These data re-emphasize the highly infectious nature and severity of white scours in calves. The high death losses and stunting as a result of scours that occurred during the 21 days serves to further emphasize the economic importance of this disease of dairy calves. The studies on the chemotherapeutic agents in vitro and in vivo in this study indicate means for better control of the disease.

6. WORKED PLANNED FOR NEXT YEAR:

Continuation of and extension of the study along the lines of the previous study and to include the blood chemistry and histopathology of calf scours.

7. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR:

Manuscript is being prepared summarizing the work to date.

8. Prepared by _____

Approved _____

(Director)

Date March 5, 1958