Budget 1933-34

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, May 3, 1933.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir:

I enclose a copy of the revised budget of the Institute of Parasitology which has just been received from Dr. Cameron for inclusion in the proceedings of the last meeting of the Committee. As he states that this has not yet received your approval, on Dr. Tory's suggestion I am including it in the proceedings of the last meeting of the Committee, on the understanding that any revisions which you may consider necessary may be made by you and Dr. Cameron and reported for purposes of record at the next meeting of the Committee.

Yours sincerely,

S.P. Eagleson.

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

INSTITUTE OF PARASITOLOGY

Salaries		
Dr. Cameron	$4,500	
Dr. Parnell	2,000	
Dr. Swales	2,000	
Dr. Conklin	500	
Mr. Griffiths	800	
Miss Smith	840	$ 10,640
Wages (e.g. 3 men at $720)		2,160
Maintenance to college		500
Travelling and field work		1,000
Animals, cages and feed		800
Equipment, chemicals, glassware, periodicals, etc.		1,000
Director's annuity (since Sept.1, 1932 to March 31, 1934)[x] and contingencies		566
		$ 16,666

[x] This amounts to $225 for this year and $130 for last year. The Principal is checking up whether it is a University charge or not.

Re payment to Bursar
Natl Research + Emp Board

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, March 20, 1933.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir:

I enclose, for your information, a copy of a letter which I have written to the Bursar of Macdonald College transmitting to him an advance which has just been received from the Empire Marketing Board to be applied toward the work of the Institute of Parasitology. I have also sent a copy of this letter to Professor Cameron, for his information.

Yours sincerely,

S.P. Eagleson.

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

March 20, 1933.

Fred Ward, Esq.,
Bursar,
Macdonald College, Que.

Dear Mr. Ward:

The National Research Council has received from the Empire Marketing Board an initial advance of £1500 on account of the Board's grant to the Institute of Parasitology at Macdonald College. This sum has been transferred to the Council through the Bank of Montreal at $4.10-3/4 to the pound, and represents the sum of $6,161.25 in Canadian funds.

I am enclosing Research Council cheque made out in favour of Macdonald College for the sum of $6,161.25, the amount received from the Empire Marketing Board. This is forwarded as a further accountable advance in connection with the work of the Institute of Parasitology. Expenditures made from the funds advanced by the National Research Council and the E.M.B. through the Council for this purpose should be confined to expenditures authorized by the Associate Committee on Parasitology as recorded in the proceedings of that Committee.

In a letter just received from the Empire Marketing Board covering the remittance of the money herewith transferred to you, the concluding paragraph reads as follows: "The Board will be glad to be furnished with audited accounts of expenditure on the scheme to 31st March, 1933, as early as possible after that date." I would, consequently, urge the desirability of your forwarding a complete statement of all expenditures incurred in connection with the work of the Institute from April 1, 1932 to March 31, 1933, at the earliest possible date after the close of the present month. The arrangement with the E.M.B. is that all expenditures will be audited by the Auditor General of Canada, and that a complete copy of all documents covering all expenditures will be forwarded to them after having been audited.

There is particular urgency about the matter at the present time, as it is unlikely that the Empire Marketing Board will forward a further remittance until the statement of expenditures for the current year has been received, and owing to the present position of the E.M.B., it is essential that a further advance be secured as soon as may be feasible.

With kindest personal regards, I remain

Yours sincerely,

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, May 18, 1933.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir Arthur:

I enclose for your information a copy of a letter which I have written to the Empire Marketing Board, and also a copy of a letter sent to Mr. Ward, regarding the Institute of Parasitology.

Yours sincerely,

S.P. Eagleson.

S.P. Eagleson,
Secretary-Treasurer.

DE.

Copy for the information of Sir Arthur Currie

May 18, 1933.

The Secretary,
Empire Marketing Board,
2 Queen Anne's Gate Buildings,
London, S.W.1, England.

Dear Sir:

I am sending to you herewith by registered mail a statement of the complete expenditures incurred by the Institute of Parasitology at Macdonald College during the fiscal year April 1, 1932 to March 31, 1933, amounting to $14,918.75. This statement is accompanied by invoices covering all expenditures. You will note that it has been audited and is certified correct by the Auditor General of Canada.

You will also note that this expenditure covers the maintenance and equipping of the Institute, and was undertaken on the understanding that the cost would be divided equally between the National Research Council of Canada and the Empire Marketing Board. The amount payable by each organization for the year just closed is, consequently, $7,459.38.

The National Research Council has paid the above amount to Macdonald College to cover its share of the expenditures of the year just recently closed, and has also made a further advance to be applied toward meeting expenditures during the current year. We have received from the Empire Marketing Board, through the Bank of Montreal, the sum of $6,161.25, this being the equivalent of £1500, and this amount has been transferred to the Institute of Parasitology to be credited as a contribution from the E.M.B. toward this work. Consequently, in order to close out the accounts for the past year, in accordance with the vouchers submitted herewith, a further payment of $1,298.13 is required from the Empire Marketing Board, and we would appreciate receiving a further remittance of this amount at your earliest convenience.

With respect to the new year, I enclose a copy of the budget for the year ending March 31, 1934, totalling $16,666.00 This has been formally approved by the Associate Committee on Parasitology.

The accommodation in the laboratory is at present being extended, the capital cost being borne by McGill University, and, consequently, it is estimated by the Director of the Institute that the expenditures for certain items in the budget will be heaviest during the first half of the current year.

So far as it is possible to estimate at the present stage, the expenditures between April 1 and September 30 next will be approximately as follows:

Salaries -	$5,320
Wages	1,500
Maintenance	250
Travelling and field work	750
Animals, cages and feed	600
Equipment, etc.	800
Director's annuity	388
	$9,608

If it is possible for the Empire Marketing Board to provide a further advance to be applied on the expenditures for the current year, this favour would be greatly appreciated both by the National Research Council and by the Institute of Parasitology.

Yours very truly,

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

INSTITUTE OF PARASITOLOGY

Budget for the Year April 1, 1933 to March 31, 1934

Salaries -		
Dr. Cameron	$4,500	
Dr. Parnell	2,000	
Dr. Swales	2,000	
Dr. Conklin	500	
Mr. Griffiths	800	
Miss Smith	840	$10,640
Wages		2,160
Maintenance to college		500
Travelling and field work		1,000
Animals, cages and feed		800
Equipment, chemicals, glass-ware and periodicals, etc.		1,000
Director's annuity (since Sept. 1, 1932 to March 31, 1934) and contingencies		566
		$ 16,666

C O P Y

AUDITOR GENERAL

Canada

Ottawa, May 18, 1933.

Dear Sir,

Re Accounts, Institute of Parasitology

I am in receipt of your letter of the 10th inst. requesting that one copy of the certified vouchers submitted to this office in support of expenditure for the fiscal year 1932-33 in connection with the Institute of Parasitology at Macdonald College be returned to your office after being audited for transmission to the Empire Marketing Board as they are assuming one-half of the cost.

In this connection I am returning herewith the accounts, Nos. 1 to 373, amounting to $14,918.75, which have been audited and certified correct.

Yours truly,

(Sgd.) A.H. BROWN

for Auditor General

The Secretary-Treasurer,
National Research Council,
O t t a w a.

Copy for the information of Sir Arthur Currie

May 18, 1933.

T. Fred Ward, Esq.,
Bursar,
Macdonald College, Que.

Dear Mr. Ward:

The invoices covering expenditures by the Institute of Parasitology, which have been audited by the Auditor General of Canada, have just been returned to us. I enclose, for your information, a copy of a letter which I have written to the Empire Marketing Board in this connection requesting a further payment from them.

You will note that in auditing, certain small errors were discovered which reduced the total credit of $14,920.08 to $14,918.75. I am asking Mr. Shaver, our Accountant, to send you a detailed explanation of this difference of $1.33, in order that your records may be complete.

I am enclosing Research Council cheque made out in favour of Macdonald College for the sum of $2,459.38, this being the balance due from the National Research Council in connection with expenditures incurred during the fiscal year just closed on March 31 last. This will leave you with an advance of $5,000.00 from the National Research Council to be applied on expenditures incurred during the fiscal year which began on April 1 last.

May I take this opportunity of congratulating you on the very great care and trouble which you and your staff obviously took in preparing the invoices covering last year's operations. Our Accountant after making his pre-audit prior to submitting them to the Auditor General remarked to me that they were one of the best set of invoices which he has ever received, and it gives me very great pleasure to pass his comment on to you and your staff, and to assure

you that we greatly appreciate your cordial co-operation in this and other similar grants with which we are mutually concerned.

Yours sincerely,

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

Hudson's Bay research

April 22, 1933.

Major General J.H.Macbrien, C.B., C.M.G., D.S.O.,
Commissioner, Royal Canadian Mounted Police,
O t t a w a . Ontario.

My dear General,

I am taking the liberty of sending by this mail a copy of the last McGILL NEWS, which contains an article on parasitology by Professor Cameron, Director of the Institute of Parasitology at Macdonald College.

Briefly, let me tell you that in the last three or four years Macdonald College of McGill University has begun investigation into this parasite question, and I am simply amazed at the amount of damage these parasites cause. No doubt even this small country loses many millions of dollars a year, due to this parasitic infection. They are found in abnormal numbers in cattle, horses, sheep, pigs, poultry and all other animals used in farming. But the damage does not stop there. All fur-bearing animals are infected; the birds of the air carry the infection from one place to another. The buffalo herds of the Western Plains are badly infected, and I am quite convinced that we have opened up here a problem of enormous importance to this country.

While the problem has been investigated for some years by R.L.Conklin, Professor of Animal Pathology and Veterinary Surgeon at Macdonald College, and much valuable preliminary work has been done, the Institute was only established last year. The Empire Marketing Board, the Dominion Research Council, the Agricultural Department of Quebec, have all co-operated in the establishment, equipment and staffing of the Institute. We have brought out from Scotland to be its Director, Professor T.W.M.Cameron, one of the most outstanding helminthologists in the British Empire.

I am now about to ask your co-operation in the work of this Institute, which it is our intention to make the outstanding Institute of Parasitology and Helminthology of the British Empire in the whole north temperate zone. We

Cannot afford to neglect the presence of these parasites in the fur-bearing animals of the north, but our difficulty is to get entrails of these animals for examination. May we hope to enlist the help of your force, the Mounted Police, in this work? You have your stations everywhere throughout this country, in Yukon, the Northwest Territories, Labrador, and it may be possible for them to shoot some of these animals and engage to send us such parts of the bodies as are necessary for laboratory examination. Dr. Tory, Chairman of the National Research Council, intends to speak to you, while Dr. Cameron is to give you a more detailed statement of what would be of use to him and how it is done. He tells me that in Scotland, where he came from, the police were of assistance to him in sending him samples from outlying districts. When the problem is presented to you in this detailed fashion, will you give it your sympathetic consideration? I should gladly answer or cause to be answered any questions you may have to ask.

Ever yours faithfully,

Principal.

Royal Canadian Mounted Police.

Office of the Commissioner.

Ottawa, April 26th, 1933.

Ref. No. 33 D 1589 Q 4.

Dear Sir Arthur:

1. I have received your letter of the 22nd April, with regard to the steps being taken in McGill to investigate the parasite question in Canada, and the desire of Professor T.W.M. Cameron to obtain entrails of fur-bearing animals of northern Canada for examination.

2. After perusal of your letter and the copy of the "McGill News" you kindly sent, I am of opinion that it would be well to acquaint Mr. H.H. Rowatt, Deputy Minister, Department of the Interior, with the information you have given me, so that the whole Government organization in the North West Territories and Yukon Territory may be brought to bear, and that the necessary permits, etc., may be given to the Police to obtain such specimens as you may require, without having to first secure licenses. The question of the cost of shipping out the entrails from remote points could also be considered.

3. Insofar as the North West Territories are concerned, the Deputy Minister of the Interior is the Commissioner of those Territories, and there is a Council, of which I am a member, which co-operates with him in deciding policies in those Territories, and I consider your plan would be effectively dealt with if you wrote to Mr. Rowatt along the same lines as you have given me for the consideration of the Council. I may add that I am quite willing for this Force to obtain such specimens as Professor Cameron desires, providing the North West Territories Council will co-operate.

4. Insofar as the Yukon Territory is concerned, this Force will also be willing to act with the Yukon Council if the Deputy Minister, Department of the Interior, will give the necessary instructions to that Council.

5. I am not sure whether the matter I shall now refer to is in connection with parasitology, but for several years past, considerable havoc has been wrought amongst sleigh dogs in the North West Territories, and this Force, as well as the North West Territories Council, has co-operated with the Department of Agriculture to endeavour to discover a preventative. The Department of Agriculture has done everything

possible to diagnose the case, but up to the present very little success has been achieved. This question is most important as without dogs in the winter, travel is almost impossible. I merely mention this in case it may be of use for investigation later, and as a means whereby the close co-operation of the North West Territories Council may be obtained.

6. Up to the present I have not heard from Dr. Tory, but you may rest assured that this question will have my personal sympathetic co-operation.

7; I have suggested your writing to Mr. Rowatt in order that this matter may be considered by the North West Territories Council for the further reason that the North West Territories Branch of the Interior also have their own employees in the far north, including medical doctors who no doubt would be of additional assistance.

8. If you agree with my suggestion it would prevent delay and would have the advantage of wider scope, and Professor Cameron's detailed instructions could be sent later to the North West Territories Council for transmission to the Police and the officials of the North West Territories, once a plan of operations has been decided upon.

Yours faithfully,

J.H. MacBrien

J.H. MacBrien,
Commissioner.

General Sir Arthur Currie, G.C.M.G., K.C.B.,
Principal and Vice-Chancellor,
McGill University,
Montreal, P.Q.

To Professor Cameron
Please note
and return,
A/4/33

INSTITUTE OF PARASITOLOGY

POSTAL ADDRESS:
MACDONALD COLLEGE P.O.,
QUE., CANADA.

McGILL UNIVERSITY
MONTREAL

First
May
1933

Sir Arthur W. Currie,
Principal,
McGill University,
MONTREAL.

Dear Sir Arthur:

I return herewith the letter from General MacBrien as requested. I am very grateful to you for the prompt and effective manner in which you have set this project going.

I am not quite sure what my next step should be as I have not heard from Dr. Tory yet: probably, however, contact should be made with the Deputy Minister of the Interior; probably, also, a letter from you would bear considerable more weight than one from me.

I am attending a meeting of the Science Division Committee of the Faculty of Graduate Studies on Wednesday at four o'clock and could, at the same time, bring with me a memorandum on the subject dealt with by General MacBrien, which, if you would be willing to do so, could be attached to your covering letter.

Yours sincerely,

Thomas W. Cameron

Tom Cameron
Northern Forest

May 3, 1933.

H. H. Rowatt, Esq.,
Deputy Minister of the Interior,
Department of the Interior,
O t t a w a .

My dear Mr. Rowatt,

I attach herewith copy of a letter written by me to Major General J.H.MacBrien, C.B., C.M.G., D.S.O., Commissioner, Royal Canadian Mounted Police, in which I asked for the co-operation of his force in helping the Department of Parasitology and Helminthology at Macdonald College, McGill University, to make a larger contribution to the solution of those problems with which that Institute can deal. In his reply, General MacBrien suggested that I write to you, as Commissioner for the Territories, in order that you might bring before your Council for decision such policies as might be inaugurated.

I am forwarding with this letter an appreciation of what the Institute of Parasitology has in mind, and I suggest that if you are willing Professor T. W. Cameron, Director of the Institute, proceed to Ottawa for consultation with you. McGill University will regard it as a favour if you will consent to discuss this matter with Professor Cameron.

Yours faithfully,

Principal.

H.H. ROWATT
DEPUTY MINISTER
ROY A. GIBSON
ASSISTANT DEPUTY MINISTER

11.

OFFICE OF
THE DEPUTY MINISTER OF THE INTERIOR
OTTAWA, CANADA

12th May, 1933.

My dear Sir Arthur:

I have your letter of the 3rd instant, enclosing a copy of one addressed to Major General J. H. MacBrien, C.B., C.M.G., D.S.O., asking for the co-operation of the Royal Canadian Mounted Police in the Arctic in connection with proposed studies in the Department of Parasitology and Helminthology at Macdonald College.

It is thought that this proposal might be advantageously discussed by the Inter-departmental Advisory Board on Wild Life Protection and a meeting has been arranged for Friday, the 19th instant. An invitation has been sent to Dr. Cameron to attend.

I am also having an item placed on the Agenda for the next session of the Northwest Territories Council, which will be held in two or three weeks' time. Council will have before it the Minutes of the meeting of the Wild Life Board and it may not be necessary for Dr. Cameron to attend.

I can assure you that we will be glad to co-operate in this matter to the fullest extent possible.

Yours very truly,

H. H. Rowatt

Sir Arthur W. Currie, G.C.M.G., K.C.B., Deputy Minister.
Principal and Vice-Chancellor,
McGill University,
Montreal,
Que.

May 16, 1933.

H. H. Rowatt, Esq.,
Deputy Minister,
Department of the Interior,
O t t a w a .

Dear Mr. Rowatt,

Let me thank you for your letter of the 12th of May, in which you say that the Northwest Territories' Council will be kind enough to consider at its next meeting the proposal of McGill University on behalf of its Department of Parasitology and Helminthology.

Ever yours faithfully,

Principal

H. H. ROWATT
DEPUTY MINISTER
ROY A. GIBSON
ASSISTANT DEPUTY MINISTER

OFFICE OF
THE DEPUTY MINISTER OF THE INTERIOR
OTTAWA, CANADA

10th June, 1933.

Dear Sir Arthur,-

Following the receipt of your letter of the 3rd ultimo, an invitation was extended to Professor Cameron to appear before the Advisory Board on Wild Life Protection and outline his proposals in the interests of the Institute of Parasitology.

A special meeting was convened for the purpose and the Minutes indicate that the Board was heartily in favour of the Institute carrying on whatever work it could in connection with the survey of parasites in northern Canada. It was suggested by one of our officers that a good start might be made if accommodation could be found for a qualified parasitologist to accompany the Eastern Arctic Expedition this summer. If this were done it would be possible to try out several proposed methods of collecting, preserving and shipping specimens. After determining the most economical method, the work could be extended each year and include particularly the Wood Buffalo Park and the Government Reindeer Station in the Mackenzie District, Northwest Territories.

These suggestions seemed to meet with Professor Cameron's own ideas. On his return to Macdonald College, and no doubt after discussing the matter with you, he made application for Dr. Ivan W. Parnell to join the Eastern Arctic Expedition, which is leaving Montreal on the "Nascopie" on the 8th July next. The application was favourably considered by the Northwest Territories Council and has been approved by the Honourable, the Minister of the Interior.

Our agreement with the Hudson's Bay Company provides for the transportation, meals, etc., for five scientists,

including.....

Sir Arthur W. Currie, G.C.M.G., K.C.B.,
Principal and Vice-Chancellor,
McGill University,
Montreal,
Quebec.

including the representative from the Institute of Parasitology, for the round trip from Montreal to Halifax, N.S. It is understood that Dr. Parnell will not be able to make the round trip but will disembark at Moosonee, Ontario. He will be expected to defray all expenses to Montreal and home from Moosonee.

I may say that the Department is particularly anxious to co-operate with the scientists and others interested in parasites insofar as they relate to the reindeer and commercial fur bearers in the Northwest Territories. It is hoped that in the present instance we will not only secure information of immediate value but will be paving the way for a more extensive study of the fur cycles and kindred subjects which it is believed have such a bearing on the economic resources of northern Canada.

Yours very truly,

Assistant Deputy Minister.

June 15, 1933.

R oy A. Gibson, Esq.,
Assistant Deputy Minister,
Department of the Interior,
Ottawa, Ont.

Dear Sir,

Let me acknowledge your letter of the 10th of June in which you tell me of the arrangements made with the Hudson's Bay Company for Dr. Ivan W. Parnell of our Institute of Parasitology to join the Eastern Arctic Expedition this summer.

McGill University is indeed grateful for the co-operation of the Department of the Interior in our study of parasitology problems, and I am quite sure that such co-operation cannot fail to result in a contribution which will extend considerably the economic resources of northern Canada. I feel that Dr. Parnell will be working not only in the interests of the Institute of Parasitology but that his presence on the Expedition will help to further the objects of the Department of the Interior.

Yours faithfully,

Principal

INSTITUTE OF PARASITOLOGY

POSTAL ADDRESS:
MACDONALD COLLEGE P.O.,
QUE., CANADA.

McGILL UNIVERSITY
MONTREAL

Thirteenth
June
1933

Sir Arthur W. Currie,
Principal,
McGill University,
MONTREAL, Que.,

Dear Sir Arthur:

I have today received from the Assistant Deputy Minister of the Interior, a copy of a letter which he has sent to you in reply to your letter of the 3rd May. Mr. Gibson's letter, I think, explains what has taken place subsequently. In amplification of it however, I think I should explain that Dr. Parnell will be absent from Montreal for July only and during this period he will be engaged in collecting material exclusively from Quebec. I hope that, following our general plan, we will be able to extend our activities in future years to include Ontario and the North West Territories. As a preliminary however, and as you suggested, I thought it would be advisable to confine our attentions to our own Province.

We will have no difficulty in meeting Dr. Parnell's Railway fare back from Moosonee.

It occurred to me also, that this trip might be of use to other Departments of the University and I am arranging for Dr. Parnell to collect material for the Entomology Department; if you think that any of the other Departments at Montreal would like animal material from those areas, we shall be only too happy to collect or arrange to have collected, all we possibly can.

I am informed that the other four scientists on the trip will include a Botanist, a Geologist, a Mineralogist and an Ethnologist.

In addition to this trip the Department of the Interior is arranging to have reindeer material sent to us

To Col Bovey
Investigate this
Arthur Currie
14/6/33

Bovey arranged with Fantham & Huskins & wrote Cameron.

13th June, 1933.

Sir Arthur W. Currie,

from around Churchill in view of the movement of those animals which is taking place towards the East, and the Police are hoping to be able to send more material from the Yukon.

None of this, of course, is interfering or supplanting in any way, our main researches in connection with parasites of domesticated animals; these are going forward exactly as we planned at the Meeting.

Yours sincerely,

Thomas W. Cameron

21st June 1933.

Dear Dr. Cameron:

Sir Arthur asked me to look into the suggestions made in your letter of the 13th.

I have spoken to Huskins, who will get in touch with you direct if he wants anything. I have the enclosed memorandum from Dr. Fantham.

As regards the toenets mentioned his paragraph one, he says that he may have one ready by the time you go.

If there are any questions arising perhaps you would be so good as to get in touch with him direct.

Yours sincerely,

Wilfrid Bovey.

Hudson Bay Survey

INSTITUTE OF PARASITOLOGY

POSTAL ADDRESS:
MACDONALD COLLEGE P.O.,
QUE., CANADA.

McGILL UNIVERSITY
MONTREAL

Twentyfourth
April
1933

Sir Arthur W. Currie,
Principal,
McGill University,
MONTREAL.

Dear Sir Arthur:

I enclose, as requested, a copy of a letter and memorandum on our proposed parasitological survey of the mammals of the Hudson Bay - Labrador area. As you will see, much of its success will depend on General MacBrian's sympathetic cooperation.

Yours sincerely,

Thomas W. Cameron

COPY

Twentyfourth
April
1933

Dr. H. M. Tory,
President,
National Research Council,
OTTAWA, Canada.

Dear Dr. Tory:

I attach hereto a memorandum on the proposed scheme for collecting material from the Hudson Bay - Labrador area: and I would be very grateful for any assistance from General MacBrian that you can obtain. I think his Department will be interested as both dogs, related wild carnivores and fur animals and their food animals are of great importance in the Territories.

As requested at the Meeting, I have sent a copy of this letter and memo. to Sir Arthur Currie.

Yours sincerely,

Proposed Investigation on the parasites of Dogs and other economically important Parasites in the Hudson Bay - Labrador Areas.

Little is known of the diseases affecting Dogs and other mammals in Arctic and sub-Arctic areas, although there are indications that parasites play a part of considerable importance. I have found Trichinosis in Arctic Foxes and Polar Bears: this parasite, of course, also occurs in Man, in whom it causes a very serious disease. There are also, a number of unconfirmed reports on the common prevalence of liver-fluke disease in dogs in these areas, while a considerable number of parasites have already been recorded from fur-bearing animals farther south in Canada.

The question of cyclical abundance of rodents and fur animals is also bound up with disease and preliminary enquiries show that parasites probably are very important factors.

It is undoubtedly of great scientific interest and may be of considerable economic importance to ascertain what parasites are present in these districts and I have to propose the following method of making a preliminary investigation.

A Government ship leaves Montreal early in July to cruise around these districts, returning here in September. It is proposed to forward in this ship a number of large dust-bins and a supply of formalin for preserving purposes. These dust-bins would be deposited at suitable points in the Territories, with a supply of formalin and detailed instructions for collection. Entire small animals and the viscera of large animals would be immersed in this preservative and the dust-bins would be collected a year hence, and be returned to Montreal for examination and report. Parasitic material would be examined here and other pathological material would be forwarded to interested laboratories (such as Dr. Watson's). In this way it should be possible to collect a considerable amount of material with an absolute minimum of expense and we would then be in a position to conduct further investigations on bionomics and give advice on prevention. I might add that this technique has already been employed by us in surveying the parasites of wild mammals in Scotland with considerable success - we obtained 64 different species of worm parasites there from a small country which has a negligible wild fauna; a number of these were found to be common to wild and domesticated mammals and were of great economic importance accordingly.

In order to carry out this plan, it will be necessary to secure authority to proceed and to secure the assistance of intelligent local collectors, such as medical men and police officials. Sir Wilfred Grenfell has promised, in general terms, what assistance he can give and I am in communication with him at present. I have asked him for the names of Medical Officers who might be willing to assist in this project (a copy of his letter is attached hereto. This will only cover a part of the area to be surveyed: and it will, I think, be necessary to secure the cooperation of the Royal Canadian Mounted Police for the remainder. The demands made on their time will be slight and the results obtained should be of considerable value to their Service and to the Dominion.

Excerpt from letter written by Sir Wilfred Grenfell to Dr. A. Gibson, Dominion Entomologist, Department of Agriculture, Ottawa, Canada.

"Also there is another matter that is of enormous importance to the whole of eastern Canada, and that is the diseases that affect our dogs periodically and the cyclical diseases that affect our fur-bearing animals and rabbits. I have seen Mr. Elton, here in Oxford, but I thought that probably you had some Government reports or the names of some books where I could begin some study of this, and perhaps collect facts through our doctors distributed along the Coast, as they have scientific abilities.

Mr. Alderdice, the Newfoundland Prime Minister, is very anxious to start sanctuaries for fur-bearing animals, and since by far their worst enemies are diseases and since very little has been done in the way of trying to rehabilitate some of the most valuable which are fast disappearing on the Labrador Peninsula, I want to offer such services as we can render on our coast for collating information that might be helpful."

Morin joins Committee

April 22, 1933.

Honourable Mr. A. Godbout,
Minister of Agriculture,
Department of Agriculture,
Quebec, P. Q.

My dear Minister,

It is a pleasure for me to tell you that at last we have an Institute of Parasitology at Macdonald College, well organized, and in good running order. Already considerable valuable results have been obtained from the investigations which have proceeded all winter.

The Committee consist of Dr. H.M.Tory, President of the National Research Council; Dr. Robert Newton, Director of the Biological Department, National Research Council; Dr. John Todd, who was for many years professor of parasitology at McGill University and who now lives at Ste.Anne de Bellevue; Dr. H.S.Barton, Deputy Minister, Department of Agriculture, Ottawa; Dr. A. E. Cameron; Professor T.W.M. Cameron, Director of the Institute; Dr. R. L.Conklin, professor of animal pathology, Macdonald College, and myself, with Mr. S.P.Eagleson of the National Research Council as Secretary.

It is the unanimous wish of this Committee, as expressed at the meeting held last Thursday afternoon, that the Department of Agriculture at Quebec be asked to nominate someone to sit as the Department's representative on this Committee. Dr.Tory, as Chairman, has written to you as well. I hope you will comply with the request of the Committee, for I can assure you that your representative will receive a warm welcome from us all.

Ever yours faithfully,

Principal.

DEPARTMENT OF AGRICULTURE
PROVINCE OF QUEBEC

OFFICE OF THE DEPUTY MINISTER

Quebec, April 28th, 1933.

Sir Arthur Currie, Principal,
McGill University,
Montreal, P.Q.

Dear Sir Arthur:

The Honourable Mr. Godbout directs me to acknowledge receipt of your letter of the 22nd instant, and to inform you that he will be in a position to answer you shortly.

Yours very truly,

J.-Antonio Grenier,
Deputy Minister of Agriculture.

MC.

Thorn joins Committee

COPY - For the information of - Sir Arthur Currie.

May 4, 1933.

Honourable Adelard Godbout,
Minister of Agriculture,
Quebec, Que.

Dear Mr. Godbout:

As you are probably aware, the work carried on in the Institute of Parasitology at Macdonald College is being financed jointly by the National Research Council and the Empire Marketing Board, and is being directed by the Associate Committee on Parasitology of the National Research Council. A list of the personnel of this Committee is enclosed herewith for your information.

Since your Department has contributed largely toward this work in providing capital expenditure for the Institute building, it is considered desirable that the Department should be represented on the Committee directing the work. Consequently, I have pleasure in extending to you at the request of the Committee an invitation to appoint a representative of your Department to serve as a member of the Associate Committee on Parasitology of the National Research Council.

Sincerely yours,

(Sgd.) H.M. TORY

President.

May 31st, 1933.

S. P. Eagleson, Esq.,
Secretary,
National Research Council,
O t t a w a .

Dear Mr. Eagleson,

As we agreed at the last Meeting of the Advisory Committee, I wrote to the Minister of Agriculture at Quebec, asking them to appoint a member of the Committee, and am now in receipt of his reply.

Mr. Adrien Morin, Head, Live Stock Branch, Department of Agriculture, Quebec, will join our Committee as their representative. Will you please send him notification and let him know when meetings are called?

Yours faithfully,

Principal

DEPARTMENT OF AGRICULTURE
PROVINCE OF QUEBEC

OFFICE OF THE DEPUTY MINISTER

Quebec, May 30th, 1933.

Sir Arthur Currie, Principal,
McGill University,
Montreal, P.Q.

Dear Sir Arthur:

As requested in your letter of the 27th instant, I am pleased to give you Mr. Morin's address, which is the following :

Mr. Adrien Morin,
Head, Live Stock Branch,
Department of Agriculture,
QUEBEC.

Yours very truly,

J.-Antonio Grenier,
Deputy Minister of Agriculture.

MC.

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, June 1, 1933.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir:

In Mr. Eagleson's absence, I wish to acknowledge receipt of your letter of May 31 advising that you have been informed by the Minister of Agriculture at Quebec that Mr. Adrien Morin will represent that Department on the Associate Committee on Parasitology.

Your letter will be brought to Mr. Eagleson's attention immediately upon his return to Ottawa, and in the meantime Mr. Morin's name has been placed in our records as a member of this Committee.

Yours very truly,

W. Laurtee
for Secretary-Treasurer.

WHC/DE

DEPARTMENT OF AGRICULTURE
PROVINCE OF QUEBEC

OFFICE OF THE DEPUTY MINISTER

Quebec, May 22nd, 1933.

Sir Arthur Currie, Principal,
McGill University,
Montreal, P.Q.

Dear Sir Arthur:

Pursuant to my letter of April 28th, I have the pleasure of informing you that the Quebec Department of Agriculture will be represented on the Associate Committee on Parasitology by Mr. Adrien Morin.

Yours very truly,

J.-Antonio Grenier,
Deputy Minister of Agriculture.

MC.

May 27th, 1933.

J. Antonio Grenier, Esq.,
Deputy Minister of Agriculture,
Department of Agriculture,
Quebec, P. Q.

My dear Mr. Grenier,

Let me thank you for your letter of the 22nd of May in which you are kind enough to advise me that the Quebec Department of Agriculture will be represented on the Advisory Committee on Parasitology by Mr. Adrien Morin. You might kindly let me know Mr. Morin's address, so that he may be sent notices of meetings. We shall be very happy to have arrepresentative of your Department associated with us on this Committee.

Ever yours faithfully,

Principal

CABLEGRAMS:
"MOUNTCLUB, MONTREAL."



Dec, 27th/31

Dear Sir Arthur,

Since you sent me the invitation, I shall be very glad to serve on the advisory committee for animal parasitology: you know the fixed opinion to which my experience has brought me viz.- that it is idle to spend research money

on buildings when most ample funds are lacking for salaries and, especially, for laboratory maintenance.

I am delighted that there is to be a department of parasitology + , judging from the programme outlined by your memorandum, funds for its permanent support.

I am,

Yours very truly,

J. W. Todd

Todd joins Committee

December 22nd,
1931.

Dr. John L. Todd,
Senneville, P. Q.

My deqr Dr. Todd,

I am enclosing herewith a little Memorandum on this Institute for Research and Parasitology. I spent last Tuesday afternoon at Macdonald College, discussing the project with Dr.Tory, Dean Barton, Dr. Conklin and others.

I found that Barton was very keen on the small separate building for this work, and I think his reasons are pretty sound. The Dominion Research Council and the Empire Marketing Board have guaranteed a grant of $50,000, to be paid in annual instalments during the next three years, and Dr.Tory tells me that it is the hope of the Empire Marketing Board to establish at Macdonald the Research Institute for the British Empire for the whole North Temperate Zone.

You will note in the memorandum that we propose the formation of a group to act as advisers in connection with this research and you will see your name set down as a member of that Committee. The purpose of this letter is to give you certain information regarding a project in which I know you are keenly interested and with which you are deeply sympathetic, and also for the purpose of getting your consent to serve on the Committee.

With all good wishes,
I am,
Ever yours faithfully,

Principal

May 18th, 1932.

Dean H. Barton,
Macdonald College, P.Q.

My dear Dean Barton,

Will you please send me an outline of the Research projects to be undertaken, as presented by Professor Conklin yesterday?

I would also like any suggestions you or Conklin might have for publicity. I think when we announce Cameron's appointment we should make as much of it as possible, and certainly we must not forget to keep Conklin well in the foreground.

Regarding the budget for the work, will you please not forget to have Ward send me an estimate of annual maintenance charges.

I am anxious to go over with you this proposed budget, and see what assurances we can give the Department, and I want Conklin's outline in order to enclose it in my letter to Cameron when I make acknowledgment of his acceptance.

Ever yours faithfully,

Principal.

May 20th, 1932.

Memorandum re Research in Animal Parasitology.

Initiation of Work at Macdonald College:

Previous to 1926 several departments had engaged in certain phases of parasite work at Macdonald College. This led to the recognition of the problem of entozoal diseases of domestic animals in Canada and elsewhere. The losses were known to be heavy but there was little definite information available because apart from some studies on parasites of foxes and on certain insect parasites, there had been no serious attempt to investigate the problem in Canada. In order that work undertaken might be coordinated and at the same time resources pooled, a committee of those interested was formed in the fall of 1926, when a joint project was initiated.

Development of the Work and Sources of Support:

A survey, made possible by assistance from the National Research Council, revealed the prevalence of poultry parasites in a large area of the province, and other investigations at the packing houses and elsewhere definitely indicated the extent of this problem. In a field so vast it became at once apparent that while progress might be accomplished with the resources available, plans should be made for a comprehensive programme.

The committee accordingly drew up a five-year programme for the investigation of the parasites of poultry, sheep and swine, to serve as a working plan and as a basis of appeal for financial support. Representations were made to the Empire Marketing Board, the National Research Council and the Quebec Department of Agriculture.

As a result of the negotiations which followed and the further development of the work at Macdonald College, support has been received from all three sources; the Quebec Department made a grant for the building required, while the Empire Marketing Board and the National Research Council are sharing a grant of $50,000.00, to be expended over a period of three years.

Work Accomplished:

The details of the work accomplished during the intervening period are contained in reports made to the National Research Council by Dr. Conklin and Dr. DuPorte, and in papers published by them and other members of the staff. Among the results obtained, the following may be mentioned: a technique for the infecting of birds and for the raising of pest-free birds has been developed; poultry parasites found in Quebec have been identified and described, the northern fowl mite has been discovered on wild birds and poultry and reported for the first time on the North American Continent; parasites infesting various species of wild birds in this locality have been determined; pathological conditions in the intestines of poultry, produced by worm infestation, have been described; "blackhead of fowls" formerly not thought to be an important disease in fowl has been demonstrated as the cause of serious losses in young chicks and associated with caecal worm infestation; an important fluke (flat worm), new to this continent and affecting sheep and fur-bearing animals, has been found in three Eastern provinces; a connective tissue parasite in horses has been found in Quebec and New Foundland; seventeen species of parasites, including ~~the~~ three new species, affecting mink have been determined; the presence of an intestinal fluke

of cattle, apparently causing considerable losses in Prince Edward Island is now under investigation. As the work has progressed every effort has been made to develop measures of control. It has now grown to the point where further staff are required and with the larger grants available it will be possible to develop the full programme.

Dr. Cameron

Dr. Conklin will be associated with Dr. Cameron in the further development of the work. Dr. Conklin is a man of wide experience and a recognized authority in his profession. He is an indefatigable worker, an original thinker and has several exceptionally find pieces of work to his credit as well as being particularly successful in his practice. He has taken a keen interest in the pathological and economic aspects of parasitology. The recent substantial progress in the work at Macdonald College has been accomplished largely through his personal efforts or under his immediate direction and his services will be invaluable in carrying on the project.

Correspondence re date of meetings

Nb. No minutes received of 2nd meeting in June.

Canada

NATIONAL RESEARCH COUNCIL

CABLE ADDRESS: "RESEARCH"

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, May 13, 1932.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir Arthur:

As I have been unable to find Dr. Todd's name listed in either the Montreal city or telephone directory, if you would have the enclosed letter notifying him of the meeting of the Committee on Parasitology at Macdonald College on Tuesday next forwarded to him, this favour will be greatly appreciated. I assume that Professor Todd has already been advised of his appointment to the Committee, as a representative of McGill University.

Yours sincerely,

A. Vaglsen.

Secretary-Treasurer.

SPE/DE

Canada

CABLE ADDRESS: "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, May 13, 1932.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir Arthur:

I am requested by Dr. Tory to advise you that a meeting of the Committee appointed to direct the programme of work to be carried out at the proposed Imperial Institute of Parasitology at Macdonald College, will be held in Dean Barton's office at Macdonald College on Tuesday, May 17 next, at 1.30 p.m.

Yours sincerely,

A. Ragleson.

Secretary-Treasurer.

SPE/DE

Canada

CABLE ADDRESS: "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, May 23, 1932.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir Arthur:

At the recent meeting of the Committee on Parasitic Research at Macdonald College, it was agreed that a further meeting of the Committee would be held at Macdonald College on Friday, June 17 next. Unfortunately, it has been found that the Colloid Symposium, which is meeting in Canada this year in our new research laboratories, is holding its sessions from June 16-18 inclusive, and it will, consequently, be extremely difficult for Dr. Tory to be at Macdonald College on the 17th of June. He has therefore asked me to inquire whether Monday, June 20, would be an equally convenient date for you and if not, whether you could suggest a date during the week beginning Monday, June 20, which would be convenient.

I am sending a copy of this letter to Dean Barton for his information, in order to ensure that any date which may be fixed may be satisfactory to him and to the members of his staff who may be concerned.

Yours sincerely,

A. C. Caplan.

Secretary-Treasurer.

SPE/DE

Canada

CABLE ADDRESS: "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, June 2, 1932.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir Arthur:

I wish to advise you that a meeting of the Associate Committee on Parasitology will be held in Dean Barton's office at Macdonald College beginning at 1.30 p.m. on Monday, June 20 next, since we are advised that this date is convenient for you and for Dean Barton and his staff.

Yours sincerely,

A. Vaughan

Secretary-Treasurer.

SPE/DE

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, October 26, 1932.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir Arthur:

I enclose herewith a copy of the proceedings of the third meeting of the Associate Committee on Parasitology, held at Macdonald College on September 30 last.

Yours sincerely,

S.P. Eagleson.

S.P. Eagleson,
Secretary-Treasurer.

acp

J

October 31, 1932.

S.P. Eagleson, Esq.,
Secretary-Treasurer,
National Research Council,
O t t a w a .

Dear Mr. Eagleson,

Let me thank you for the copy of the proceedings of the third meeting of the Associate Committee on Parasitology which I have noted.

Yours faithfully,

Principal.

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, January 11, 1933.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir Arthur:

I am requested to advise you that a meeting of the Associate Committee on Parasitology of the National Research Council will be held at Macdonald College on Tuesday, January 17 next. The Committee will meet at Macdonald College for lunch and the meeting will be held immediately thereafter.

Yours sincerely,

S.P. Eagleson.

S.P. Eagleson,
Secretary-Treasurer.

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, April 4, 1933.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir:

Dr. Tory is of the opinion that it would be advisable to hold a meeting of the Parasitology Committee at Macdonald College next week, and he has asked me to communicate with you and ascertain what date would best suit your convenience. Any day expect Tuesday would be satisfactory to Dr. Tory. It is suggested that as usual the meeting should be held immediately following lunch at Macdonald College. On receipt of your reply, I will notify the other members of the Committee.

Yours sincerely,

S.P. Eagleson.

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

April 5, 1933.

S. P. Eagleson, Esq.,
Secretary Treasurer,
National Research Council,
O t t a w a .

Dear Mr. Eagleson,

Next week it will be impossible to have a meeting of the Parasitology Committee:- Tuesday is inconvenient for Dr. Tory, Wednesday afternoon is Corporation meeting of McGill, and Thursday is Board of Governors meeting. Now we come to the next week, and I find no day convenient until Thursday (April 20th). Monday is Easter Monday. I am busy with Sir Arthur Salter here on Tuesday, going to a luncheon given for him by Vincent Massey on Wednesday, and will be free on Thursday. I am sorry, but it so happens there is a congestion of meetings and engagements.

Ever yours faithfully,

Principal

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, April 10, 1933.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

Dear Sir Arthur:

In accordance with the suggestion contained in your letter of the 5th instant, a meeting of the Associate Committee on Parasitology has been called for Thursday, April 20 next, at Macdonald College immediately after luncheon.

Yours sincerely,

S.P. Eagleson

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

Form 6123

CLASS OF SERVICE	SYMBOL
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Day Letter	D L
Night Message	N M
Night Letter	N L

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SIR ARTHUR CURRIE

PRINCIPAL MCGILL UNIVERSITY MONTREAL QUE

WOULD IT BE CONVENIENT FOR YOU TO ATTEND MEETING PARASITOLOGY COMMITTEE MACDONALD COLLEGE FRIDAY OCTOBER THIRTEENTH IMMEDIATELY FOLLOWING LUNCH

1219P S L EAGLESON

S.P. Eagleson, National Research Council, Ottawa

Friday October thirteenth will be convenient.

A.W. Currie

foned cpr oct.4

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, July 25, 1933

Sir Arthur Currie, Principal,
McGill University,
Montreal, Canada.

Dear Sir:

In Mr. Eagleson's absence on holidays, I am enclosing a copy of a letter which I have written to the Bursar of Macdonald College transmitting to him an advance which has just been received from the Empire Marketing Board, to be applied toward the work of the Institute of Parasitology. I have also sent a copy of this letter to Professor Cameron, for his information.

Yours sincerely,

(Miss.) E. F. Beach

for S. P. Eagleson,
Secretary-Treasurer.

KM
Enc. 2

July 25, 1933

Mr. T. Fred Ward, Bursar,
Macdonald College,
Quebec.

Dear Mr. Ward:

In Mr. Eagleson's absence on holidays, I wish to advise you that we have received, through the Bank of Montreal, a cheque in our favour for $4,895, the equivalent of £1000., to be used in connection with the Empire Marketing Board's grant to the Institute of Parasitology.

I have pleasure in enclosing a cheque in favour of the Bursar, MacDonald College for this amount ($4,895), $1,298.13 of which is to be used to close out last year's work and the balance to be regarded as an accountable advance in connection with the work for 1933-34.

In this connection, I am enclosing a copy of a letter dated June 28, which Mr. Eagleson received from the Empire Marketing Board before leaving on holidays, and which I think will furnish you with the necessary information regarding this grant.

Very truly yours,

E.S.E.

S. P. Eagleson,
Secretary-Treasurer.

KM
Enc. 2

COPY

EMPIRE MARKETING BOARD,

28th June, 1933.

Sir,

I am directed by the Chairman of the Empire Marketing Board to refer to your letter of the 18th May, 1933, enclosing a vouched and audited statement of expenditure amounting to $14918.75 incurred during the year ended 31st March, 1933, on the maintenance of the Institute of Parasitology at Macdonald College, McGill University.

In reply I am to inform you that one half of the expenditure i.e. $7459.38 has been accepted as a charge upon the Empire Marketing Fund. An advance of £1500 sterling, equivalent to $6161.25 was made in February last, and a balance of $1298.13 is accordingly due to the National Research Council.

It is noted that the Board's share of expenditure likely to be incurred during the half year ending 30th September, 1933, is estimated at about $4800. Arrangements have therefore been made for payment to the National Research Council through the Bank of Montreal of the sum of £1000. The amount by which the equivalent of that sum exceeds the payment of $1298.13 already due will be regarded as an advance in respect of the Board's share of expenditure during the half year ending 30th September, 1933.

I am, Sir,

Your obedient servant,

(Signed) Secretary.

The Secretary-Treasurer,
National Research Council,
Ottawa, Canada.

INSTITUTE OF PARASITOLOGY

FILE ON APPOINTMENTS

Correspondence between Macdonald College and University	pages	200-204
Correspondence between Research Council and University	"	206-211
Letter January 19th 1934 as to confirming understanding as to constitution of Committee	"	212

July 23rd, 1935

S. P. Eagleson, Esq.,
Secretary-Treasurer,
National Research Council,
Ottawa, Ontario.

Dear Mr. Eagleson,

Thank you for your letter of July 16th concerning the retirement of Dr. Tory and the Advisory Committee on Parasitology. I am making the necessary corrections in our Calendar.

Yours sincerely,

Registrar

Changes made
in Calendar
July 30/35

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, July 16, 1935.

T.H. Matthews, Esq.,
Registrar,
McGill University,
Montreal, P.Q.

Dear Mr. Matthews:

In reply to your letter of the 10th instant, I regret to confirm the information which you have received that Dr. Tory retired from the presidency of the National Research Council on June 1 last. He has been succeeded as president by Major-General A.G.L. McNaughton.

In reply to your inquiry, I may say that both the President of the National Research Council and the Principal of McGill University are members of this committee ex officio. Further, the President of the Council was, I understand, appointed Chairman of the Committee because of the fact that the work which the Committee directs is entirely financed through the National Research Council.

I trust that this will furnish the information which you require.

Yours sincerely,

S.P. Eagleson

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

215

SECRETARY AND BURSAR

McGILL UNIVERSITY
MONTREAL

July
Tenth
1934.

Lieut. Col. Wilfrid Bovey,
McGill University,
Montreal.

Dear Colonel Bovey:

I have much pleasure in informing you that the Governors of the University, at a meeting held on the 5th instant, appointed you a member of the Associate Committee on Parasitology at Macdonald College.

Yours faithfully,

A S Clarke

Secretary

214(a)
~~209~~

14th June 1934.

Dear Mr. Glassco,

At the next meeting of the Board of Governors will you note that the following additional names should be added to the Committee on Parasitology:-

Wilfrid Bovey
T. Fred, Ward
Dr. Lionel Stevenson, Provincial Zoologist, Ontario Veterinary Collete, Guelph.
S.P.Eagleson, Secretary-Treasurer of the National Research Council.

In connection with Dr. Stevenson's appointment, will you please note that the Institute serves the Province of Ontario as well as the Province of Quebec.

Yours faithfully,

Wilfrid Bovey.

A. P. S. Glassco, Esq.,
Secretary and Bursar,
McGill University.

14th June 1934.

Dear Dr. Tory,

I have your letter of June 11th and am pleased to note that you have concurred in our proposal as to appointments of Colonel Bovey and Mr. Fred. Ward on the Parasitology Committee.

We shall be pleased to do our part by formally appointing Dr. Stevenson and Mr. Eagleson.

Yours faithfully,

Chancellor.

Dr. H. M. Tory,
National Research Council,
Ottawa, Ont.

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, June 12, 1934.

Colonel W. Bovey,
McGill University,
Montreal, Que.

Dear Colonel Bovey:

I have pleasure in advising you that the National Research Council at its last meeting formally approved your appointment as a member of the Associate Committee on Parasitology. The Council also approved the appointment to the Committee of Dr. Lionel Stevenson, Provincial Zoologist, Ontario Veterinary College, Guelph; Mr. Fred Ward of Macdonald College, and of the undersigned.

Dr. Tory has written to Mr. Beatty requesting the concurrence of McGill University in these appointments.

Yours sincerely,

S. Eagleson.

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

213

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, January 19,1934.

T.H. Matthews, Esq.,
Registrar,
McGill University,
Montreal, Que.

Dear Mr. Matthews:

I have received your letter of January 5 concerning the personnel of the Parasitology Committee.

Regarding the nature of the Committee there is no question but that Sir Arthur and Dr. Tory were in agreement from the beginning that this is a joint committee of the Research Council and McGill University, and that appointments to the committee require the sanction of both organizations. This has always been done. The necessity for strictly observing this agreement is apparent on consideration of the respective contributions of the two organizations toward the work which this committee directs and controls. The Institute is located at Macdonald College and McGill University has provided the building, while the Research Council is paying the entire operating cost including salaries, equipment, supplies, light, heat, etc.

In the Research Council records this committee is classified as an Associate Committee merely because all external committees appointed by the Council are given this general title, in order to avoid a series of miscellaneous titles. From our point of view there is not the slightest objection to the committee being called a joint committee of McGill University and the National Research Council in your university records and calendar. In fact we think this would be preferable.

Regarding Professor Fantham, there unfortunately appears to be misunderstanding, as his name was not proposed by Sir Arthur for membership at any meeting of the committee or submitted to the Research Council in any form in this connection. Unquestionably he is not at present a member of the committee since his appointment has not been approved by both organizations. I am quite satisfied that there was no confusion whatever in Sir Arthur's mind on this point.

212

As a matter of fact there is already a precedent in which the Research Council nominated two persons for membership on the committee, one of whom was not satisfactory to McGill University. His name was immediately dropped and a person acceptable to both organizations substituted. v. p. 59

I trust that this explanation will make the present position quite clear and may be of service in preventing misunderstanding regarding this committee in the future.

Yours sincerely,

S.P. Eagleson.

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

January 22nd, 1934

S. P. Eagleson, Esq.,
Secretary-Treasurer,
National Research Council,
Ottawa, Ont.

Dear Mr. Eagleson,

I wish to thank you for your letter of the 19th of January concerning the Parasitology Committee and for the trouble you have taken to explain the situation.

Yours sincerely,

Registrar

COPY FOR THE INFORMATION OF - Colonel Bovey

January 19, 1934.

T.H. Matthews, Esq.,
Registrar,
McGill University,
Montreal, Que.

Dear Mr. Matthews:

I have received your letter of January 5 concerning the personnel of the Parasitology Committee.

Regarding the nature of the Committee there is no question but that Sir Arthur and Dr. Tory were in agreement from the beginning that this is a joint committee of the Research Council and McGill University, and that appointments to the committee require the sanction of both organizations. This has always been done. The necessity for strictly observing this agreement is apparent on consideration of the respective contributions of the two organizations toward the work which this committee directs and controls. The Institute is located at Macdonald College and McGill University has provided the building while the Research Council is paying the entire operating cost including salaries, equipment, supplies, light, heat, etc.

In the Research Council records this committee is classified as an Associate Committee merely because all external committees appointed by the Council are given this general title, in order to avoid a series of miscellaneous titles. From our point of view there is not the slightest objection to the committee being called a joint committee of McGill University and the National Research Council in your university records and calendar. In fact we think this would be preferable.

Regarding Professor Fantham, there unfortunately appears to be misunderstanding, as his name was not proposed by Sir Arthur for membership at any meeting of the committee or submitted to the Research Council in any form in this connection. Unquestionably he is not at present a member of the committee since his appointment has not been approved by both organizations. I am quite satisfied that there was no confusion whatever in Sir Arthur's mind on this point.

As a matter of fact there is already a precedent in which the Research Council nominated two persons for membership on the committee, one of whom was not satisfactory to McGill University. His name was immediately dropped and a person acceptable to both organizations substituted.

I trust that this explanation will make the present position quite clear and may be of service in preventing misunderstanding regarding this committee in the future.

Yours sincerely,

(Sgd.) S.P. EAGLESON
Secretary-Treasurer.

SPE/DE

210

January 5th, 1934

S. P. Eagleson, Esq.,
Secretary-Treasurer,
National Research Council,
Ottawa, Canada.

Dear Mr. Eagleson,

I wish to thank you very much for your letter of the 30th of December concerning the Parasitology Committee.

I fully share your regrets that there should be any misunderstanding concerning this committee, but I have just consulted Sir Arthur's file and feel convinced that he regarded it as a joint committee of the National Research Council and the University appointed by both institutions, rather than as a committee of the Council only. This seems to me to be implicit in the letters which he wrote asking the members originally suggested (other than those of the National Research Council) to serve, and in his letters to the Department of Agriculture asking them to appoint two members to the committee.

Professor Fantham, whom I consulted yesterday, certainly believes himself to be a properly appointed member of the committee, which seems to me to support my interpretation of Sir Arthur's attitude. I imagine that Sir Arthur intended to suggest Professor Fantham's name at the July meeting but forgot to do so, but the impression left in Professor Fantham's mind and the note to this office are evidence that Sir Arthur felt that the committee might add to its members and that the University might nominate new members directly.

This is apparently not the view taken by the National Research Council, so that I think it particularly desirable that the exact constitution of the committee should be settled. Whether Professor Fantham is or is not at the moment a member of the committee is a question that might lead to unpleasantness, so that I think you will agree that it is desirable that he should be elected, or re-elected, with every form of legality as soon as possible.

I hope that a little clarifying of the situation now may prevent any subsequent friction and enable the co-operation of the bodies interested to be complete and effective.

208

209 see 214(a)

It is simply with a desire to attain that end that this letter has been written.

Yours sincerely,

T.H. Matthews
Registrar

Canada

CABLE ADDRESS "RESEARCH"

NATIONAL RESEARCH COUNCIL

OFFICE OF THE SECRETARY-TREASURER

OTTAWA, December 30 1933.

T.H. Matthews, Esq.,
Registrar,
McGill University,
Montreal, Que.

Dear Mr. Matthews:

I wish to acknowledge receipt of your letter of the 29th instant, also a copy of your letter to Dr. Snell under the same date regarding the membership of the Associate Committee on Parasitology of the National Research Council.

With reference to the list of members of this Committee which appear in the proceedings of the fifth meeting of the Committee held on April 20 last, I may call attention to the fact that Mr. Adrien Morin of the Quebec Department of Agriculture and "the Dean or Acting Dean of Macdonald College" were appointed members of the Committee by the Research Council at a meeting held on July 14 last. The list contained in the fifth meeting was therefore correct at the date of that meeting although it has been definitely understood by all members of the Committee that Macdonald College has been entitled to be represented at all meetings of the Committee held since Dr. Barton's retirement as Dean, and has, consequently, welcomed Dr. Snell's attendance at the meetings.

I sincerely regret that there should have been any misunderstanding regarding the personnel of this Committee.

Referring to your letter to Dr. Snell, I note that you state that on instruction from Sir Arthur Currie the names of Mr. Adrien Morin and Professor H.B. Fantham were added to the list of members of the Committee and also that the name of the Committee was changed to "Advisory Committee" instead of Associate Committee. If Sir Arthur desired to have

Professor Fantham appointed a member of this Committee, I feel certain that the Research Council would gladly have taken the necessary action, but I do not recall that this appointment was ever suggested at any meeting of the Committee. He has not been appointed a member by the Research Council and is not on our official list of members.

With reference to the name of the Committee, I may say that all external committees appointed by the Council are called "Associate Committees." These, however, are of two general types, - those which have advisory functions only and those which are actively engaged in the direction of research work. In view of the fact that the Parasitology Committee has very definite functions both with respect to expenditures and in the fixing of the programme of the Institute of Parasitology, the Research Council has classed it as a Research Committee rather than merely an Advisory Committee, but the title "Associate Committee on Parasitology" as formally authorized by the Research Council is correct for all such Committees.

I am sending a copy of this letter to Dr. Snell for his information.

Yours sincerely,

S.P. Eagleson.

S.P. Eagleson,
Secretary-Treasurer.

SPE/DE

MACDONALD COLLEGE

McGILL UNIVERSITY

RAILWAY STATIONS AND EXPRESS:
STE. ANNE DE BELLEVUE, QUE.

POST OFFICE:
MACDONALD COLLEGE, QUE., CANADA

Jan. 3rd, 1933.?

Col. W. Bovey,
Director of Extra-Mural Relations,
McGill University,
MONTREAL, Que.

Institute of Parasitology

Dear Col. Bovey:

For your information, I quote excerpts from the minutes of the Proceedings of the Associate Committee on Parasitology, first meeting May 17th, 1932:

Organization.

"The Committee had under consideration the form of the organization which should direct the work of the Institute. Dr. Tory explained the procedure which has been followed by the National Research Council in the appointment of various Associate Research Committees, and suggested that an Associate Committee on Parasitology might be appointed by the Council, this to be a joint Committee on which McGill University, the National Research Council and the Federal Department of Agriculture could be represented.

The function of the Committee would be to supervise the research programme and to control the work carried on at the Institute, also to deal with questions relating to the financial and general administration of the work.

It was agreed that the work should be organized under a Committee such as outlined above, and that the personnel of this Committee, be approved as follows:

National Research Council - Dr. H.M. Tory - chairman
Dr. Robt. Newton

McGill University - Sir Arthur Currie,
Dean G. S. H. Barton
Prof. Cameron
Dr. R. L. Conklin
Dr. Todd

204

Col.Bovey - continued -

Department of Agriculture - 2 representatives to be nominated by the Department.

Secretary - S. P. Eagleson, Secretary-Treasurer, National Research Council Ottawa, "

from the minutes of the third meeting, held September 30th, 1932:-

Finances

"Attention was called to the fact that a contribution of $25,000. each from the National Research Council and the Empire Marketing Board to be used over a period of three years, beginning April 1st, 1932, would make available each year for the work of the Institute a sum of slightly more than $16,000."

Inasmuch as the Empire Marketing Board discontinued their support of this work as from September 30th last, Dr. Tory stated that the National Research Council would continue to make provision for the work on the same basis as heretofore.

I have consulted with Dr. Cameron and he has no information with regard to the late Principal having taken the matter up with the Carnegie people.

Mr. Eagleson, Secretary-Treasurer of the National Research Council informed me, when he recently visited the College, that the National Research Council would likely make arrangements to take care of the necessary funds for the carrying on of the work of the Institute of Parasitology for the balance of the term - i.e. three years as from the first of April, 1932.

I do not know that any arrangements have been made for the future of the Institute but I have no doubt but that the National Research Council will be able to arrange for permanent funds for this work.

Yours faithfully,

T. FRED. WARD,
Bursar.

TFW:WW

December 29th, 1933

S. P. Eagleson, Esq.,
Secretary-Treasurer,
National Research Council,
Ottawa, Canada.

Dear Mr. Eagleson,

My attention has been drawn by Professor Snell to discrepancies in the lists of the Associate or Advisory Committee on Parasitology as published in the Calendar of McGill University and in the Announcement of Macdonald College.

You will notice that the list given in the Proceedings of the Fifth Meeting of the Committee does not include the name of Professor Snell, who was at the meeting. The other change is, I think, covered by my reply.

Yours faithfully,

T.H. Matthews
Registrar

December 29th, 1933

Dr. J.F. Snell,
Acting Dean,
Faculty of Agriculture,
Macdonald College, Que.

Dear Dr. Snell,

I am sorry that the lists of the Parasitology Committee as given in your Anncuncement and in the Calendar do not agree.

The Committee as printed in the Calendar is given on Page 19 of the Proceedings of the 5th Meeting held at Macdonald College on the 20th of April published by the National Research Council, of which I expect you have a copy. To this list I was instructed by Sir Arthur to add the names of Adrien Morin, representing the Department of Agricultura of the Province of Quebec (see Page 6 of minutes) and Professor H.B. Fantham. I was also instructed that the Committee should be called the Advisory Committee and not the Associate Committee and Sir Arthur's secretary had previously made this alteration on Page 19 in his copy.

I am sending a copy of this letter to Mr. Eagleson.

Yours sincerely,

Registrar

MACDONALD COLLEGE

McGILL UNIVERSITY

RAILWAY STATIONS AND EXPRESS:
STE. ANNE DE BELLEVUE, QUE.

POST OFFICE:
MACDONALD COLLEGE, QUE., CANADA

FACULTY OF AGRICULTURE
OFFICE OF THE DEAN

December 28th, 1933.

Mr. T.H. Matthews,
Registrar,
McGill University,
Montreal, Que.

Dear Mr. Matthews:

I notice that on page 22 of the University Calendar the degree of M.A. instead of B.A. is associated with my name.

I note also that the Committee on Parasitology, described as Advisory Committee on page 29, does not coincide in personnel with the Associate Committee on Parasitology as given in the Macdonald College announcement on page 16. The list in the Macdonald College announcement is as given to us by Mr. Eagleson, the Secretary. I am not aware of the existence of any other Committee on Parasitology.

Yours faithfully,

J.T. Snell

Acting Dean.

JFS/Y

200

Take to Macdonald College.

Inter-department Correspondence

McGILL UNIVERSITY

Graduate Students

March 15, 1933.

Sir Arthur Currie,
Principal and Vice-Chancellor,
McGill University.

Dear Sir Arthur:

I enclose a statement as desired, of the scheme for graduate students working in the Department of Parasitology. This is forwarded for the consideration, and, as I hope, the approval of the Institute concerned.

The intention is to secure only first rate men who would materially assist in the carrying out of research in Parasitology of such a character as would be beneficial to the aims of the Institute.

Yours very truly,

A S Eve

Dr. A.S. Eve,
Dean, Graduate Faculty.

Enc.

April 22, 1933.

Dr. H. M. Tory,
President,
National Research Council,
O t t a w a .

My dear Dr. Tory,

As promised, I have written to the Department of Agriculture, asking for the nomination of a representative of theirs to serve on the Committee of the Institute of Parasitology. I have also written to General MacBrien regarding any assistance to our work which can be given by the Northwest Mounted Police.

But my particular reason for writing to you at this moment is to tell you that at our meeting last Thursday I neglected to bring forward a proposal for graduate students working in the Department of Parasitology. This proposal was forwarded to me by Dr. Eve, Dean of the Faculty of Graduate Studies and Research of McGill, and I was instructed to bring it to the Institute Committee for their consideration and approval.

The intention is to secure only first rate men who would materially assist in the carrying out of research in parasitology of such a character as would be beneficial to the aims of the Institute. I am very sorry that I overlooked this matter.

Will you examine it and tell me if you think we may take a chance on inserting this in our Announcement of the Faculty of Graduate Studies and Research?

Ever yours faithfully,

Principal

NATIONAL RESEARCH COUNCIL
CANADA

CABLE ADDRESS: "RESEARCH"

OFFICE OF THE PRESIDENT

OTTAWA April 26, 1933

Sir Arthur W. Currie, G.C.M.G., K.C.B.,
Principal and Vice-Chancellor,
McGill University,
Montreal, Canada.

My dear Sir Arthur:

I have your letter of April 22nd.

I have gone over the suggested course for graduate study and think it is quite all right. Cameron had a talk with me about this some time ago and I told him I did not think it would be wise to undertake an organization for formal lectures, but he assured me that the teaching would be carried on by seminars and that it would not interfere seriously with his time; and further, that the progress of research, by the extra work we would thus be able to do, would more than compensate for his loss of time. You are at liberty therefore, so far as I am concerned, to go ahead with the plan.

I was pleased to see what I thought was a better temper on the part of Conklin. I hope from now on things will run smoothly between him and Cameron. The more I see of Cameron, the more I am impressed with his good sense and wisdom. I think he will completely justify the confidence that we have shown in him.

Sincerely yours,

H. M. Tory, President.

HMT:KM

27th April 1934.

My dear Steel,

With reference to our correspondence as to the Parasitology broadcasts, there has apparently been some difficulty and a good deal of delay over this matter previously.

Unfortunately, Dr. Parnell, who was actually in charge of the work in Northern Quebec, is now away and in his absence it will be impossible to get the new broadcasts written before May 12th.

Yours sincerely,

Wilfrid Bovey.

Colonel W. A. Steel, M.C.,
Canadian Radio Broadcasting Commission,
Ottawa, Ont.

INSTITUTE OF PARASITOLOGY

POSTAL ADDRESS:
MACDONALD COLLEGE P.O.,
QUE., CANADA.

McGILL UNIVERSITY
MONTREAL

Twenty-sixth
April
1934

Col. W. Bovey,
Department of Extra-Mural Relations,
McGill University,
MONTREAL.

Dear Colonel Bovey:

First of all, may I thank you very much indeed for the excellent lunch and very nice time you gave me on Saturday. I enjoyed it immensely.

Secondly, with reference to Col. Steel's letter, I think it is too late for the broadcasts to be effective and in any case, I could not split the message up in Parnell's absence, as I do not know the people up north. If, however, the C.R.B.C., had made this suggestion when the message was first sent in last Fall, I am sure it could have been done.

With many thanks for your help in this connection.

Yours sincerely,

Thomas W. M. Cameron

CANADIAN RADIO BROADCASTING COMMISSION

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LT.-COL.W. ARTHUR STEEL, M.C.

File 64-5-1

Ottawa, April 18, 1934.

Wilfrid Bovey, Esq.,
Department of Extra-Mural Relations,
McGill University,
Montreal, P.Q.

Dear Mr. Bovey:-

I have received your letter of April 11 together with a message consisting of the examination of parasites. It will be a pleasure for us to broadcast same in the Northern messages. However, I must inform you that these messages must be as short as possible. I would therefore ask that some deletions be made in your enclosed report, due to the fact that the time of this broadcast is relatively short.

Yours very truly,

Thomas Maher

Vice-Chairman.

11th April 1934.

Dear Mr. Maher,

You may be aware that during the last few years an Institute of Parasitology has been established at Macdonald College by the Research Council, the Government of the Province of Quebec and this University. The work of the Institute consists in the examination of very numerous parasites existing throughout Canada and causing very large losses among animals and livestock of all kinds, as well as attacking human beings.

One of the districts which suffers particularly is the Arctic area. Last year an officer of the Institute visited the Eastern Arctic and a great deal of material brought back by him or sent in to us afterwards has now been examined. The Director wishes to get a report out at once. A written report can only be sent by the Nascopie, but the Director has prepared a radio report which could be given in a very few minutes. Owing to the extreme importance of the matter in question to the people of the Arctic, we should be grateful if you would arrange to have this message sent out in as efficient a manner as possible.

Faithfully yours,

Wilfrid Bovey.

Thomas Maher, Esq.,
Canadian Radio Broadcasting Commission,
Ottawa, Ont.

INSTITUTE OF PARASITOLOGY

POSTAL ADDRESS:
MACDONALD COLLEGE P.O.,
QUE., CANADA.

McGILL UNIVERSITY
MONTREAL

Fourth
April
1934

Col. W. Bovey,
Department Extra-mural Relations,
McGill University,
MONTREAL.

Dear Col. Bovey:

I asked the Canadian Broadcasting Commission to broadcast the enclosed message to the North. They refused as they were restricting their messages to short personal affairs. Do you think anything could be done about it with C K A C in Montreal? I am very anxious that it should be sent as it will affect the amount of material we shall receive. Moreover, a number of the people up North asked Parnell to have it sent, and I do not want them to think we have let them down.

Any help you can give will be appreciated.

Yours sincerely,

Thomas W. McLaren

10th February 1934.

Dear Dr. Tory,

I thank you for your letter of February 8th with enclosure.

A few days ago Mr. B. W. Taylor, who is in charge of fish culture for the Province of Quebec, as well as being on our staff, came to me concerning the possibilities of co-operative work between his department in the Provincial Government and the University. As Parasitology was mainly concerned, I took him out to Macdonald and put him in touch with Dr. Cameron.

What will come of it I do not know, but I shall keep you advised.

Faithfully yours,

Wilfrid Bovey.

Dr. H. M. Tory,
National Research Council,
Ottawa, Ont.

23rd January 1934.

Dear Dr. Tory,

On Sunday last I had an interview with the Honourable W. J. P. MacMillan of Prince Edward Island. During the course of this I mentioned Dr. Cameron's approaching visit, his project of establishing local parasitologists in various provinces and the investigation concerning fox genetics in Prince Edward Island. Dr. MacMillan said that he would be very glad indeed to see Dr. Cameron when he visited the Island in March and discuss the whole matter with him. He said it would be quite impossible to appoint any geneticists on their own, but he thought they would be willing to join with the other Maritime Provinces in naming one.

He has a very definite idea of the importance of the subject and I am sure that Dr. Cameron will find in him a very sympathetic listener.

Faithfully yours,

Wilfrid Bovey,
Director.

Dr. H. M. Tory,
National Research Council,
Ottawa, Ont.

Leiper joins Committee

NATIONAL RESEARCH COUNCIL
CANADA

CABLE ADDRESS: "RESEARCH"

OFFICE OF THE PRESIDENT

OTTAWA June 10, 1933.

Sir Arthur Currie,
Principal,
McGill University,
Montreal, Que.

My dear Sir Arthur:

We have received a letter from Dr. Leiper accepting appointment to the Associate Committee on Parasitology, a copy of which I enclose.

Sincerely yours,

R. W. Boyle

R.W. Boyle,
Director, Division of Physics &
Engineering - For President.

noted
L.S.R.

C O P Y

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

Keppel Street
(Gower Street)
London, W.C.1

30th May, 1933.

Dear Dr. Tory:

I am sorry to say that your letter of 23rd February inviting me to become a member of the Associate Committee on Parasitology of the National Research Council of Canada, arrived during my absence on Easter vacation and, with certain other letters, has been overlooked. I consider it a very great honour to be associated with the development of the Institute of Parasitology at the Macdonald College to the Directorship of which Dr. Cameron, a former colleague of mine, has been appointed.

Canada offers a very fine field for helminthological research and I believe that the Institute under Cameron's direction will make great strides. Recent developments of helminthological centres in Australia and Canada have taken place through the encouragement of the Empire Marketing Board and it is my hope that the Imperial Bureau of Agricultural Parasitology may become a useful bibliographical centre for all these new activities.

Yours very sincerely,

(Sgd.) R.T. LEIPER

Dr. H.M. Tory,
National Research Council,
Ottawa, Canada.

Journals.

MACDONALD COLLEGE

McGILL UNIVERSITY

RAILWAY STATIONS AND EXPRESS:
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POST OFFICE:
MACDONALD COLLEGE, QUE., CANADA

INSTITUTE OF PARASITOLOGY

Nineteenth
January
1 9 3 3

Sir Arthur W. Currie,
Principal,
McGill University,
MONTREAL.

Dear Sir Arthur,

"Journal of Parasitology,"

You will recall that at the meeting on Tuesday I brought up the question of the Institute acquiring the back numbers of the "Journal of Parasitology," which would cost $95. Dr. Todd, who presented the existing set of the journals to the Medical Library on his retirement, suggested that the set should be placed on loan at this Institute, where, of course, as in the case of the other periodicals and books in our possession, they would be available to any member of the University requiring access to them. The matter was referred to you to see what arrangements could be made.

If the back numbers can be placed on loan here, we shall be responsible for all future numbers, thus saving the University $3.15 per annum.

This journal is the only American journal devoted entirely to parasitology, and its back numbers are in almost daily requirement by members of our staff. It is little used elsewhere, and as it is practically a necessity that we should have easy access to it, it seems a pity to spend $95. if an arrangement can be made with the Medical Library.

The other periodicals devoted to parasitology in the libraries at McGill are not in such constant demand here, as they are mainly concerned with

Arranged as far as possible
Several duplicate volumes are going to Macdonald
Remainder cannot be sent as we have only one complete set and it is needed here

Mal Morey
Follow this up please

Sir Arthur W. Currie,

European and tropical forms; accordingly our present arrangements for consulting them should suffice, but you will, I think, realize the necessity for our possession of those dealing with the North American forms.

Yours very sincerely,

Thomas L. M. Cameron.

1914-1922 complete

9 vols to 1923

$1.80 per vol.

John Wolever

June 21st, 1932.

Mr. C. F. Wylde,
Medical Library,
McGill University,

My dear Dr. Wylde,

You know that at Macdonald College we have established an Institute of Parasitology, and one matter that concerns us is the scarcity of literature in our Library there.

I have asked Professor Conklin to see you and Professor Simpson to discuss what can be done for the loan from our Medical Library of suitable works, journals, etc. to Macdonald.

Dr. John Todd, formerly on our staff, is on the Committee out there, and in discussing this matter at a meeting, he ventured the opinion that his library, which he gave to McGill, would probably be of more use out there than here just now. If that is so, it might be transferred on permanent loan to the Institute of Parasitology at Macdonald, and such volumnes re-loaned to the Medical Library as may from time to time be required.

I am bespeaking for the Institute a favourable measure of co-operation on the part of the Medical Library here.

Ever yours faithfully,

Principal

Presence of the Lancet Fluke, *Dicrocoelium dendriticum* (Rudolphi 1819), in Canada

R. L. Conklin
and
Alex. D. Baker
Macdonald College, McGill University, Canada

Issued October 4, 1930

Reprinted from the Journal of Parasitology
September, 1930, Vol. XVII, pp. 18 and 19

Printed and Published in the United States of America

PRESENCE OF THE LANCET FLUKE, *DICROCOELIUM DENDRITICUM* (RUDOLPHI 1819), IN CANADA

R. L. Conklin
AND
Alex. D. Baker
Macdonald College, McGill University, Canada

On December 1, 1929, specimens of sheep livers were received from the Lake St. John region of Quebec. The animals were reported as having had "liver trouble" and of five sheep three had died. Flukes were located in large numbers in the sheep livers and the parasite identified as *Dicrocoelium dendriticum* (Rudolphi 1819). The five infested sheep had been brought in from Nova Scotia. The two surviving sheep were slaughtered after diagnosis of the trouble had been made. The same species of fluke, as above, was later found and identified from a section of sheep liver received from Nova Scotia on December 16, 1929. On March 10, 1930, examination of a carcass of a mink received from Prince Edward Island disclosed the presence of the same parasite as noted above.

In the liver, gall bladder, pancreatic duct and duodenum the parasites were present in large numbers. The livers were enlarged and at the pole more spongy than cirrhotic.

DESCRIPTION OF PARASITE

Small trematode, body pointed anteriorly and posteriorly; attenuated anteriorly, and the greatest breadth usually behind the middle of the body; length 5.1 to 7.0 mm. and breadth 1 to 1.4 mm. Oral and ventral suckers present. Ventral sucker same size as oral sucker or slightly larger (0.3 mm.); two suckers separated from each other by about one fifth length of body (by same distance as the length of the vitellaria). Surface of body smooth. Intestine divides anterior to the genital pore; intestinal ceca about three fifths of body length, broadening rather slightly at their free ends. Testes two in number, smoothly indented, and lying obliquely behind the ventral sucker; posterior testis usually slightly the larger (0.4 to 0.55 mm.). Vasa deferentia run forward to cirrus pouch from anterior margins of testes. Ovary single, considerably smaller than testes (0.2 mm.); it approaches the median line behind the posterior testis and is not indented on its margin in the same manner as the testes. Vitellaria (yolk glands) double, commencing posterior to

caudal margin of second testis and terminating near commencement of slight swelling of distal ends of intestinal ceca; with fingered outline on both ental and ectal margins. The conspicuous uterus is situated behind the ovary, filling most of the body caudad to that organ; with many transverse coils sent out to the lateral fields. The uterus finally terminates in a narrow tube which runs forward, between the two testes, to the ventral sucker and terminates at the genital pore. Cirrus and cirrus-pouch located slightly anterior to ventral sucker. Seminal receptacle present, located caudad to ovary and slightly to one side. Shell gland present on median line behind ovary. Laurer's canal distinct. Eggs of parasite thick shelled and varying in color according to age; when young they are yellowish and when older dark brown. The eggs are oval, operculated at one end and frequently flattened on one side; size 0.3 to 0.4 mm. by 0.15 to 0.2 mm.

In addition to localities cited herein, this fluke has been recorded as occurring in Germany, Italy, Africa, Siberia, Turkestan, Egypt, Algeria, and South America. The parasite has not previously been recorded as occurring in Canada or the United States. It has been previously reported from man, ox, ass, goat, horse, deer, hare, rabbit, sheep and pig. Species of snails (*Planorbis*) have been suspected as the intermediate hosts of this fluke.

The identification of this fluke was confirmed by the Bureau of Animal Industry, Department of Agriculture, Washington, D. C., to whom we are continually indebted for many services.

THE

JOURNAL OF PARASITOLOGY

A Quarterly Devoted to Medical Zoology

The JOURNAL OF PARASITOLOGY, published quarterly, is a medium for the prompt appearance of briefer papers and notes on Animal Parasites whether Protozoa, Vermes, or Arthropoda, concise technical notes of interest to parasitologists, and brief reviews of monographs and books. It is controlled and published by an Editorial Board of scientific men in the interest of the field of medical zoology. The latest studies on diseases caused by animal parasites are given to our readers. A unique and valuable item is the list of brief references to all new species of human parasites, printed immediately upon the appearance of the original papers.

The JOURNAL asks the support and cooperation of all interested in the field of Parasitology. Appropriate manuscripts and helpful suggestions will be welcomed by the Editorial Board.

Subscription price, $3.00 a Volume; Canada, $3.15; Foreign, $3.25. Single numbers are not for sale.

The edition of Volume I, No. 1, is exhausted but Nos. 2, 3 and 4 will be sold as long as the supply lasts for $1.00 each. Volumes II to VII, inclusive, $3.00 each.

All business communications should be addressed to

HENRY B. WARD, Managing Editor
Urbana, Illinois

MACDONALD COLLEGE LIBRARY

COMMON ANIMAL PARASITES INJURIOUS TO SHEEP

in Eastern Canada



Common Animal Parasites Injurious to Sheep in Eastern Canada



Figure 1.

These lambs were the same age when the photo was made. The large lamb came from a flock that has been protected against worms. The flock from which the small lamb came received no treatment to prevent worm infection. The cost of treatment is less than 5 cents per head.

Published under the auspices of the Eastern Canada Society of Animal Production, as a contribution from the Committee on Animal Health.

Members of the Committee on Animal Health:
DR. A. E. CAMERON, *Chief Inspector Health of Animals Branch, Ottawa;*
DR. R. L. CONKLIN, *Macdonald College, Quebec;*
DR. LIONEL STEVENSON, *Department of Agriculture.*

Manuscript prepared by Dr. Lionel Stevenson, Department of Agriculture, Toronto, Ontario

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FOREWORD

The well cared for sheep flocks in Canada, that is, those sheep that are given the protection of suitable buildings, abundant good feed, a frequent change of grazing ground and a suitable vermifuge at regular and appropriate intervals, should suffer but little from parasitism. Unfortunately many of the flocks do not receive the necessary care, but are left to shift for themselves under conditions that favor the advance of parasitism. We see all degrees of neglect in the care of sheep flocks and consequently we have all degrees of parasitism, from the "just noticeable" down the scale to "utter ruin" of the flock. Hence we see many flocks that pay but little profit to their owners. These worm-ridden flocks are often sold to farmers that are quite inexperienced in sheep husbandry. The sheep carry the parasites with them to their new home, and in spite of the change to new ground, the infestation is as heavy as ever at the end of a three year period. Under such conditions the inexperienced sheep farmer becomes discouraged and looks for a remedy or an outlet. Unless the sheep farmer has a knowledge of the numerous parsites and their life history, he is unable to institute methods of sheep management that will reduce and control the worm handicap. Internal parasites work in an insidious way, they are hidden from view, and unsuspected they carry on their destructive and parasitic existence. They have become increasingly numerous, until today but few flocks escape their ravages. The internal parasites take the sheep's blood, they take the sheep's food, they destroy the sheep's tissues and organs, they irritate the sheep beyond endurance, they poison the sheep with their toxins and they work hand and hand with disease producing germs to create conditions that bring the unfortunate parasitized animal down to its death. The work of the breeder and feeder is frequently defeated, due to the presence of parasites and the lack of the application of the principles of control.

Many thousands of lambs have perished needlessly on the farms of Eastern Canada during past years. Many thousands of lambs too light for slaughter reach the stockyards each year, between September and December, to be returned to country points for further feeding. These feeder lambs are light because of parasitic infestation, and represent a large loss to the industry in that they must be fed for an additional period. About twenty percent of the Eastern feeder lambs die between November and March, and those that survive make a very inferior carcase. A type of carcase is produced that can never make a "roast of lamb" popular on the dinner table. Many shipments of inferior wool go forward to the markets each year, gathered from sheep that have been left to suffer the misery caused by keds, lice and worms. Such parasitized sheep yield but three or four pounds of fleece and frequently abort their lambs, or produce a lamb that is too weak to live. It is to change this picture and help the sheep industry of Eastern Canada, that this bulletin is written.

SUSCEPTIBILITY OF SHEEP TO PARASITISM

In the struggle for existence parasites flourish where conditions favor them most. The body of the sheep offers so much that is essential to the well being of many of the lower forms of animal life, that no less than fifty-eight distinct parasitic creatures attack it successfully unless control measures are instituted by the shepherd.

The thin skin, well nourished by blood and carrying a warm covering of wool, offers a bountiful and well protected feeding ground, to the surface feeding parasites as ticks, keds, lice and mange mites. The blood vessels and skin supply the necessary nourishment to the parasites. The wool makes a well protected home in which countless generations of young parasites can be reared from very small beginnings. The wool of the sheep is a dense medium from which it is quite impossible for the sheep to cause dislodgment of the parasites. In this regard the sheep is at a greater disadvantage than the other domestic animals, the bodies of which are covered with a coating of hair that is shed twice a year along with its attached inhabitants.

The alimentary tract of the sheep, particularly the stomach, the small intestine, and the large intestine with their moisture, even temperature, wealth of digested food and vascular easily penetrated lining membrane, offer conditions highly satisfactory to the growth of the stomach worm, the hook worm, the tape-worm, the nodular worm and the whip worm. The lungs with their spongy delicate tissue, richly supplied with blood and lymph, offer a home that fills all requirements demanded for the growth of the three varieties of lung worm attacking sheep.

The practice of herding sheep in flocks or large bands, in buildings, enclosures or on the ranges that have been long used for sheep, expose them to the accumulative affect of the parasitic plagues. The continual mixing of the infested individuals with the other sheep that are susceptible tends to bring about a like condition of infestation throughout the flock.

(The failure of many stockmen to destroy the carriers of parasites, usually the poorer individuals, has done much to bring about the continued increase of sheep pest in this country.) The susceptibility of the sheep is so great and the parasitic trouble so wide spread, that very few lambs escape infestation. Parasites make miserable runty lambs and hard "ratty" looking sheep, that can neither be a pride nor a profit to any self respecting farmer.

PROTECTING THE FLOCK

The common knowledge that hill land is the best for sheep, is explained by the fact that the lower moist lands, offer more favorable conditions for the incubation of the eggs of the various worms that are parasitic on the sheep. Such lands with their more luxuriant vegetation also offer protection to a greater degree, to the young worms until they reach their host animal. On the hills the winds and the rain move a large part of the worm eggs to the lower areas, thereby concentrating the infective principle on the low ground. The scant vegetation of the hill lands permits the drying out influence of the sun's rays to create conditions unfavorable to the continued life of the worm egg and the young worm. The lower areas have shallow pools or swampy places formed by the water draining away from the higher areas. This drainage or surface water very frequently contains countless thousands of infective worm eggs or larva, and the lamb or sheep drinking such water is taking all the risks leading to worm infestation. Pasture fields on which small pools of water form after a rain are a source of danger, as the sheep will drink from such pools.

Sheep should be supplied with pure drinking water, preferably from wells and delivered into troughs that are well above the ground surface. Drinking from swift running creeks or springs offers but little danger of infection, but care should be taken to keep the sheep and lambs away from stagnant pools and ditch water.



Figure 2.

"Worms made the difference." Treatment costing less than 5 cents would have saved this lamb. It pays to treat the flock spring and autumn and to change the pasture frequently.

The old pasture lots, laneways, yards near buildings and old orchard lands that have been grazed by sheep for many years are responsible for much of the parasitic infection in sheep, as such old grounds are usually heavily seeded with the eggs of the various worms. Each "wormy" sheep is a spreader of worm eggs. Worm eggs and larvae are resistant to weather conditions and retain life for a considerable time. The blades of grass become contaminated with the young worms, and the sheep or lamb nibbling the grass will take them up not knowing the danger. The cleft lip of the sheep permits it to graze close, but the position of its eyes do not permit it to see just what it is taking into its mouth, therefore many encysted larva on grass or in the bodies of snails, beetles or flies are taken in and pass to the stomach of the sheep to be released there and start their life of parasitism.

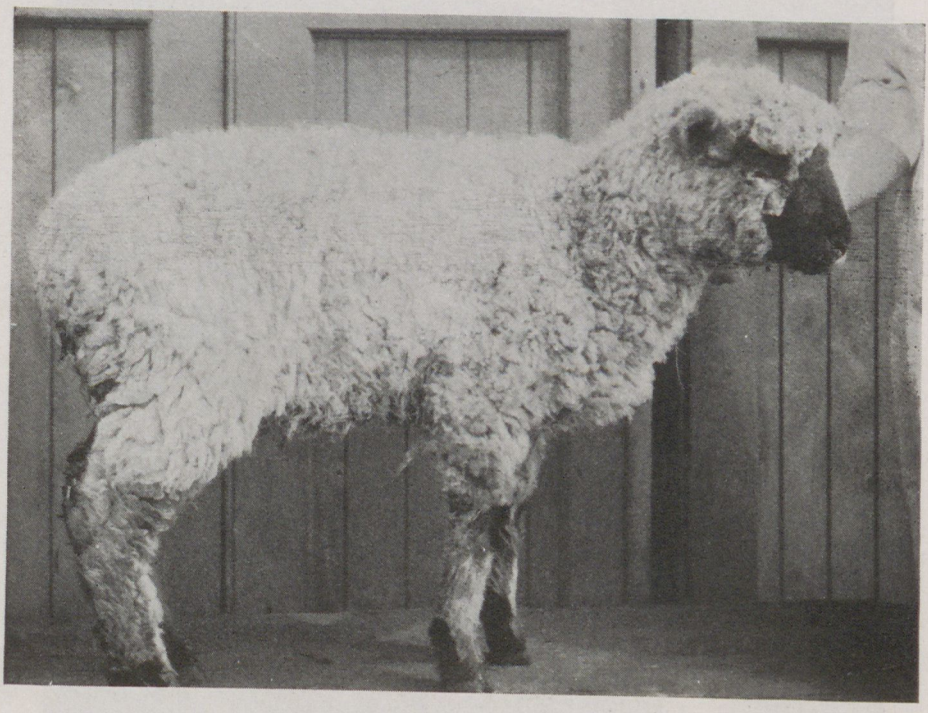

Figure 3.

A light feeder lamb. Thousands of light lambs go to market each year. Worms are responsible for this condition. The subject of the photo was infected with five varieties of internal parasites.

Young animals suffer most. The young lamb is a tender animal and its tissues are easily injured by worm infestation. For this reason the lamb should be given a chance to keep free of parasites by allowing it to graze

on land that has not been contaminated by the droppings of "wormy" sheep. A lamb born of a "wormy" mother and permitted to graze over the same ground stands an excellent chance of being "wormy". Pollution of grass land comes quickly, as one sheep heavily infested with the common worms may distribute over the pasture on which she walks, as many as 10,000,000 worm eggs a day. Such wholesale "seeding down" of pastures, will indicate the necessity of frequent change of grazing ground, the resting of old pastures, the use of forage crops, the use of new grass seeding, the use of the dry lot method of rearing lambs, the use of vermifuges to destroy worms as well as the use of care and judgment in the purchase of either breeding or feeding sheep.

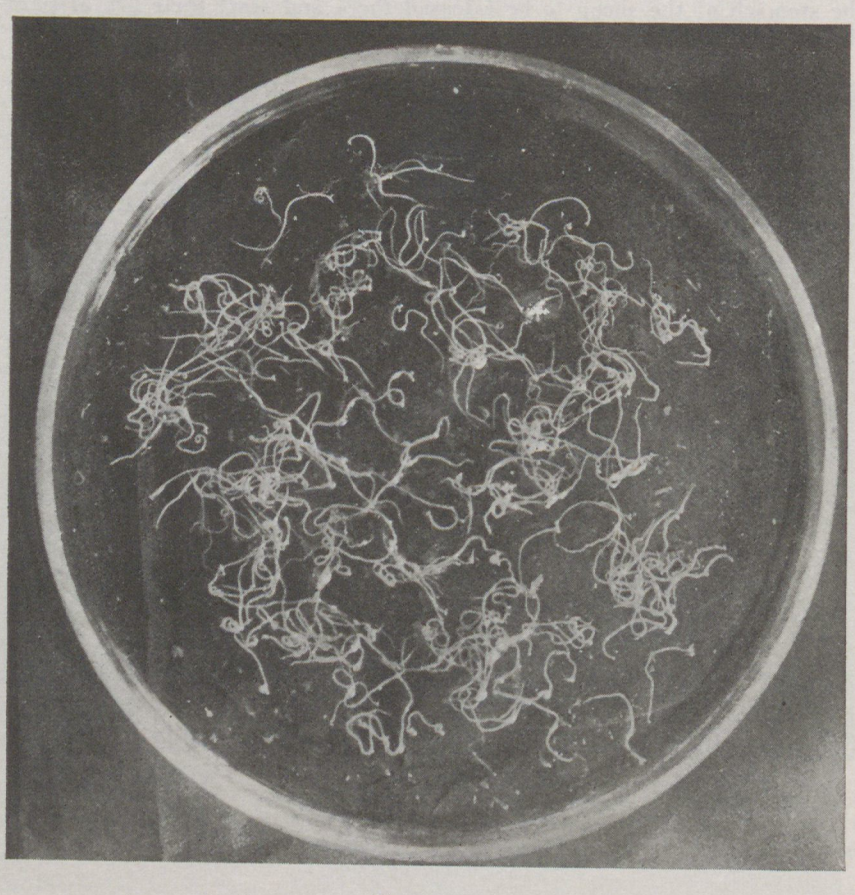

Figure 4.

Stomach worms, Haemonchus contortus, natural size. These worms when present in large numbers cause serious injury and may bring the sheep down to the point of death.

THE PARASITES INJURIOUS TO SHEEP

The Stomach Worm *(Haemonchus contortus)*

Description.— The Stomach Worm of Sheep is a very small thread like creature that is found in the abomasum (true stomach). It may also be found in the upper part of the small intestine in cases of heavy infestation. The male worms are less than three quarters of an inch long. The female worms may reach a length of one and a quarter inches. The Stomach Worm may be any shade of white in color or they may be white with a blood red coloration showing through the body wall. This worm is a blood sucker capable of bringing the sheep or lamb down to the death point.

Life History of the Stomach Worm.—The life of the Stomach Worm from egg to sex maturity is best considered in three stages, viz, the egg to larva, the larval, and the adult or sexually mature stage. The egg to larva, part of its life commences with the development of the egg from the germ cell to the condition of fertilization in the uterus of the worm. After the eggs are fertilized they are released from the uterus of the worm to mingle with the food in the fourth section of the stomach of the infested sheep. The worm eggs pass with the food and food residues until they reach the soil in the dung pellets. As many as 6000 Stomach Worm eggs have been recovered from a single pellet of sheep dung. Should the temperature and moisture conditions be favorable to worm egg incubation at the time the worm egg laden dung pellets are scattered on the soil hatching takes place and a little worm is released from each fertile egg.

This little larva feeds on the fecal matter surrounding it for three or four days and reaches larval maturity in that time if the weather conditions are favorable. Frost and dry weather destroy many of the eggs and very young larvae. Once full larval development is attained the little worm is protected by a chitinous coat or sheath. In this condition the larva can withstand the Canadian winter. The larva after leaving the dung-ball may ascend a blade of grass or attach itself to other vegetable debris near the surface of the soil, or it may be washed into a pool of water. In any of these positions the worm may be taken up by the lambs while they are feeding or drinking from surface pools. The young worm carried on grass or in water, on reaching the fourth section of the stomach is released from its protective coat due to the action of the stomach juices. Now free, the little worm attaches itself by its armed head to the stomach wall, and taps a bountiful food supply. The growth period of 14 to 21 days brings the worm up to sexual maturity.

The stomach worm will like all other worms die of old age in time. Its length of life is believed to be six to ten months. Sheep heavily infested in the autmun will, if they survive, carry fewer worms in the spring, in any part of the country where winter infestation does not take place, showing that the life of this worm is short.

Distribution.— The Stomach Worm is to be found wherever sheep are bred. Very few flocks are entirely free from the pest. Pastures contaminated by Stomach Worm infested sheep have been known to remain infective for a full year after the sheep had been removed. Pasture lands carrying a large number of sheep, each year for a long period are generally heavily infected with the eggs of this worm. A rest from sheep grazing for more than twelve months is required by pasture land if it is to become free of infection by natural methods. Plowing will turn worm infection on the land, down out of the way of grazing sheep. Permanent pastures perpetuate stomach worms.

Symptoms.— The presence of a few Stomach Worms will not create any suspicion of parasitism, but as numbers increase and the handicap becomes greater, the sheep or lambs will become unthrifty. The first symptom of the presence of Stomach Worm in the flock is the poor condition of the lambs, and the soiled rear quarters of many members of the flock. Many members of the flock will have an unthrifty appearance, pale skin and pale membranes. Very advanced cases frequently show a swelling of the lips, and also swellings on the lower jaw and brisket.

The fecal matter from sheep heavily infested with Stomach worm is usually coated with blood stained slime. The eggs of the Stomach Worm may be demonstrated by microscopic examination of the dung secured from sheep infested with this parasite.

A post mortem examination of the stomach and intestine of sheep will reveal the presence or absence of this worm. If present it will be found attached to the membrane. The worms are small and may be overlooked by the inexperienced.

Treatment for Stomach Worm Infection.— The sheep that are to be treated for the removal of Stomach Worm, should be prepared by with-holding all feed for at least 18 hours. They should also be kept from water for 6 hours before treating. This is important, because if the drug is to do its work the stomach and intestine must be free of food and excess water. Should it be necessary to drench lambs that have not been weaned, they should be deprived of their mother's milk for six hours, before being dosed. After dosing the sheep the starvation period should be continued for four hours. If lambs have been treated do not let them back with the ewes until two hours have passed after dosing. Mature sheep can be double dosed during cool weather, at one round-up, that is starve and deprive of water for 18 hours, administer the dose and continue to withhold feed and water for a further 24 hours, then administer the second dose and keep the sheep from feed and water for a further four hours before turning them back on the range. The drugs that are commonly used to destroy Stomach Worms are listed as follows,—

1. Copper Sulphate and Mustard, given in drench.
2. Tetrachlorethylene, given in capsule, as Nema Capsule.

3. Carbon-tetrachloride and Epsom salts, given in capsule.

4. Copper Sulphate, Tobacco and Sodium Arsenite, given as a tablet or pill.

5. Nicotine Sulphate, given as a drench in the strength of four tenths of one percent.

6. Copper Sulphate and Sodium Arsenite administered as a powder.

7. Carbon-tetrachloride, given with mineral oil or castor oil.

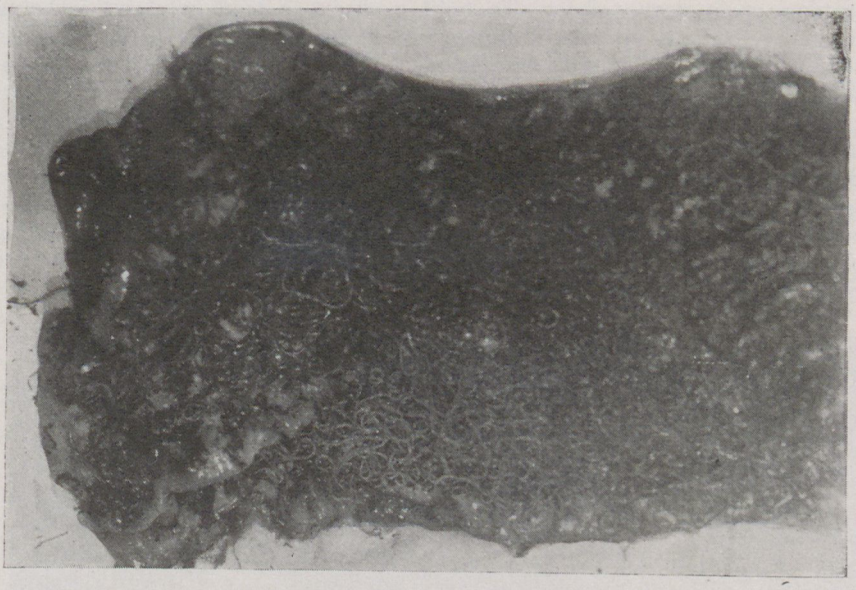

Figure 4a.
Stomach worm of sheep attached to membrane of abomasum.

The Copper sulphate and Mustard drench has been popular as a remedy against Stomach Worms, due to its cheapness, comparative safeness and ease of administration. In making this drench use a wooden pail or stone crock or an enamel-ware vessel of ample size, (two and a half gallons for 100 sheep). Measure out four ounces of Copper Sulphate, dissolve this by adding two quarts of hot water, then add four ounces of mustard and stir well, when this has been done, add two gallons more water. The total quantity of solution liquid or drench in the pail or crock will now be two and a half Imperial gallons. This quantity will dose 100 head of sheep once and allow for waste. The dose is as follows,—

For adult sheep, measure out 3 to 4 fluid ounces.
For lambs 2 to 4 months old, measure out 1 to 1½ fluid ounces.

For lambs 4 to 6 months old, measure out 1½ to 2 fluid ounces.
For lambs 6 to ten months old, measure out 2 to 2½ fluid ounces.
Measure accurately and keep well mixed.

In administering the drench, keep the sheep and the lambs together, this will prevent bleating while the dose is being given. Keep the sheep or lamb that is being drenched on its feet, do not sit them down, as such a position is a dangerous one for the sheep or lamb that is being drenched. Use a small thin necked bottle or fit a tube or rubber hose to any suitable bottle or funnel, to do the drenching with. A dose syringe is a very handy instrument in dosing sheep. To hold a sheep or lamb while it is being drenched, back it up into a corner and stand astride the neck. You can hold it in this position with your knees, leaving both your hands free to administer the dose. Do not raise the sheep's mouth above the level of its eye. Treat sheep gently and give them plenty of time to swallow. After a sheep is drenched, mark it or put in another pen, so that it will not be double dosed. All the drugs used against worms are poison and must be given in small quantity, so do not dose a sheep twice on the same day. Mistakes may result in killing the sheep. A little equipment to aid in handling the sheep, as hurdles, panels, woven wire and boards with which to make pens will save much time and labor.



Figure 5.
Administering a capsule or a pill to a sheep.

Tablets, pills and capsules are more difficult to administer by inexperienced hands than is the drench of liquid. A mouth gag or speculum and a forcep are required to properly handle tablets, pills and capsules.

Copper Sulphate and Tobacco are frequently given in drench liquid. The preparation is the same as for the Copper Sulphate and Mustard drench, except that but one ounce of Tobacco is substituted for four ounces of Mustard.

Copper Sulphate and Sodium Arsenite are used in combination by the sheep ranchers of South Africa, with a high degree of efficiency. This vermifuge requires a special set of measures for its administration. The two drugs are mixed in the proportion of four parts of Copper Sulphate to one part of Sodium Arsenite. The dose is as follows,—

For large sheep, 500 mgr Copper Sulphate and 125 mgr Sodium Arsenite.

For medium sizes sheep, 400 mgr Copper Sulphate and 100 mgr Sodium Arsenite.

For small sheep, 300 mgr Copper Sulphate and 75 mgr Sodium Arsenite. Tobacco infusions and Nicotine Sulphate solutions, containing four-tenths of one percent Nicotine Sulphate are given in doses up to four and one half fluid ounces to adult sheep, with fairly satisfactory results.

Considering cost, efficiency and safety in the farmer's hands the Copper Sulphate and Mustard drench is to be recommended for districts where there is no competent veterinary service.

Mass treatment is not generally very satisfactory in cases where the infection is heavy, but it is well worth its cost and should be used if individual treatment can not be applied. For mass treatment of a flock one pound of finely ground Copper Sulphate can be mixed with each 20 pounds of salt and the sheep allowed to lick at pleasure. Tobacco can be mixed with salt at the rate of one pound of broken tobacco leaf to each ten pounds of salt. This tobacco-salt mixture should be kept before the sheep and lambs at all times, it will keep many young worms from getting started. Copper Sulphate can be mixed with grain or pulped roots and given to sheep in that way with fair success. It is done as follows. Starve the sheep over night to get them empty, mix finely pulverized Copper Sulphate at the rate of, three ounces per 100 sheep, with one bushel of pulped roots. Keep the sheep from other food or water for six hours. If pulped roots are not available 25 pounds of finely ground oats can be used.

We have to fight worms with a poison, and Copper Sulphate is poison, so be careful that no animal gets too much. It pays to dose sheep individually and to employ skilled help as mistakes mean loss.

Prevention of Stomach Worm Infestation.—If at all possible keep the young lambs off the old pastures areas, lanes, unplowed orchards and grass areas around buildings where infested sheep have been running for years. It is a good plan to grow an autumn seeded forage crop as wheat and vetch or rye and use it for early spring pasture. This gives the lambs a clean pasture to start on. From the early spring

pastures the lambs should go onto newly seeded meadows or land that is growing sweet clover or alfalfa.

The use of the second growth on the meadows and grain lands after the removal of the hay and grains crops is always to the advantage of the sheep and lambs as the land is clear of worm infection. Tall growing crops for forage, as Dwarf Essex Rape, Soy Beans, Sweet Clover and other tall plants that will keep the sheep feeding above the danger zone, the surface of the soil, is to be recommended.

The use of a folding system as practiced in Europe is a very great help in the control of sheep parasites as the animals are moved to new ground before the worm eggs have developed to the stage infective to sheep. It is a good practice to keep the sheep moving from field to field as opportunity offers. Always feed from racks and water from troughs that are well above the surface of the ground, as such practice aids in worm prevention.

Flocks that are heavily infested should be drenched every month during the pasture season and a Tobacco-Salt lick provided them all the time. When unthrifty individuals appear in the flock cull them out as it is unprofitable to keep weakling runty lambs.



Figure 6.
Section of Intestine split open to expose Nodular Worms. Note "gate Hook" appearance of female worms. Natural size.

The Nodular Worm *(Oesophagostomum Columbianum)*

Description.— A small white worm that spends its adult life in the large intestine of the sheep. The males are one-half to five-eighths of an inch long. The females are a little longer than the males, being five-eighths

to seven-eighths of an inch. The head end of the female is bent and resembles a hook in outline. The body of this worm is of uniform thickness for the greater portion of its length. The head is armed. The eggs are oval in outline and very small.

The Life History of the Nodular Worm.— The Nodular Worm is principally found in its adult state in the large intestine, while cysts or nodules may be found spotted all over the intestinal tract and stomach. The life of this worm is best considered in three stages, the egg to larval, infective larval and sexually mature. The first stage begins in the uterus of the female worm while it is a resident in the large intestine of a sheep. The fertilized eggs are released from the uterus of the worm and pass along with the food residues reaching the soil incorporated in the dung pellets. If weather conditions are favorable to incubation the little eggs hatch in twenty four hours.

The newly hatched larvae feed on the fecal matter which surrounds them in the dung ball. They moult twice during the four or five day period while progressing to the infective stage. The young larvae are sensitive to unfavorable weather and many perish at the end of the grazing season, they are not winter hardy. Lambs and sheep pick up the young worms when feeding over land that has been occupied by "wormy" sheep. The young worms may be on the grass or in the water pools from which the sheep drink. Ewes that are nursing lambs may get their teats soiled with fecal matter containing the young worms. This fecal matter on being transferred to the mouth of the nursing lamb may cause infection. The larva on gaining entrance to the stomach and intestines of the sheep or lamb awakens to activity and at once burrows through the mucous membrane and invades the connective tissue lying between it and the muscle layer. The larva migrates aimlessly in the sub-mucosa and comes to rest at a time and in a location suited to its further development.

At the point where the larva finally stops a cyst forms that is at first watery, then a creamy yellow and eventually a hard yellowish-green-cheese like mass. These cysts become nodules due to the pus forming organisms that enter them from the intestine. Such nodules may become as large as hazelnuts. They give the intestine a nodular or knotted appearance. The young worm lives in a cyst for a period varying from a week to several months. It then re-enters the lumen of the intestine to complete its development. When the little worm leaves the cyst that it helped create in the intestinal wall it may be one-eighth of an inch long, it is very active and ready for a period of quick growth to sexual maturity.

Distribution.— That the Nodular Worm is very widely distributed in Eastern Canada, is indicated by the fact that but few sheep and lambs slaughtered in the abattoirs are found to be entirely free from it. The importations into Canada of sheep gut for sausage casing (to take the place of what we permit the Nodular Worm to destroy for us) has exceeded a million dollars in a single year. The author has examined over 2,000 sheep

and lambs and found but six of the number to be entirely free of Nodular Worm lesions.

Symptoms.—The adult Nodular Worms resident in the large intestine, apparently cause but little irritation to the sheep. The great injury done by this worm results from the habit of the larva, entering the intestinal wall and causing the development of the nodules. These nodules become centers of pus distribution, centers of irritation and gut weakness. The absorption that takes place from the numerous small pus centers in the intestinal wall, brings about a condition of toxemia or acute verminosis, that may reduce the animal to a condition of skin and bones. Severe irritation and acute pain may be caused by the rough edge of the nodules in contact with sensitive structures. Intestinal rupture followed by peritonitis is a common outcome of the destructive work of the young Nodular Worms. A light infection may not produce any noticeable symptoms, and since most of the sheep of the country are infested with two or more internal parasites it is difficult to attach the responsibility.

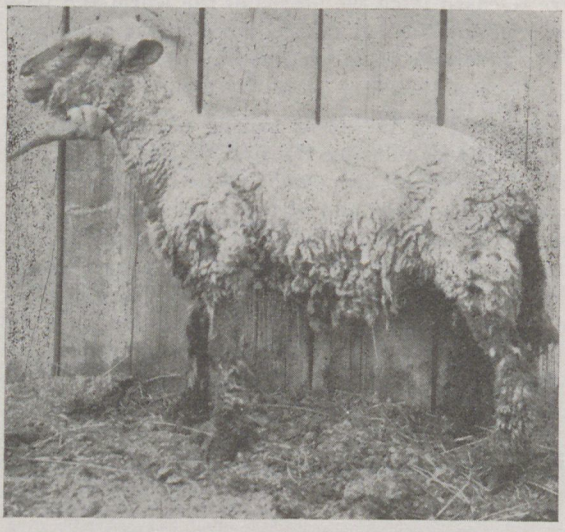

Figure 7.
Sheep heavily infested with Nodular Worms looks like this one. Note the poor condition of the fleece and general unthrift.

It is definitely known however that Nodular Worm can bring about a condition of general debility, with marked emaciation and anemia to be followed by death. Anyone who has seen the "terrible mess" that the Nodular Worm can make of the intestines of a sheep will not doubt its ability as a destroyer of sheep and lambs. The absorption of toxic substance from the pus centers (nodules) is very great. Some sheep will die, others will be hard looking and unthrifty. Thin individuals with a hard, stary wool appear in the flock. Later these hard looking sheep develop swellings beneath the jaw, throat and brisket.

Treatment.—The adult worm in the large intestine may be killed by the repeated use of either Tetrachlorethylene or Carbon Tetrachloride. The

treatment should be repeated every two weeks during the grazing season and the flock changed to fresh ground after each treatment.

The use of enemas made by mixing one gram of Thymol in 50 cubic centimeters of Gum Acacia solution has given good results. This treatment should follow a physic that has caused a rapid clearing of the bowel. The medicated enema is injected after the bowel has been cleared with warm water.

The young worms within the wall of the intestine are out of reach. There is no treatment to remove the nodules, which must remain during the life of the sheep. The lamb flock can at weaning time be given the Thymol-Gum Acacia enema and then placed on clean land where older sheep have not been for at least a year.

Prevention of Nodular Worm Infection.— To develop a new worm free flock from the old flock, proceed as follows, breed the ewes as early as possible that the lambs may be well raised before the pasture season arrives. Keep the ewes and their lambs in a dry pen that is well bedded with straw. Place all feed in suitable racks and take such precautions as will prevent the lambs feeding from a dung soiled floor. Arrange the troughs and racks so that fecal matter will not be carried in. Use sufficient clean litter to prevent the udder or teats becoming soiled with dung. This is important. When the lambs are four months old put them on grass or forage crop where other sheep have not been for at least a year. Never let the lambs when once weaned go back with the ewes. If the lambs are not old enough to wean when grass comes keep them in their clean pen until they are old enough. The ewes can be turned out to graze and they can be brought in twice a day so that the lambs can nurse. For this meeting of ewe and lambs a bare yard should be provided adjoining the one in which the lambs are kept. The sheep and her lambs meet in this yard for a very short time. After nursing the lambs are returned to their pen and the ewes to their pasture. The success of the method depends upon the thoroughness with which it is carried out. One hour of neglect will spoil weeks of good work. With a new flock of lambs on the farm all the other sheep should be disposed of at once and the pastures over which the old flock grazed should be rested for a year. A ram lamb can be reared for a flock header. Do not bring in any sheep from the outside as trouble may come with such. Keep the flock moving and don't over crowd the pasture area at any time. Provide forage crops for spring and autumn grazing to help out the native pasture and supply clean ground. The words "permanent pastures perpetuate parasites" should be painted on every sheep pen door.

The Hook Worm of Sheep *(Bunostomum trigonocephalum)*

Description.— The Hook Worm that infests sheep is a small yellowish or ivory colored worm. It is found in the lower portion of the small intestine. The Hook Worm is usually less than one inch in length.

Life History. The mature Hook Worms are found attached to the lining membrane of the intestine, being most abundant at the lower end of this organ. Fertilized eggs are released by the female worms. These eggs pass along with the food and are finally mixed in the dung pellets that are discharged from time to time.

When weather conditions are favorable for worm egg incubation, hatching will take place. The young worm feeds within the dung pellet for a time and then leaves it to enter the soil. Two stages are passed through by the young worm before it reaches the infective stage. Cool weather retards the incubation of the eggs and development of the young worms. After reaching the infective stage the young worm lives on or in the surface soil where it apparently awaits an opportunity to enter the body of a sheep or lamb. This is done when the sheep lies down on contaminated soil. The mode of entry differs from most parasites in that the young worm penetrates the skin at any point where it may touch the soil. Once through the skin the young worms enter blood vessels to be carried to the heart and lungs. From the lungs they migrate up the trachea to be swallowed and passed to the intestine, where they attach themselves and grow to maturity.

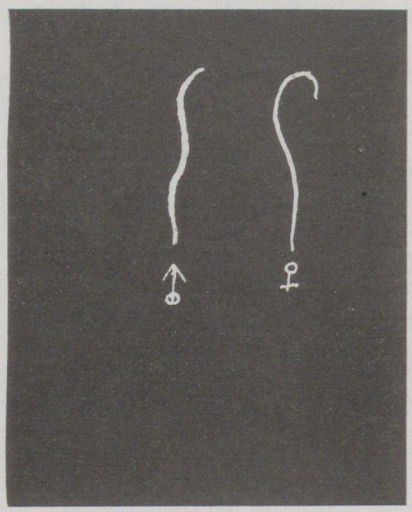

Figure 8.
Hookworm of sheep.

Distribution of Hook Worm.– The Hook Worm of Sheep is very common in Eastern Canada, being found in large percentage of the flocks that are not given the attention that goes with good sheep husbandry. The Hook Worm was imported into Canada with sheep from Europe and the United States.

Symptoms of Hook Worm infestation.— The symptoms of Hook Worm infestation in sheep are similar to those symptoms caused by the Stomach Worm. The Hook Worm brings about an impoverishment of the blood, and interferes with the nutrition of its victim. The sheep become anemic, weak, unthrifty and watery swellings sometimes appear on the dependent parts of the body. The skin becomes pale, the wool dry, short and poor as the infestation advances.

Treatment.—The measures recommended for Stomach Worm control are very useful against the Hook Worm. A flock that is regularly treated



Figure 9.

Nodular Strongylosis — Section of intestine from sheep showing the lesions caused by the larvae of the Nodular worm. Note the small hard lumps on the intestine — cut these open and they are "gritty" if old — and filled with a "green yellow cheese like pus." The young worm that causes these nodules lives in them for a short time.

for Stomach Worm infestation is less likely to suffer from the presence of Hook Worm. The drug that has been found to be most effective against Hook Worm is Tetrachlorethylene, it is administered in capsule. Strict hygienic measures about the sheep yards should be maintained. Frequent changes of grazing ground will help in reducing infection. Old bedding ground should be plowed up or fenced off, as such spots are always dangerous. If sheep persist is sleeping in one place, make them move to a clean spot.

The Whip Worm of Sheep *(Trichuris ovis)*

Description.— The Whip Worm of sheep is a small white worm, that resembles a minute whip, hence its name. The head and neck end of this worm is a long hair like structure, while the body portion is of much larger diameter. The two sexes are about the same length, which is two or three inches. The female has a longer and more slender body than the male. The eggs are very small and in shape resemble the outline of a lemon.

Life History of the Whip Worm. The Whip Worm spends its adult life in the large intestine, where it is firmly attached by its head to the mucosa. The body portion of the worm floats free in the intestine. The eggs are discharged from the worm and pass from the sheep in the dung to infect the soil, yard space or feeding equipment.



Fig. 10.
Whipworm of sheep.

The eggs in an infective condition or the young larva is taken in by the sheep while feeding on short grass or from a dung soiled floor or by drinking surface water. The young worm once free in the large intestine attaches itself to the lining membrane by burying its long head and neck deeply into the tissue. In this position it reaches maturity in about twenty one days.

Distribution of the Whip Worm.— The Whip Worm is common in Canada. Large numbers of Whip Worm have been observed in the large intestine of lambs reared on old grass lands that have been used for sheep for many years.

Treatment and Control of Whip Worm.— Owing to the location of this worm in the large intestine, medicinal treatment has not proved very satisfactory. Effective control can only be obtained by preventive measures, already outlined for Stomach Worm, namely sanitation and frequent change of grazing ground.

The Tape Worms of Sheep *(Moniezias)*

Four species of Tape Worm commonly occur in the sheep in Canada, viz, the Moniezia expansa, the Moniezia alba, the Moniezia planissima and the Thysanosoma antinioides. The last named is not found in the Eastern Provinces, other than in recently imported sheep. The Moniezia expansa is the species giving the most trouble in the sheep of Eastern Canada.

***Moniezia expansa*—Description.—** The head is small and pear shaped, the suckers projecting and slit like, the segments are broader than long and may reach the width of one half inch. This Tape Worm may be found in any size and length in lambs, frequently reaching eight feet. Tape Worms of different sizes and different ages may be found lying side by side in the intestine. As many as thirteen in such position have been noticed in a lamb.

***Moniezia alba*—Description.—** The head is small with oval attachment discs, the segments are nearly as long as broad and may reach a width of three eighths of an inch. This Tape Worm is generally under five feet in length.

Moniezia planissima.—**Description.**— The head of this Tape Worm is small and nearly square in outline, the attachment discs are elongated and the segments are wide and short. The segments may attain a width of one half inch. This Tape Worm is usually less than three feet in length.

Thysanosoma actinioides.—**Description.**— The head of this Tape Worm is small and free of hooks. The segments are broader than long and

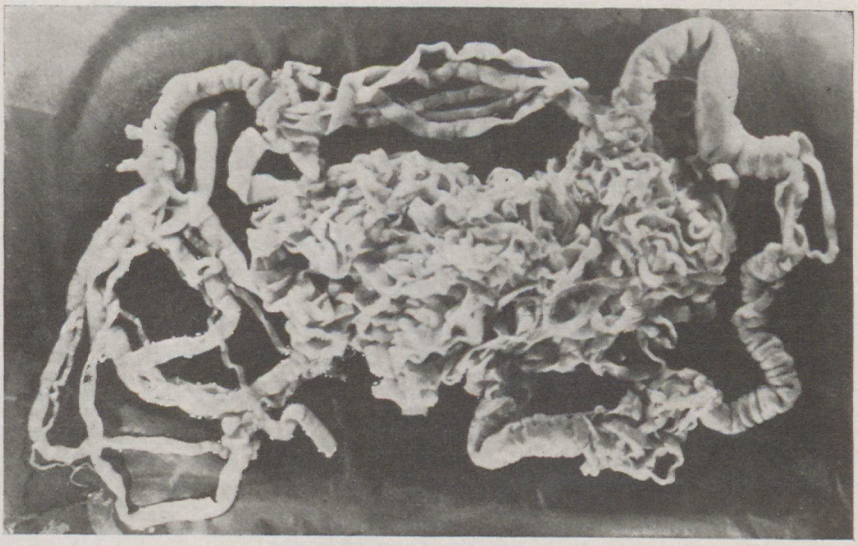

Figure 11.

Tape Worms — (Moniezias) taken from lamb two months old. Note the intestine has been dissected away in places to expose the worms. As many as 13 tape worms were found side by side. The intestine was blocked by the presence of so many worms.

have the posterior edge fringed. This is a small Tape Worm which invades the bile ducts of the sheep's liver, a habit that makes treatment very difficult.

Distribution of Tape Worm.— Tape Worm infestation is very common in Eastern Canada, and quite serious on many farms. Very few flocks are free from the pest and there are usually one or two individuals in every flock that act as carriers of Tape Worm. These same infested sheep are spreaders of Tape Worm eggs and keep sheep premises in a dangerous condition for lambs. Young lambs suffer most Tape Worm infestation. The intermediate hosts are not known.

Symptoms of Tape Worm infestation.— Lambs that become infested with Tape Worm during early life are generally hard looking, "pot-bellied," anemic looking creatures that are very light in weight. One Tape Worm



Figure 12.
A dirty hind end usually indicates parasitism in its early and middle stage. Constipation usually follows in the last stage of parasitism as the animals become weak and anemic.

present in the intestine of a lamb may not bring on noticeable symptoms of its presence, but a number of Tape Worms feeding within the lamb at the same time will make a runt out of their victim. Infested lambs have diarrhea in the earlier stages of infection, this is followed by weakness, emaciation and constipation as the infestation advances. Lambs may die due to the presence of many Tape Worms. Lambs that are infested with Tape Worm will pass the ripened segments of the worm out with the dung. The segments may be seen by anyone that takes the pains to look carefully over the faeces, at a point where the sheep have bedded down over night. The segments are small pieces of Tape Worm and when seen on the dung, may resemble flakes of bran. Sometimes quite long ribbon like strings of Tape Worm are expelled with the dung of lambs.

Aids to Expel Tape Worms.— It is difficult to remove the entire Tape Worm and unless the head or scolex is removed it will grow again. The portions that are easily removed are the segments or egg sacs. These should be destroyed. Prepare the lambs and sheep by with-holding food and water for at least 24 hours. Should the lambs be very young they can not be starved longer than six hours. The more empty the intestine and the stomach the more likely the drug is to do its part in removing the Tape Worm.

The following drugs are used to destroy Tape Worm with fair success, —Oil of Male Fern, Areca Nut, Kamala, Thymol, Pepo, and Copper Sulphate. Of these drugs Oil of Male Fern has the best record for efficiency in removing Tape Worm, but this drug must be used with care as a overdosing is dangerous. Oil of Male fern is generally given in milk. It should not be given in oils. The dose of Oil of Male Fern for a large lamb is one dram, small lambs are dosed in proportion. The Dose of Oil of Male Fern for a sheep is one to two drams according to size of the sheep. Areca Nut if fresh has some efficiency in removing Tape Worm from lambs and from sheep. The dose of Areca Nut for a large lamb is one dram. It is given in a drench. The dose of Areca Nut for small lambs is one half dram or less. The dose of Areca Nut

for mature sheep is, one-to one-and-a-half drams. Kamala is used with fair efficiency in removing Tape Worm. The dose of Kamala for a large lamb is three-quarters of a dram. The dose of Kamala for a grown sheep is one and a half drams. Kamala can be given in milk, gruel or water as a drench. Flocks that are regularly treated for Stomach Worm with Copper Sulphate-Mustard drench are less likely to be injured to any extent by Tape Worm, as this drench is fairly efficient in clearing the intestines of sheep of Tape Worm segments. See section on Stomach Worm for directions in preparing the Copper Sulphate-Mustard drench.

Prevention of Tape Worm Infestation.— The flock master should maintain hygienic conditions in the pens where the sheep winter. Keep the pens dry and well bedded with straw. Treat the flock for Tape Worm when you bring them in for the winter. Destroy all the discharges that come from the sheep after treating, for three days, then clean up the pens and yards for winter occupation. In the spring dose the flock again for Tape Worm, wait for three days and then move the sheep to new quarters. The dung from the pens and yards occupied during the winter should be plowed down. Move the flock frequently while it is at pasture. Use forage crops. Do not let the lambs graze over old grass plots that have been used by sheep during the past year. Plots around buildings, orchards, laneways and poultry yards are often heavily contaminated by wormy sheep, hence the necessity of keeping lambs away from such places. A sharp lookout should be kept for segments of the Tape Worms on the dung and when such are found, they should be burned or buried deeply. When sheep die the bodies should be disposed of in a way that will prevent dogs reaching them. Livers and intestines of sheep slaughtered and found to be infested with the Fringed Tape Worm should be burned.

Other Tape Worms Injurious to Sheep. —There are four or more Tape Worms that infest the dog and the wolf in their primary stage (adult). These same worms infest the sheep during their larval life, that is the sheep is the secondary host for the following: Taenia hydatigena, Taenia ovis, Taenia multiceps and Echinococcus granulosus. These Tape Worms grow to maturity in the intestine of the dog and of the wolf. The dog and the wolf are responsible for the distribution of the Tape Worm eggs over the pasture or woodland where the sheep feed. Considerable damage results each year through loss of sheep from this form of Tape Worm infestation.

Taenia hydatigena.— This is the adult Tape Worm in the intestine of the dog, the egg of which produces the thin necked Bladder Worm, found attached to the omenta, or liver or mesentary of any sheep unfortunate enough to have swallowed the egg. Several Bladder Worms may not cause any noticeable symptoms, but if a sheep or lamb picks up the eggs contained in one segment of the Taenia hydatigena, as dropped by a dog running over the pasture, the resulting infestation will surely kill the sheep. Sheep raised in back districts where wolves are numerous become more heavily infested with Bladder Worms than those raised elsewhere.

Taenia ovis.—This Tape Worm lives its adult life in the intestine of the dog. Segments of the Tape Worm are passed with the faeces of the dog and these contaminate the pasture grass and the water supply of the sheep's grazing ground. The eggs are taken up by the sheep or lamb while at pasture. The egg on reaching the intestine of the sheep liberates the larva, which when free penetrates the intestinal wall and migrates to various parts of the body by way of the blood stream or in the connective tissue. The larva eventually comes to rest and forms a small cyst in the muscle tissue. These cysts are about the size of a grain of wheat and white in color. Each cyst contains a head and a neck of a new Taenia ovis should it succeed in reaching a suitable host animal.

"Measly mutton" is the name given to any sheep carcase containing the cysts of this Tape Worm. All sheep carcases passing through the abattoirs where government inspection is in force, are examined for these cysts. All carcases in which cysts are found go to the tank, they are not used for food.

Taenia multiceps.— This Tape Worm spends its primary stage in the dog or wolf. Its larval or embryo form causes the condition known as gid in sheep. Sheep that graze over pasture areas that have been contaminated by dogs carrying the Taenia multiceps, will pick up the eggs of this Tape Worm. On reaching the stomach and intestine of the sheep the egg releases its embryo, which when free cuts its way through the wall of the intestine and enters a blood vessel to be carried to the brain and other tissues of the sheep. The surface of the brain is best suited to its development and here the embryo worm wanders for a time before settling down to complete its growth into the form known as the large Bladder Worm. This development takes about eight months. The irritation and pressure on the brain caused by the growing parasite brings about the following symptoms. The infested sheep are restless, always moving, may walk in circles, or the gait may be swaying and stumbling. The head is usually held in an unnatural position, frequently high, sometimes low and drawn to one side. The vision may be much deranged. Water and feed are generally refused. Infested sheep usually die about nine months after having picked up the eggs of the Taenia multiceps. May to August is the season when infection is most likely to be picked up.

Echinococcus granulosus. —This Tape Worm spends its primary life in the intestine of the human, or the dog or the wolf. The secondary or embryo stage is spent in the liver or the lungs of the sheep or the deer. It is sometimes found in other organs. In the sheep it occurs as a multiple Bladder Worm. It may be quite small or very large. The Bladder Worm contains a clear fluid in which a brood capsule is visible. No well defined symptoms follow the development of the Bladder Worm of the Echinococcus granulosus, as the cysts vary in size and location.

Treatment and Control. Treat all dogs that enter the pastures or frequent the sheep yards, with a suitable vermifuge every three months.

Destroy all dogs known to harbor the Echinococcus granulosus (Hydatid Tape Worm) and burn the body. Properly dispose of all sheep or the offal of any sheep that may die or be slaughtered on the premises. Sheep heads and viscera should be burned and not thrown out where dogs can get them. Sheep farmers should work to obtain such regulations as will bring about a safe disposal of the offal of all sheep slaughtered in country slaughter-houses.

The losses at the farm and at the abattoir, due to these Tape Worms, is considerable and humans sometimes become infested through close association with infected dogs or through using meat that contains the cyst form of the Tape Worm.

When an animal dies dispose of it at once by burning, in order that any parasites that it may harbor will be destroyed. Dead and unburied animals left lying where birds and dogs can feed are frequently the cause of the spreading of parasites that may be very injurious to the animals remaining on the premises.

The Thread Lung Worm of Sheep *(Dictyocaulus filaria)*

Description.—The Thread Lung Worm of Sheep is a small white worm that lives the greater part of its life in the bronchioles of the lung. The male worms are one and a half inches long. The females are larger than the males and may attain a length of four inches. The intestine is visible as a dark line for the entire length of the body. The eggs of this worm are quite large, oval in outline and contain well developed embryos when released from the uterus of the worm.

The Life History of the Thread Lung Worm.—The sexually mature worms are resident in the large air passages of the lungs. Here the female worm deposits her eggs, which at the time of release contain the embryo. In animals where the infestation is light and the lungs but little injured, the embryo is released from the shell while the egg is in the air passage. The young worm works its way up the trachea to be coughed out or swallowed. When the infestation is heavy and the lungs are in a congested condition, many of the eggs will be cast out before the completion of incubation. These may be found in the dung, or in the discharges from the nose or in mucous taken from the throat of the sheep.

Upon reaching the soil, the pen floor or the feed trough with favorable conditions of moisture and heat, the larval worms that survive go into a moulting stage. When the moulting is completed the larva becomes infective and any lamb or sheep swallowing them will likely become a victim of the disease pulmonary strongylosis (Hoose or Husk). It takes about ten days under favorable conditions, from the time that the larva leaves the lung until it reaches the infective stage. The young Lung Worm after reaching

the infective stage is very resistant to weather conditions and may live for many months on the pasture grass awaiting the coming of a sheep or lamb.

After being swallowed by the lamb or sheep the young Lung Worm reaches the intestine with the food, it then penetrates the wall of the organ and enters a blood vessel to be carried to the lungs where conditions for its development are favorable. It leaves the blood capillary in the lung tissue and enters an air sac and then the small air tubes. It grows to maturity in three or four weeks, moving meanwhile into the larger air tubes as its growth demands it.

Five or six weeks after the lamb has picked up the infective young Lung Worms, evidence of their presence will be noticed in the unthrift of the lamb. The adult life of the Lung Worm is believed to be over six months, as numerous worms are found on autopsy after the sheep have been off the land for five months.

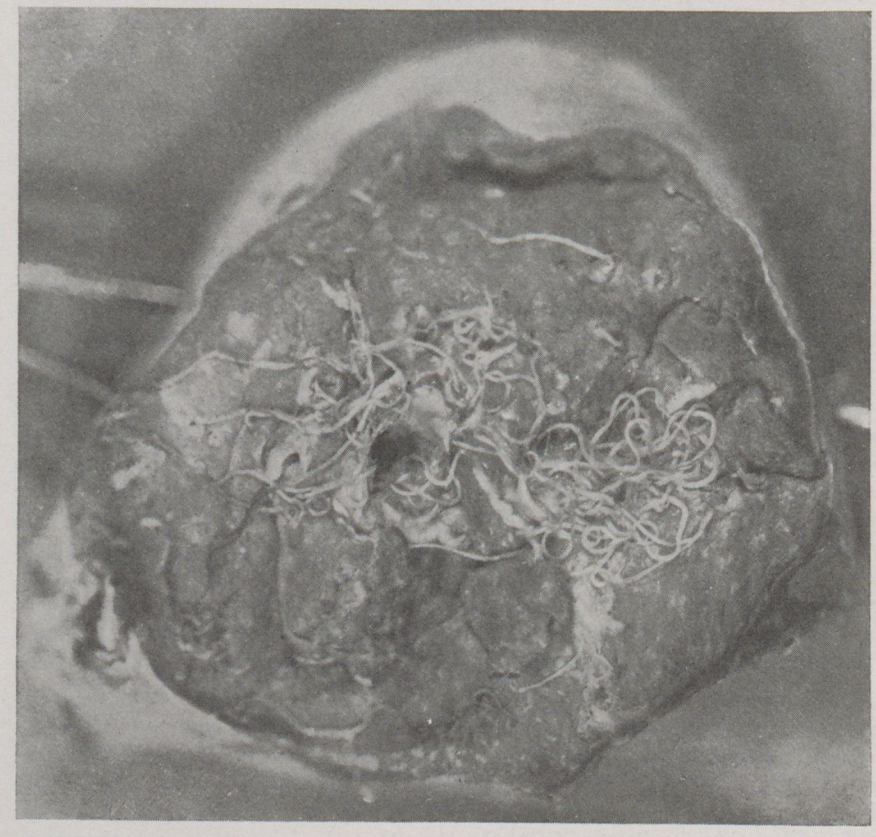

Figure 13.
Lung Worms emerging from the air tubes in a freshly cut section of a sheep lung.

Distribution of the Thread Lung Worm.— The Thread Lung Worm is wide spread. Well managed flocks suffer but little from this parasite. Neglected flocks that continue on infected pastures get into a deplorable condition, and unfortunately such flocks are frequently found in every section of the country. Lung Worm is frequently introduced into a flock through the purchase of a breeding ram from an infected flock.

The practice of going to the stock yards of the large market centers for stock to be used for breeding purposes has been responsible for much of the spread of this parasite. The failure of sheep owners to remove unthrifty members from their flocks often results in the multiplication of Lung Worm trouble on the premises.



Figure 14.
A victim of Lung worm — An advanced case. Autopsy revealed much Lung Worm and a pneumonia condition. Nodular worm, Hook worm, and Stomach worm were also present in the intestine.

Symptoms of Lung Worm Infestation.— Lambs infested with this worm become unthrifty after being at pasture for about two months. In severe infestations there is a pasty yellowish diarrhoea, a hacking cough, the breathing is not normal, the wool is rough, the eyes watery and crusted,

and the nostrils dirty with a discharge from the lungs and nasal passages. The lamb has a tucked up and forlorn appearance. It rapidly loses weight, becoming just a rack of bones as the disease advances. Older sheep when infested with this Lung Worm show similar symptoms, except the diarrhoea. Should infested lambs survive the winter, they make small runty sheep, that can never be profitable.

A post-mortem examination of a lamb heavily infested with Lung Worm, reveals a condition of verminous pneumonia, with much of the lung tissue so altered that it cannot function. The worms are easily located in the air tubes, and the eggs and larvae may be seen in dung and mucous when such is examined under the microscope.

Treatment and Prevention.— In contesting the presence of Thread Lung Worm in the flock, the disposal of all factors that are detrimental to the sheep's well being is the first step. When the worms inhabiting the stomach and the intestine are removed the lamb is better able to withstand the ravages of the Thread Lung Worm. Strict attention to hygiene around the pens and feed troughs, frequent change of grazing ground, the extensive use of forage crops, are points that should be kept in mind by the sheep owner. The use of tall growing forage, such as rape and sweet clover, corn and soy beans, and second growth clovers to keep the sheep feeding above the surface of the soil are aids in preventing infection.

A Lung Worm will die when its mission in life is completed (producing eggs), and the lesions in the lung tissue of the sheep will heal and leave the animal in fair condition to continue life, if the flock master will do his part to prevent new infection getting into the sheep. The following treatments have been found useful in coping with Thread Lung Worm.

• Causing the sheep to breath the fumes that are produced by burning or vaporizing such substances as, tar, sulphur, turpentine, and eucalyptus, or the spraying of vermicidal solutions directly into the trachea, and the use of respiratory antiseptics that can be given in feed or in drenches. The application of any treatment other than respiratory antiseptics in very advanced stages of Thread Lung Worm infestation is attended with some risk to the sheep as the reserve of normal lung tissue is frequently very small. Such sheep would probably die anyway, so treatment should not be withheld from the rest of the flock. The following intratracheal spray mixture has been used with success.—

Beechwood creosote	10 parts
Oil of Turpentine	20 parts
Chloroform	10 parts
Olive Oil	60 parts

The dose of this solution or mixture is 3 to 4 cubic centimeters, and it is *injected into the wind-pipe by a competent veterinarian.*

Another intratracheal spray that has merit is composed of the following,—

Iodine (metallic)	1 gram
Potassium iodide	10 grains
Distilled water	90 CC
Olive oil	200 CC
Oil of chenopodium	50 CC
Oil of turpentine	50 CC

The dose of this spray mixture is 3 to 4 cubic centimeters and it is *injected* into the trachea (wind-pipe) by a *competent veterinarian.*

The following substances can be heated to form smoke or vapor, which when inhaled will be irritant to the lungs and unfavorable to the worms in the air tubes,—sulphur, oil of eucalyptus, creosote, creolin and turpentine. Tar, sulphur and turpentine can be mixed in equal parts for vaporization, it is one of the standard mixtures in use. Such treatment to be of use, must be repeated frequently. A suitable building in which the flock that it is desired to treat can be confined is necessary for the application of the respiratory treatments. A building of suitable size, that is safe from fire danger and tight enough to make a concentration of fume possible should be selected. The animals are confined in the building, then the fume producing substance is carried in and suspended from the ceiling at a safe height, in a metal pail or other safe container, the door is closed and the sheep required to breath the fumes until they are all coughing, they are then released. The time required for treatment is about twenty minutes.

Care should be taken not to expose the sheep too long, as suffocation may result. The weakling sheep of the flock should be separated from the stronger and receive treatment by themselves. The attendant in charge should watch the sheep closely and be prepared to remove any that show distress without delay. The application of the respiratory treatment for Lung Worm is best carried out under the supervision of a veterinary surgeon. Drugs that have an antiseptic action when excreted in part through the lungs may be given as a drench. Such drugs are as follows,— Terebene, Oil of Garlic, Eucalyptus, Creosote, and Creolin. The dose of Terebene for a lamb suffering with parasitic bronchitis is one dram, given twice a day in a pint of milk. A combination of Terebene and Tincture of Camphor, one dram of each, in a pint of milk daily can also be used. The following formula has proven useful in cases of parasitic pneumonia and bronchitis.

Cod Liver oil	20 ounces
Terebene	2 ounces
Oil of eucalyptus	2 ounces

The dose for a large lamb is one fluid ounce of the mixture twice a day. Mix with a pint of milk and give as a drench.

The Hair Lung Worm of Sheep *(Prostostrongylus rufescens)*

Description.— The Hair Lung Worm of Sheep is a brownish-red hair like worm that lives in the smaller air tubes and lung tissue. The males are about three quarters of an inch long and the females from one inch to one and a half inches in length. The egg is of medium size and contains a visible embryo at the time of release from the uterus of the female worm.

Life History of the Hair Lung Worm.— The life history of this parasite is believed to be very similar to that of the Thread Lung Worm described in the previous paragraphs.



Figure 14a.

The dirty hind end usually indicates the presence of intestinal or lung worms. The sheep shown in this photo proved an autopsy to be heavily infested with Lung Worm.

Distribution.— The Hair Lung Worm of sheep is found less frequently than the Thread Lung Worm. However its distribution is wide and both varieties are found frequently in the same sheep. It is known to be very hardy to adverse weather conditions.

Symptoms.— The symptoms manifested in cases of Hair Lung Worm infestation are similar to those described for Thread Lung Worm in previous section.

A slightly different picture is revealed by post mortem examination. The Hair Lung Worm, its larva and eggs cause a localized pneumonia condition, distinguished by grayish yellow tumor like areas that vary in size up to three quarters of an inch across, frequently very irregular in outline and but slightly elevated above the surface of the neighbouring tissue. A microscopical examination of these areas will usually reveal the presence of the larvae.

Treatment and Prevention of Hair Lung Worm.— All animals known to be infested with Hair Lung Worm should be disposed of by slaughter as soon as possible. Weak or ailing sheep should always be removed from the main flock and given special care if it is decided to keep them for a short time. The use of bronchial antiseptics as advised in the

section dealing with Thread Lung Worm will help improve the condition of lambs. Shepherds should realize that animals with "wormy" lungs are weaklings and as such require good nursing treatment if they are to make gains or at least hold their weight while the infestation is dying out. Pure air, dryness underfoot and good feed are essential to recovery.

Hair Lung Worm *(Synthetocaulus capillaris)*

This Hair Lung Worm is smaller than either of the two Lung Worms previously described in this bulletin. The females are less than an inch long and brownish-red in color. The males are the same color and about one half inch in length. This Lung Worm spends the greater part of its life in the minute air channels.

The embryonated eggs are released in the bronchioles to complete their incubation. The released larva migrates out by way of the trachea, reach the soil, go through a moult and then become infective to any sheep that may take them up while feeding.

When the adult worms have completed their life work they bore into the lung tissue and become encapsulated. The nodules so formed may be felt with the fingers near the edge of the lung. They are small and rarely exceed the size of a pea.

Infection takes place as with the Tread Lung worm, so the same hygienic measures of control apply equally to this Hair Lung Worm. Bronchial antiseptics, a good tonic and clean dry living conditions for the infected sheep are helpful.

The Liver Fluke of Sheep *(Fasciola hepatica)*

Description. — In appearance the Liver Fluke of Sheep is a flattened, leaf like, oval shaped parasite that is less than an inch long. On the under surface at the head end there is a conical process in which is located the mouth surrounded by a sucker disc. Just back of the mouth a ventral sucker is to be found. The body surface of the Liver Fluke is covered with very minute spine like processes all of which point backwards from the head end. The purpose of these spines is to enable the Fluke to hold its position and also move forward in the bile ducts. In color the Liver Fluke resembles liver. The eggs of the Liver Fluke are very large, round-oval in outline and colored brown.

Life History.— The sexually mature Liver Fluke resident in the bile ducts of a sheep's liver, releases its eggs. The eggs are carried with the bile to the gall bladder, ultimately to the intestine and to the outside with the feces of the sheep. One Liver Fluke may produce 100,000 eggs. The eggs under suitable conditions of moisture and temperature go through an embryo producing process and eventually release a small organism that is capable of living for a short time in surface water. This organism attacks a snail of

the genus Limnaea and burrows into its body. While in the snail's body it undergoes a further development to a stage known as the cercaria. It leaves the body of the snail, swims about in the water for a time and finally comes to rest on a blade of grass, where it becomes encysted. These cercaria cysts are about one-sixteenth of an inch in diameter, white in color and circular in outline. Sheep grazing over swampy ground or along ditches pick up the blades of grass with the attached cercariae. The grass going the normal route into the stomach carries the cercaria cyst with it. The young fluke is released from the cyst, passes on to the intestine, which it penetrates to enter the abdominal cavity, here it wanders at large until it reaches the surface of the liver, which it penetrates to enter a bile duct. The little flukes migrate in the bile ducts to suit their growing needs, going from the smaller to the larger ducts.



Figure 15.

The Liver Fluke of Sheep. Mature specimens taken from the large bile ducts of the liver of sheep. In color, these oval flattened, creatures resemble liver.

Distribution.— The Liver Fluke depends upon the snail, and conditions favorable to the snail. So its presence in Eastern Canada is confined to the districts where the snails of the genus Limnaea flourish. Both the snail and young forms of the Liver Fluke require water and perish under dry conditions. Sheep grazing around water holes, sloughs and marshes, ditches and flood lands are very apt to be infested with Liver Fluke.

Symptoms.— A few Liver Flukes in a sheep's liver will not bring about any noticeable symptoms to indicate their presence, but heavy infestations will bring about a condition known as "liver rot." Sheep heavily infested lose condition, the appetite becomes poor, the animal is listless, dejected, the respirations are feeble and quick, edematous swellings may appear under the jaw, the brisket or the belly, and diarrhoea is usually present. Sheep may make fair recovery if the infestation is light.

An examination of a fluke infested liver will reveal the following, a soft rotten condition, an uneven or roughened surface, areas of scar tissue and enlarged bile ducts.

Treatment and Prevention.—Sheep should not be permitted to graze over ground known to be infested with Liver Fluke. The draining of wet pasture areas, to rid the land of the snails that serve as hosts for the develop-

ing flukes is recommended. The application of lime to infected pastures is helpful. Salting pastures is also practiced during June, July and August. The sheep should be provided with drinking water that is known to be free from infection. Flukes present in the bile ducts of the liver may be destroyed by administering Oil of Male Fern, Danistol or Carbon-tetrachloride. These drugs should be administered under the direction of a competent veterinarian.

The Nostril Fly of Sheep *(Oestrus ovis)*

Description.— The Sheep Nostril Fly which is the parent of the grubs causing the condition commonly spoken of as Grub-in-the-Head, is a little larger than the stable fly. The head of this fly is yellowish, the thorax is brownish grey, the abdomen is hairy, mouth parts are absent, wings are large and transparent, the winglets are large and white.



Figure 16.
The "grub" of the Nose Bot of sheep "Oestrus Ovis"

The larva of the Sheep Nostril Fly is yellowish white in color and is composed of eleven or more segments. When fully developed the larva are three-quarters of an inch in length and one third of an inch in diameter. The larva is provided with a strong pair of mandibles, that give them a secure hold on the membrane lining the sheep's nasal passages during the eight or ten months of larval life.

Life History.— The adult fly does not feed, so its life is short. After leaving the place of pupation, the female fly seeks a mate. The fertilization of the eggs being attained, the female fly leads a lazy life, during which the egg incubation goes on toward the development of young larva that are destined to live an independent life as soon as they are discharged from the body of the mother fly. (In this advanced stage of multiple pregnancy).

The female fly seeks a flock of sheep on which to bestow her progeny. Upon finding a sheep that is willing to stand, the fly deposits the young, living larvae on the edge of the sheep's nostril, one at a time making frequent thrusts as long as the sheep will stand. In this way one fly may unload as many as sixty little grubs on one sheep.

The young grub crawls upward in the nostril of the sheep to come to rest at some suitable point in the nasal passages. The grubs cause consider-

able irritation, resulting in an outpouring of serous fluid and mucous, on which the grub is nourished during the long period of larval life, eight to ten months. When fully developed the grubs loosen their hold on the membrane, to be shaken or sneezed out by the sheep in her efforts to dislodge them. Reaching the soil the grub which is quite active seeks cover in the loose dust or top soil to go through the last stage of its development, emerging from its pupal case in four to six weeks as a two winged fly. Some grubs do not succeed in getting out of the nasal passages while alive. Those that die, decompose and are thrown out through a fistula or with the other nasal discharges.

Distribution.— The Sheep Nostril Fly came to Canada with the importations from Great Britain many years ago. It is quite common in all sheep districts and has spread to the wild deer in the back districts. All persons familiar with the normal actions of sheep, know when the fly is about and attempting to deposit its larvae. The fly during flight makes a peculiar buzzing note, which together with its quick movements about the sheep's head cause much alarm. The sheep try to avoid the fly by crowding together and keeping their heads down. If many flies are working the sheep run about, sneeze and rub their noses in attempt to offset the tickling caused by the presence of the recently deposited larva. Sheep will run into thickets, long grass or shade or hold their heads low in a furrow bottom if such is available, in order to keep its nose out of reach of the fly.

Symptoms.—The symptoms indicating the presence of the grub in the nasal passages of the sheep, vary with the numbers present, and the general health of the sheep. Strong sheep in good condition are not affected as severely as weaklings or sheep in poor condition from lack of feed. One grub will cause but little trouble, while twenty or more grubs will create much irritation and a condition of "snotty nose" develops and continues as long as the grubs are present, in the nasal passages. The infested animal shakes its head, sneezes and rubs its nose, thereby trying to dislodge the grubs.

During the early stages of infestation the symptoms are those of a cold, a running nose and sneezing. This early stage of misery advances as the grubs grow and bacterial complications set in, until a severe catarrhal condition has developed. The air passages are partly plugged making breathing difficult. The presence of large amounts of purulent material brings about a condition of toxemia, that keeps the sheep unthrifty as long as the grubs remain. In severe infestations the animals may die.

Treatment and Prevention.— The use of lime dust, sulphur fumes, benzine, eucalyptus, turpentine or other irritants that produce violent sneezing and stimulate heavy mucous secretion give some relief to infested sheep. The spreading of dry lime over the pen floor and then causing the sheep to mill around and inhale the lime particles is sometimes practiced. The fumes of tar-sulphur-turpentine vaporization as recommended for lung worm treatment is also useful against the grub of this Sheep Nostril Fly.

The injection of irritants as turpentine or benzine into the nostrils of the sheep to bring on violent sneezing and activity on the part of the grub is sometimes quite effective in bringing the grubs out. Grubs can be removed by surgical interference, but this is expensive and can only be applied to highly valuable sheep. Protection is always better than treatment and the little labor required is always well repaid in the thrift of the flock.

Sheep running on bare fields where there is no natural cover or shrubbery into which they can go during the heat of the day, can be protected by applying pine tar to their nostrils each week and by plowing shallow furrows across the field, into which the sheep can dip its nose when the fly is about. Salt and feed troughs can be so constructed that the sheep will keep its own nose smeared with pine tar, thus saving the labor of hand work. Such a trough can be made by boring holes, three inches in diameter and five inches deep into a cedar log of suitable size and length. The holes are filled with salt and pine tar smeared around the edge of the hole frequently enough to keep it sticky and in good condition to mess up the sheep's nose when she comes to lick the salt. Sheep running on pasture land where there is an abundance of tall grass or other forage plants, as sweet clover, alfalfa, or have a wood lot into which they can go are seldom bothered by this pest.

The Sheep Ked *(Melophagus ovinus)*

Description.— The Sheep Ked, commonly called the Sheep Tick in Canada, is a reddish brown insect infesting the skin and wool of sheep. The females are one quarter of an inch or more in length and about one eighth of an inch across the abdomen. The males are a little smaller than the females. The body is hairy and has a hard covering. Three pairs of short strong legs are attached to the thorax. These legs are furnished with grasping claws useful to the Ked in making its way through the wool. The abdomen is oval or nearly round in outline and quite large.

Life History of the Sheep Ked.— The female Ked gives birth to living young, seven or eight days after having mated. The newly born larva is enshrouded in a soft whitish membrane, which is quite sticky and serves to attach it to the wool. On aging the membrane covering the larva changes color, becoming a chestnut brown and also quite hard. In size and shape the newly liberated larva resembles a radish seed. In warm weather the period of development takes place in less than 20 days, while during cold weather and on exposed sheep it may take 40 or more days. The pupa may remain attached to the wool or it may fall to the floor of the pen or soil. The young Ked should it fail to get back onto another sheep or lamb will perish. When the wool is long the pupa is not likely to fall from the sheep but remain there and complete its development. On the other hand during the short wool season after shearing, many of the pupae will fall off and perish. This is one reason why the Ked is more abundant during the winter.

It takes on the average about 30 days for the newly hatched larva to develop to sexual maturity.

Sheep Keds are found wherever sheep are kept in domestication. The life of this insect is spent entirely on the sheep's body, the one exception being the few that may fall from one sheep to gain a position on another or the migration from ewe to lamb. The Keds being without wings and having legs not well adapted for speed do not travel very far. Their migrations consist of transfer from sheep to sheep when the wool offers a bridge during close contact. Removed from the body of the sheep the Keds will die in eight days, on the other hand the pupa can live apart from the sheep if the weather is cool and the transformation thereby delayed.

Damage from Ked Infestation.—The irritation and worry caused the unfortunate sheep by this insect, is sufficient to remove all chance of profit from the flock, unless allayed or removed. The proboscis of the Ked is lance like and penetrates the sheep's skin, this is accompanied by pain and the injecting of an irritant salivary secretion. Itchy red pimples appear at the point of penetration, these remain for a day or more. Heavy infestations



Figure 17.

Sheep Keds or "ticks." This pest causes much misery and unthrift in sheep and lambs. Be humane and dip the flock at least once a year — better twice a year. The sheep will pay for it — in better wool and better lambs.

may show from 14,000 to 20,000 Keds on a single sheep. Thrift is impossible under such a handicap. Heavily infested sheep usually die as their resistance is so reduced that they fall easy pray to other parasites and bacterial diseases. The wool from heavily infested sheep is much lower in value than that from clean sheep, as it is of poorer staple, stained with excrement, broken pupal cases and debris of Keds long dead. All this has to be removed by extra washing and carding, which requires time and money. Hence the sheep owner that neglects to dip his flock has to take a lower price for his wool crop.

Treatment and Control.— Dip the flock in September and again in 24 days. If the work is well done the sheep will be free of Keds and in better shape to stand the winter and the other parasites that may occupy the stomach, intestine or lungs. Keep other sheep away. If you bring in a new ram, dip him twice before turning with the flock. The breeding ability of Keds indicates that double dipping should be practiced, as most of the common dips in use have little or no effect on the pupae. The second dip gets the Keds that have emerged between dippings. If but three young Keds escape, a male and two females, a population of 1200 may develop on one sheep in six months time. Sheep pens should be thoroughly cleaned out after the sheep go out in the spring. Spraying such pens with a strong disinfectant is always good practice and will head off trouble that might come later on.

People working with infested sheep should be invited to stay away from clean flocks until such precautions are taken to eliminate the danger of carrying infection. Trouble can be carried from farm to farm at shearing or any other time by thoughtless people.

Dip solutions made from coal-tar creosote, lysol, cresol, creolin, nicotine-sulphate, and lime-sulphur-arsenic compounds all give excellent results against Keds if properly made up and applied with thoroughness. Commercial dips offered to sheep men by the trade, if of well known and reliable brands are easier to work with than a dip made up on the farm. Such commercial concentrated dip fluids and powders, can usually be obtained through firms handling stockmen's supplies and through organizations formed to serve the sheep industry. For those sheep owners having very small flocks and desiring to prepare a dip solution from materials already on the farm, the following formulae are given.

Soda Emulsion.— To make the stock solution, dissolve one pound of hard soap in two gallons of boiling water, remove from the stove, and while very hot add two gallons of coal oil. Mix well by stirring and pouring, or by forcing through a spray pump. To use, dilute this stock solution by adding eight gallons of warm soft water for each gallon, that is four gallon of stock solution is added to thirty two gallons of warm soft water, making a total of 36 gallons of dip ready to use.

Milk Emulsion.— To make the stock solution, to two gallons of milk add four gallons of coal oil, mix thoroughly in an old churn or by forcing through a spray pump. This makes the stock solution. To use, add the six

gallons of stock solution to 48 gallons of warm soft water, making a total of 54 gallons of dip ready to use. These home made dips while not giving the same efficiency as the best commercial dips, are very cheap and can be made up quickly from materials always on hand on the farm. In the spring the Keds migrate from the ewe to the lambs and much annoyance for the lambs will follow. The early spring is a time when the dipping of sheep can not well be carried out and some other means of keeping the Keds in check must be used. A powder that can be rubbed into the lambs wool will give some relief and make it possible for the lamb to thrive until dipping can be done. The following powder is very useful to hold lice and Keds in check.

Napthalene	1 ounce, powdered
Hellebore	1 ounce, powdered
Sabadilla seed	3 ounces, powdered
Tobacco dust	3 ounces, powdered
Sulphur	2 ounces, powdered
Boracic acid	3 ounces, powdered

Mix well and apply with a shaker, or with a dust blower, while the wool is parted by an assistant.

The Biting Louse of Sheep *(Trichodectes ovis)*

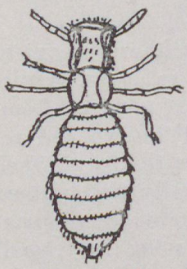

Figure 18. *Biting lice, (Trichodectes ovis)*

Description.— The Biting Louse of Sheep may be distinguished from the Sucking Louse and from the Foot Louse by its head, which is as broad as long, and by the single row of hairs on each segment. The abdomen is white in color and the head reddish. The male is about one twentieth of an inch long. The female Louse is slightly longer than the male.

Life History of the Biting Louse.— The sexually mature female louse releases her eggs on the wool, quite close to the skin of the sheep. The eggs being quite sticky adhere to the wool on drying. Hatching takes place in five to ten days according to the temperature at the point where the egg is attached and the conditions under which the sheep is living. Sheep with open fleece and exposed to the cold do not offer as favorable conditions for incubation of the lice eggs as do the close wool sheep or sheep sheltered by warm buildings. The young lice grow to sexual maturity in about two weeks time under average conditions, or in nine days under very favorable conditions.

Treatment and Control.— Flocks that are regularly dipped twice a year are not likely to be troubled with biting lice, unless they are exposed to infection. The same dipping that serves to kill the Keds or so called

Sheep Ticks, suffices to control the lice. In neglected flocks where the regular dipping practice has been overlooked, lice can be held in check during the winter period by dusting Sodium Fluoride through the wool. The quantity required is one half ounce per sheep. Keep the Sodium Fluoride away from the eyes and nose of the animal. The loss of wool, of mutton and lambs due to the irritation set up by the lice is considerable each year. In very severe infestations the ewes will abort their lambs and the wool crop may be reduced by more than fifty percent.

The Sucking Louse of Sheep *(Haematopinus ovillus)*



Figure 19
Sucking Louse x 30.

Description.— The Sucking Louse of Sheep is much larger than the Biting Louse. It has a longer and narrower head. With the Sucking Louse each segment of the abdomen has two rows of hairs. The female Sucking Louse is about one twelfth of an inch long. The abdomen and the thorax in both sexes are white.

Life History.– The Sucking Louse feeds by puncturing the sheep's skin with its proboscis and drawing blood from a vessel within reach. The sexually mature females release their eggs, which adhere to the wool fibres quite close to the skin. The eggs under favorable conditions incubate in from ten to eighteen days. Cold weather, exposure and open fleece delay the hatching process. The young lice grow to sexual maturity in fourteen days, mate at once and produce more eggs to keep the species going.

Description.— Sucking Louse of Sheep is widely distributed and found in poorly cared for flocks in all parts of the country.

Treatment and Control.— The use of sheep dips as recommended for the destruction of Keds. For winter infestations when dipping is not easily carried out, the use of the following powder is recommended.

Napthalene	1 ounce, powdered
Hellebore	1 ounce, powdered
Sabadilla seed	3 ounces, powdered
Tobacco dust	3 ounces, powdered
Boracic acid	3 ounces, powdered
Sulphur	2 ounces, powdered

Mix well and apply, one-half ounce to each sheep, with a shaker can or blower, while the wool is held apart by an assistant. The wool saved will pay the cost of the treatment many times.

The Mange Mites *(Acarina)*

The Mange Mites that infest sheep, persist in flocks that are not given close attention and regular dipping. They do considerable damage in some sections. The three varieties of Mange Mite doing damage in Canadian flocks are, the Psoroptes communis ovis, the Sarcoptes scabei ovis, and the Chorioptes ovis. The Psoroptes communis ovis which causes "Sheep Scab" is not known to exist in the Eastern provinces.. The Sarcoptic and Chorioptic forms of Mange Mite confine their attacks to the hairy areas of the head and legs of the sheep.



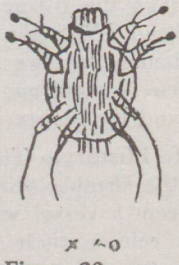



Figure 20.

Sheep Scab Mite. *Head Mange Mite.* *Foot Mange Mite.*

Description.— These mites are very small, fifty male mites placed head and tail would measure one inch and eighty male mites placed side by side would occupy one inch. The female is a little larger than the male. Both sexes are oval in outline and are equipped with four pairs of legs. The female mite has the first, second and fourth pair of legs terminating in a sucker disc and numerous hairs. The third pair of legs terminate in two very long hairs. The male mite has each leg terminating in a sucker disc.

Description.— The "Scab Mites" feed on the surface of the skin. Copulation is followed by egg production. The pregnant female mite may produce any number of eggs up to twenty five, or under certain conditions give birth to nymphs. In event of eggs being deposited on the surface of the skin which is generally the procedure, they hatch under favorable conditions in a period that usually does not exceed seven days, liberating a six legged nymph. After further changes the young mites become sex mature in six to ten days and reproduction again provided for. The increase is rapid. Frequently the female mite will produce a batch of eggs, and then go into a state of rest to recuperate for further egg production. This may happen several times with one female.

Symptoms.— The presence of "Sheep Scab" mite on the sheep is followed by intense itching. The sheep are noticed rubbing against trees, posts

or on any object on which they can get relief. The mite may be found on any part of the body that is wool covered, but the back, loin and rump areas are usually favored by the mite. The lesions are small when first found and if examined closely with a hand lens are noted to be covered with a yellowish or yellowish brown crust. The infested areas become enlarged, centers spread, to unite and form large irregular patches. The skin becomes scurfy. The mites migrate to fresh skin as the older infested areas become dry and bare of wool. The skin becomes dry and wrinkled. The wool becomes ragged due to the rubbing and scratching and much of it falls off leaving bare areas of dry scabby skin. Pregnant ewes may be so irritated by the mites as to cause them to abort their lambs. Any lambs born alive have a very poor chance while "Scab Mite" is present in the flock. Scrapings are taken from the infested areas and examined with the aid of a microscope in diagnosing sheep scab.

Treatment.— Should a flock be known to be infested with Sheep Scab Mite (Psoroptes communis ovis) it must be reported to the Federal Health of Animals Branch Inspector for the district or to the Veterinary Director General, Department of Agriculture, Ottawa. Control of Sheep Scab is undertaken under the supervision of the Health of Animals Branch, and all infected and contact sheep must be treated under the official supervision, with a Lime-Sulphur dip. The dip is prepared according to the following.

Flowers of Sulphur	24 pounds
Unslacked lime	10 pounds
Water	100 gallons

In preparing Lime Sulphur Dip, the lime is slacked to a paste condition and then the sulphur is added and well stirred in. This mixture, or lime-sulphur paste is then put in a kettle with 30 gallons of water to boil for two hours or more, being well stirred during this boiling. After boiling the mixture is poured into a barrel having a spigot a few inches from the bottom. When the settling is completed the clear liquid is drained off for use and water is added to make up to 100 gallons before use. The temperature of the dip at time of use should be 105 degrees fahrenheit. The specific gravity of the dip at time of use should be 1023.0 At least two treatments are necessary at ten to fifteen days interval.

The Head Mange Mite *(Sarcoptes scabei ovis)*

Distribution.– The Head Mange Mite is about half the size of the Sheep Scab Mite described in the last section. This mite is nearly round in outline and is equipped with four pairs of legs. The first and second pairs of legs on the Head Mange Mite terminate in a sucker disc that is attached to the end of a medium length stalk. Numerous hairs also adorn these legs. The third and fourth pairs of legs terminate in a single long hair.

Life History.— The sexually mature and fertilized female burrows into the surface layers of the sheep's skin at a point on the head where the covering is hairy. In the burrow or gallery made by the female, her eggs are released. Incubation and subsequent moultings to bring the young up to sexual maturity takes about two weeks. This change from egg to fully developed mite takes place in the burrow or gallery located in the skin of the infected sheep. The fully developed mites come to the surface of the skin to mate. Following mating the males die and the fertilized females seek locations for new galleries.

Symptoms.— Intense itching. Small nodules form on the surface of the skin due to the burrowing habit of the female. These nodules progress to the pupae development stage and then rupture leaving the skin in a scaly crusted condition. A red raw surface is exposed on removing the scales. The infested areas increase in size and the skin thickens with the extension of the scab area, leaving it rough and hard.

Treatment.— Use the following.

Sulphur	2 pounds
Oil of Tar	8 ounces
Raw Linseed Oil	1 gallon

The sulphur, tar and linseed oil are heated together in a large pot, and are not allowed to boil. This mixture should be well rubbed into the skin. In ten days the areas are washed with soap and warm water, then they are dried and the ointment again applied.

Foot Mange of Sheep *(Chorioptes ovis)*

Description.— This mite is oval in outline. It is smaller than the Head Mange Mite. The first, second and fourth pairs of legs each terminate in a sucker disc that is attached to a very short stalk. The third pair of legs terminates in two very long hairs on each. This mite attacks the hairy areas of the feet and legs of sheep.

Symptoms.— A sheep infested with the Foot Mange Mite will bite the skin of the legs, stamp its feet or rub the point of irritation with its nose. The surface of the skin where the mites are working becomes bare and red-grey crusts form, that may become wart like. The Foot Mange Mite usually attacks the areas below the hock and knee, giving preference to the region of the fetlock. The goat may be infested with this mite over its entire body.

Treatment.— Use the same treatment as advised for the Head Mange Mite. See previous section.

Ticks *(Acarina)*

The true Ticks infesting sheep are differentiated from the so called "Sheep Tick" by having many differences in body structure and life his-

tory. The true Ticks are causing less injury to sheep in Canada than any of the other parasites mentioned in this bulletin, and are found only in the back districts. Lambs should be examined frequently during the spring and early summer, for the possible presence of Ticks. These when found should be carefully removed, preferably by soaking the Tick well with a light oil. Do not pull them as the heads will break off and cause a wound that is difficult to heal or may become fly blown. An application of a mixture of crude oil and pine tar may be placed along the backs of lambs as a repellant against the Wood Tick.

Sheep Maggot Flies

There are a number of species of flies in Canada which deposit eggs or larvae upon the wool or skin of the sheep. These flies seek out conditions that are likely to be satisfactory for the development of the next generation of flies. The larva or maggot as the young is called is responsible for considerable damage each year, as the condition known as "struck" "maggoty" or "fly blown" is rather a disagreeable one for the sheep or lamb. All the various flies attacking sheep are peculiar in that, while their normal breeding place is the flesh of a dead animal left lying exposed, they are not slow in depositing on living sheep.

The Blow Fly *(Calliphora vomitoria)*

Description.— This fly is a little larger than the common house fly. In color the abdomen is bluish-green with a metallic lustre. The eyes are brown.

The Flesh Fly *(Sarcophaga sarraceniae)*

Description.— In color this fly is a light grey with black markings, resembling the common house fly. The eyes are reddish-brown and the body is covered with stiff hairs which give this fly a spiny appearance.

The eggs of the Blow fly may be deposited in wounds or on areas that are chafed or inflamed. During warm weather the eggs hatch quickly, releasing in a few hours a young larva or maggot. This maggot feeds in the wound for three to nine days and then pupates in any handy position on the sheep or it may drop off and enter the soil. A period of three weeks or more is required for development from egg to egg production by the new fly.

The female Flesh Fly deposits her larvae upon wounds on inflamed areas that are protected by wool. The larvae or maggots create conditions favorable to themselves and complete their larval life in about six days, in the wound. They crawl to a shelter when ready to pupate, and go through

the development that brings them forth as living adults in twelve days, all ready to mate and provide for the next generation.

Prevention and Treatment of Flesh Fly Injury.—All dead animals on or near the premises should be burned at once or buried deeply to insure such being out of reach of the flesh flies. By removing every possible breeding place, the number of flies in the district will be reduced to the vanishing point. Keep the sheep in as clean a condition as possible. Prevent soiling of the skin or wool with fecal matter. Keep the lambs away from chicken yards and pig yards where flies congregate. Clip away any tags of soiled wool and swab areas so treated with a creolin solution. All wounds, inflamed areas and chafed areas should be protected with a pine tar dressing. If the sheep must be handled, see that a shepherd's crook is used to guard against any chance of wool pulling. Should any sheep or lambs show evidence of being blown they should be removed from the flock and given such surgical treatment as will remove the maggots, cleanse the wound and protect it from further injury.

A disinfectant wash that is very useful can be made by adding three parts carbolic acid to ninety seven parts water. Dressings containing pine tar should be applied after the wound has been cleansed. A careful watch should be kept over the flock during warm weather as these flies have a way of finding every scratch however small. A small wire cut may become a very ugly wound if a female Blow Fly finds it.

APPENDIX

The Salt and Tobacco Lick

A Salt and Tobacco Lick can be made, which is very useful as an aid to the prevention of parasitism in sheep. Its efficiency while not the highest, is well worth the cost in that it keeps down the numbers of stomach and intestinal parasites. It is made as follows,—

Salt	100 pounds
Crushed tobacco leaf	10 pounds

The tobacco leaf should be dry in order that it may be broken up in a size equal to wheat bran. The salt and tobacco are mixed together and just enough water added so that the tobacco will stick and the salt settle into a firm cake. If sheep are not used to tobacco, then start them off with a smaller percentage of the leaf, or mix a little wheat bran or crushed oats with it to get them taking the mixture. The quantity of tobacco can be increased as the sheep get used to it.

The Salt and Copper Sulphate Lick

A salt and copper sulphate lick can be made to serve the purpose of an aid in keeping down stomach and intestinal parasites. It is made as follows,—

Salt	100 pounds
Copper Sulphate, finely pulverized	5 pounds

The finely pulverized Copper Sulphate is mixed dry with dry salt. If more than five pounds per hundred pounds is used sheep will not take to the mixture very freely. Salt licks should be prepared during the winter and boxed in suitable containers, ready for the pasture season. A salt lick containing either tobacco or Copper-sulphate, or both these drugs should be within easy reach of the sheep and lambs every day of the year. All salt boxes in which prepared or medicated salt is used, should be provided with a roof board or cover to keep the rain and snow out.

The Salt-Tobacco-Quassia and Copper Sulphate Lick. A very good Lick for Sheep, that will prevent worm infestation in the stomach and intestines, can be made according to the following.

Salt	35 pounds
Epsom salts	20 pounds
Tobacco, pulverized	25 pounds
Quassia, powdered	5 pounds
Slaked lime	4 pounds
Copper Sulphate	5 pounds
Foenugreek	5 pounds
Beta-Naphthol	1 pound

This mixture must be kept in a suitable trough, located in a shed away from rain or other moisture. Let the sheep lick as they want it.

These salt licks will not clean up a "wormy" flock, but are useful as aids in keeping a flock relatively free of stomach and intestinal parasites, providing the flock is in fair shape and is being given good care. Weakling members of a flock, often the most heavily parasitized sheep, will not use a salt lick to which drugs have been added. Such sheep must be dosed by hand.

Mineral Mixture Suitable for Sheep

A suitable Mineral Mixture containing a small amount of iodine in some form should be available to sheep and lambs at all times.

Salt	50 pounds
Sulphur	2 pounds
Oxide of Iron	1 pound
Ground limestone	20 pounds
Potassium Iodide	½ to 1 ounce.

Mix and place in a self feeder box, that the sheep may help themselves, or feed two pounds of the mixture with each 100 pounds of grain.

Tonic Suitable for Sheep recovering from worm infestation.

Sulphate of Iron	2 ounces
Gentian	4 ounces
Powdered Licorice root	6 ounces
Powdered Salt Petre	1 ounce
Powdered Nux Vomica	3 drams
Linseed meal	4 ounces.

Mix and give in a little meal, one tablespoonful twice daily, or mix with a little water or milk and give as a **drench.**

Do not keep too many sheep together, better divide the flock, and give the weaklings a chance. The sheep has a good winter coat and can stand cold, if the air is dry and pure. Sheep should have a dry place to lay down, out of the wind. Damp floors and moisture laden foul air, as is sometimes found in cow stables is destructive to sheep. The shepherd should know every sheep and lamb in the flock, he should also be able to detect the first symptoms of parasitism in the flock, and have enough good sense to head off any prospect of trouble. Don't give the flock up to the worms, better protect the sheep and reap the profits yourself.

Publicity

August 3, 1932.

News Editor,
Journal of the American Medical Association,
535 North Dearborn Street,
Chicago, Ill., U.S.A.

Dear Sir,

In reply to your letter of July 30th I am attaching herewith a short memorandum with reference to the Institute of Animal Parasitology established at Macdonald College, McGill University.

Yours faithfully,

Principal.

MACDONALD COLLEGE

McGILL UNIVERSITY

RAILWAY STATIONS AND EXPRESS:
STE. ANNE DE BELLEVUE, QUE.

POST OFFICE:
MACDONALD COLLEGE, QUE., CANADA

FACULTY OF AGRICULTURE

OFFICE OF THE DEAN

August 2nd, 1932.

Sir Arthur W. Currie, G.C.M.G.,
Principal,
McGill University,
Montreal, Que.

Dear Sir Arthur:-

In compliance with your request, I am forwarding a statement in regard to the Institute of Animal Parasitology, which I trust will supply the information for the news item in the Journal of the American Medical Association.

Faithfully yours,

W. Barton
Dean.

File

HB/B
Encl./

EDITORIAL DEPARTMENT

The Journal of the
American Medical Association
535 North Dearborn Street
Chicago

In your reply please refer to these initials | LS

July 30, 1932

Sir Arthur Currie
Principal
McGill University
Montreal, Canada

Dear Sir Arthur:

It has been reported to us that Dr. Thomas Wright Moir Cameron, Edinburgh University, has been selected to head the new helminthology institute at Macdonald College.

Would you please confirm this report as well as give a description of the institute, in order that a news item may be prepared for possible use in THE JOURNAL?

Very truly yours,

News Editor
THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

AMF

To Dean Barton.
— Please prepare
this for me. [illegible]

1/8/32

Institute of Animal Parasitology at Macdonald College, McGill University.

An institute of Animal Parasitology has recently been established at Macdonald College.

The study of animal parasites was begun some six years ago at this institution and has been carried on by members of the regular staff under the direction of Dr. R.L. Conklin with assistance from the National Research Council of Canada. Progress in the work and its importance to Canada and other parts of the British Empire justified its further development. With the cooperation of the Quebec Government, the National Research Council of Canada and the Empire Marketing Board, the establishment of the institute was made possible.

The building is of brick construction, and while not large is of three stories with roof space, and will provide ample laboratory and other accommodation for a number of workers. Housing will be provided for the smaller animals, poultry, sheep and swine, also slaughtering and postmortem facilities.

A Committee, including representatives of the University, the National Research Council, and the Dominion Department of Agriculture, has been constituted to take charge of the general administration. Dr. Thomas Wright Moir Cameron of Edinburgh University has been selected as Research Professor of Animal Parasitology and Director of the Institute, and Dr. R.S. Conklin, Professor of Animal Parasitology will be associated with him in the development of the work.

Dr. Cameron is a native of Glasgow, where he was born in 1894. He was educated at Allan Glen's School, the Universities of Glasgow, Edinburgh and London, and the Royal Veterinary College. He now has the degrees of M.A., B.Sc., Ph.D., D.Sc. and M.R.C.V.S.; after post-graduate work he obtained further experience in the London School of Hygiene and Tropical Medicine and at the Institute of Agricultural Parasitology, with both of which he was connected from 1923 to 1929.

He comes to McGill from Edinburgh where he was lecturer in helminthology, as well as being connected with the Royal Veterinary College, 1929-32. He has held many positions of importance in medical and helminthological associations and he has written over sixty papers on helminthology and veterinary parasitology.

MACDONALD COLLEGE

McGILL UNIVERSITY

RAILWAY STATIONS AND EXPRESS:
STE. ANNE DE BELLEVUE, QUE.

POST OFFICE:
MACDONALD COLLEGE, QUE., CANADA

OFFICE OF THE BURSAR

August 4, 1931.

Sir Arthur Wm. Currie, G.C.M.G., K.C.B., LL.D.,
Principal,
McGill University,
MONTREAL, P.Que.

Dear Sir Arthur,

re ANIMAL PARASITES
Montreal Daily Star, July 29.

In accordance with your telephonic request of Thursday last, I asked Dr. R. L. Conklin to prepare a report on the work done at Macdonald College on Animal Parasite Investigation.

Dr. Conklin has prepared this report and I hand it to you herewith.

Supplementary to this I enclose a copy of the Report of the Minister of Agriculture of the Province of Quebec for the year ending 30th June 1930, together with copy of a bulletin published by the Committee on Animal Health (of which Dr. Conklin is a member), under the auspices of the Eastern Canada Society of Animal Production.

Evidently the author of the article which appeared in the "Star" is not fully informed on the subject about which he wrote, and I trust the information submitted will enable you to refute the statements made.

Yours faithfully,

T. FRED. WARD,
Bursar.

TFW/VJ

McGILL UNIVERSITY

Office of the Principal
and Vice Chancellor.

Re article appearing on July 29th, 1931, in the Montreal Daily Star, headed: "Animal Parasites Drive Advocated" and claiming that this work has not up to the present time been done in Canada.

Macdonald College has on her staff the only trained zoologist and parasitologist in the Dominion primarily interested in parasites of domestic animals. At the present time there are two professional men devoting their full time to poultry parasite problems. There are also two attendants and technicians on this work, and two other professional men devoting part of their time to it. Our Zoologist and Parasitologist has devoted his entire time during the past two years.

That the work at Macdonald is well known and is receiving official recognition is evidenced by the fact that at a recent meeting of the Committee on Animal Diseases of the National Research Council, it was stated that there was hope of centering all work of this nature at Macdonald College. In fact, plans are nearing completion for the development of a Parasite Research Institute at Macdonald College to which contributions will be made by the Province of Quebec, the National Research Council and the Empire Marketing Board.

The study of parasitic diseases of domestic and fur-bearing animals was initiated at Macdonald College in 1922, and in 1927 the work was greatly widened. There is now ready for publication a paper which will bring out data not previously available in connection with parasitic diseases of the mink. Quebec is a live stock province. The health of its live stock is a matter of extreme importance, both to producers and consumers. Animal parasites have become a serious menace to sheep, swine, poultry and fur-bearing animals in Quebec and elsewhere in Canada. No research work was done in Canada on sheep, swine and poultryparasites until Macdonald College took up the work. A liver fluke in sheep was discovered for the first time in NorthAmerica in a flock of sheep near St. Johns, Que. Worth-while work has also been done on genital diseases of cattle, another source of great loss. Certain findings at Macdonald have made helpfulservices possible to a large number of dairymen who were in serious difficulty. The College has also demonstrated that it is possible to rear birds that are free from internal parasttes, and to keep them free.

Having the reputation of being one of the best equipped agricultural colleges on the Continent, Macdonald attracts a cosmopolitan student body. It is the only privately endowed institution of its kind and is thus unhampered by political interference and not restricted by provincial boundaries. It is, therefore, the logical institution for undertaking work of this nature. Its suitability may be further emphasized by its ideal situation at the centre of the most intensive practice in both production and marketing. The parasite problem here is more acute than in areas such as Western Canada, or countries such as Australia and South Africa, where range conditions prevail.

APPLICATION FROM MACDONALD COLLEGE (FACULTY OF AGRICULTURE) MCGILL UNIVERSITY TO THE EMPIRE MARKETING BOARD AND THE NATIONAL RESEARCH COUNCIL OF CANADA FOR A GRANT IN AID OF THE ESTABLISHMENT AT MACDONALD COLLEGE OF A UNIT FOR THE INVESTIGATION OF PARASITIC DISEASES OF DOMESTIC ANIMALS.

The Problem

There is urgent need for information on the distribution, pathogenicity, and control of entozoal parasites of domestic animals in Canada, especially as regards their bearing on the economic production of sheep, swine, and poultry for market. There has been practically no work done on this subject in Canada. The losses are known to be heavy but hardly any definite information is available. Recognizing the need for knowledge on this subject, Macdonald College in 1927 initiated a survey of conditions in the Province of Quebec. Owing to the lack of funds the survey was necessarily limited, but studies at the Montreal abattoirs, where pigs and sheep were found to be almost invariably infested with verminous parasites, and the repeated statements by breeders that it is extremely difficult for them to feed these animals economically for market, further impressed on us the need for an investigation into the means of ameliorating these conditions. The parasites which seem to call for more immediate attention are nodular worm in sheep, Ascaris in swine, and caeca worms, Ascaridia and Coccidia in poultry.

Following this survey we carried out a certain amount of preliminary work on caeca (Heterakis) worms and Ascaridia in poultry, paying special attention to methods of breeding and handling post-free chicks for experimental purposes, but were unable to do any work on the larger animals owing to lack of funds and adequate field equipment.

It may be poibted out that the problems are not merely of local importance since the same or related parasites constitute one of the principal limiting factors wherever the same classes of live stock are produced. The bacon trade is of vital importance to Canada and represents an important feature of our trade relations with the Mother Country. This trade has always had to meet keen competition, largely from foreign countries, and this competition is becoming increasingly severe. Faced with the probability of rising tariffs in the United States, we need more than ever to improve our position in the Empire markets and to bring all the resources of science to bear in removing every handicap to economical production; and one of the most important of these handicaps is the high incidence of parasitic infestation.

While it is true that sheep and poultry products are absorbed largely by the home market, there exists a promising nucleus of trade which it is recognized must be increased due to the force of economic conditions both at home and abroad. The volume of poultry products

is increasing markedly from year to year, but here again parasitic diseases form one of the principal limiting factors in economical production. The sheep raising industry is also on the increase, but again and again in the course of our survey we found instances of farmers being obliged to discontinue sheep raising on account of losses due largely to parasites.

Macdonald College - Its Organization and Activities.

Macdonald College, near Ste. Anne de Bellevue, Que., twenty miles from Montreal, is an incorporated college of McGill University and the seat of the Faculty of Agriculture. It was founded and equipped in 1907 for the teaching of Agriculture and its basic sciences, and for research and investigation into the problems confronting Canadian Agriculture.

The courses given include (1) a two year diploma course for intending farmers, (2) a four year course leading to the bachelor's degree with facilities for specializing in one or other of the various sciences which underly the practice of Agriculture, (3) graduate courses in the agricultural sciences given under the direction of the Faculty of Graduate Studies and Research.

Having the reputation of being one of the best equipped agricultural colleges on the continent, she attracts a cosmopolitan rather than a local student body.

Macdonald College has on her staff the only trained zoologist and parasitologist in the Dominion primarily interested in parasites of domestic animals. In addition it is the only privately endowed institution of its kind and it is thus unhampered by political interference and not restricted by provincial boundaries. It is therefore the logical institution for undertaking work of this nature. Its suitability may be further emphasized by its ideal situation at the centre of the most intensive practice in both production and marketing. The parasite problem is here more acute than in areas such as Western Canada, or countries such as Australia and South Africa where range conditions prevail.

The original endowment of the college, ample at the foundation, has not been augmented. The depreciation in the value of money and the increasing number of problems with which we are confronted make it necessary to obtain special grants for specific research problems. We are, therefore, unable to offer anything in the way of funds towards this undertaking, but we do offer the facilities of one of the best equipped laboratories in the country, sufficient land for the carrying out of field experiments and the services of a trained personnel for carrying on the work. The only capital outlay required will be for a single building in which to house a field laboratory and the experimental animals. It is intended to make this building sufficiently substantial to serve as a permanent centre for parasitological research.

We expect to erect a two-storied building which will have the following:

(a) Field laboratory.

(b) Pens for pigs and sheep to be kept under controlled conditions.

(c) Incubator rooms and pens for chickens.

(d) Feed room.

(e) Sleeping quarters for workmen.

(f) Post-mortem room.

(g) Accommodation for cages for laboratory animals.

The Staff Co-operating in the Investigation.

A committee has been formed among those interested in the problem. The parasitological, bionomic, pathogenic and therapeutic studies will be made by Prof. E. Melville DuPorte, M.Sc., Ph.D., parasitologist and Prof. R.L. Conklin, M.Sc., D.V.M., pathologist, with the added assistance of two research workers to be paid from funds made available by the grant. Co-operation in problems of management will be obtained from Professor W.A. Maw, M.Sc., of the Department of Poultry Husbandry, and Prof. E.W. Crampton, M.S. of the Department of Animal Husbandry.

The relation of parasite incidence to the nutrition of the animals will be one of the important fields of our investigation. As soon as the parasitological work is sufficiently advanced to enable us to visualize the nutritional or physiological problems, arrangements will be made with the Department of Chemistry for co-operation in this work. It is hoped that we shall be able to appoint a special research assistant in the field.

Scope of the Investigation.

Should funds be made available it is proposed:

a. To make an extensive survey to determine the distribution, prevalence and economic importance of the parasites of sheep, swine and poultry.

b. To conduct laboratory and field investigations into the bionomics of their intermediate hosts, if any.

c. To study the relation of age, previous infestation, and breed to susceptibility and resistance.

d. To investigate the effects of soil composition, texture, covering and the various climatic factors on the viability of the parasites in the soil.

e. To determine the relation between parasite infestation and the nutrition of the hosts.

f. To experiment on various therapeutic remedies.

g. To work out systems of management for the prevention of infestation.

h. To obtain the co-operation of breeders and producers in selected areas in carrying out extension demonstrations on the methods of control.

i. To use the unit created under the grant as a permanent institute for research in parasitology.

ESTIMATES.

1. Capital

a. Experimental animal house and field laboratory with full equipment -

Building for housing of laboratory, workmen, pigs and poultry	$4,800.00
Heating, lighting and plumbing	1,800.00
Sheep barn	1,500.00
Equipment for pig pens	1,100.00
" " poultry	800.00
Laboratory and office furnishings: Sinks, benches, scales, cupboards, filing cases, etc.	1,200.00
Special apparatus	800.00
b. Live stock - pigs - breeding herd	250.00
sheep - " flock	300.00
	$12,550.00

2. Maintenance (Animal)

a. Two research assistants - average salary	$4,400.00
b. Attendance and supervision of animals	2,000.00
c. Experimental animals	300.00
d. Feed - Pigs	1,400.00
Sheep	300.00
Poultry	500.00
e. Clerical work, office, maintenance, heating, etc.	1,000.00
Upkeep of apparatus, supplies, etc.	500.00
f. Survey and field work, travelling expenses, etc.	1,000.00
g. Contingencies	500.00
	$11,900.00
Capital expenditure - average for five years	2,510.00
	$14,410.00

In view of the complexity of the problem it would seem advisable to provide $15,000.00 per year.

MEMORANDUM OF THE SCOPE OF THE PROPOSED INVESTIGATIONS OF PARASITIC DISEASES OF POULTRY, SHEEP AND SWINE.

Addendum to the Application of Macdonald College to the National Research Council and the Empire Marketing Board for a grant in aid of Research.

In the application submitted, a list of some of the more important problems which suggest themselves in connection with the proposed investigation is given under the heading "Scope of the Investigations". The following is an amplification of this list and an explanation of the need for research on the various problems.

1. It is proposed to make an extensive survey to determine the distribution, prevalence and economic importance of the parasites of sheep, swine and poultry in Canada.

The enormous scope of the field forces us to limit the scope of our investigations and those classes of live stock were chosen because of their importance in Canadian Agriculture, and because of our personal knowledge of the need for some alleviation of the conditions that now obtain in regard to parasitic diseases of these animals. The investigation of parasites of other animals is not necessarily excluded from our scheme. If practicable, our preliminary survey might be extended to include all classes of domestic animals and the final decision on the parasites to which we will turn our immediate attention reserved until we have the results of the survey.

This survey is in itself an important investigation which should be undertaken without delay. In spite of the great losses known to result from parasitic infestation no attempt at such a survey has yet been made in North America.

Dr. George Hilton of the Health of Animals Branch informs us that his department a year ago "arranged to have a special inspection made of the viscera of hog carcasses with a view to obtaining information concerning the districts in which parasites infesting these animals were prevalent, but this work has been discontinued as it was accompanied by many difficulties."

The committee on parasitic diseases of the United States Live Stock Sanitary Association reported to the Association in 1927 that "at the present time the precise or even the approximate distribution of parasites of live stock in the United States is not at all well known", and presented a resolution calling for such a survey. Further, Dr. M.C. Hall, Zoologist to the Bureau of Animal Industry, who has charge of the investigations on parasites in the U.S. Department of Agriculture states that "at the present time we can safely say that we do not know how many kinds of parasites are present in any given kind of live stock in the United States, but we feel reasonably sure that there are parasites present of which we are yet unaware". This is the condition in the United States where much work has been accomplished. It is far worse in Canada.

At the present time we do not possess the data which would enable us to make even an approximate estimate of the extent of losses due to parasitic infestation, but estimates made by veterinarians and by live stock men engaged in education, production and slaughtering are useful as an index of the economic importance of the problem.

Thus for instance Dr. Alfred Savage, one of our leading veterinarians writes to us: "I have yet to autopsy a country horse without finding literally handfuls of bots and numerous sclerotomes. In

certain sections of the province sclerotomes, cylcostomes, etc., kill scores of yearling colts annually. As a conservative guess I should say there is a loss in Manitoba of 10% of the live stock value through parasitic diseases. The extension veterinarian, with whom I have just been discussing the subject, would double that figure."

Sheepmen regard parasites ~~of~~ the chief peril of the industry, and in Eastern Canada the Dominion Live Stock Branch recommends about thirty-five as the maximum size of flock as it is well known that with larger flocks trouble from parasites is likely to be excessive. One of the largest packing houses states that in districts where the nodular worm (Oesophagostomum) occurs the returns from caxings alone is thirty-five cents a head lower than from some of their other plants where this disease is not prevalent. Mr. J.K. King, Manager of the Maritime Live Stock Board, writes us: "Internal parasites are,practically driving the farmers out of sheep. In analyzing the shipping statements from different sections of the Province (N.B.) over a period of five years, we find that there is a general decrease in the average weight and finish even in view of the fact that the farmers are following better breeding and feeding methods."

The information with regard to swine is less definite but producers complain persistently of the difficulty of feeding swine economically. Our own studies show the presence of a very marked infestation of intestinal worms and lung worms in parts of Eastern Canada and we are convinced that a very considerable proportion of the trouble experienced in raising pigs economically is due to the

invasion of the lungs by Metastrongylus and the larvae of Ascaris, and to interference with the alimentary functions by Ascaris.

We have made also a partialsurvey of the poultry parasites found in several districts in Quebec and find distriibution of Heterakis, Ascaridia, Capillaria, several species of tape-worms, and coccidia. The presence or absence of parasites is known to be one of the limiting factors in profitable poultry production. Professor E.A. Lloyd of the University of British Columbia, writes us as follows: "Parasites are probably causing greater havoc at the present time in our commercial poultry flocks in British Columbia than any other unfavorable factor that we know. They appear to be associated, too, with other troubles, or are forerunners of other disturbances in that they weaken the resistance of birds to disease. Wherever commercial poultry is being kept on an intensive scale, parasites multiply at an alarming rate. The losses in young stock due to these parasites would approach half a million dollars a year. They might even reach one million dollars."

2. <u>It is proposed to conduct laboratory and field experiments on the life-history and bionomics of the parasites and of their intermediate hosts and vectors where these exist</u>.

(a) The bare events in the life-history of several of our parasites are fairly well known but there are many questions relating to their habits and bionomics which are imperfectly known or not known at all. Such questions as the relation of soil and climatic conditions to the stages outside the body of the host, the relation of alternative hosts, mechanical vectors, or wild animal reservoirs to the transmission and spread of the parasites, have a very important bearing on prophylaxis.

There are many of our common parasites such as the very prevalent intestinal tapeworms of sheep, several of the tapeworms of fowls and a large number of flukes of various animals whose life history is not yet known. To quote Dr. Maurice Hall again: "Of all the known tapeworms in the world we know the life history of perhaps one per cent, and the case is but little better, if at all better, for the parasitic roundworms and flukes. Until we have much of the information which is now lacking, we shall be unable to separate major offenders from minor offenders. We shall be unable to devise satisfactory means for saving infested animals or control measures for preventing future losses."

(b) The question of intermediate hosts, where these exist, is an important one, as one of the most effective prophylactic measures indealing with any parasite is the destruction of its intermediate hosts. The common intestinal tapeworms of sheep are known to cause a considerable mortality and to produce a very high incidence of morbidity among lambs. It is presumed that it has as an intermediate host some insect or mollusc which is ingested by the sheep while feeding. If this proves to be true it will be important to study the life-history and bionomics of the organism in order to discover if it lends itself to any practicable method of control. This is of course true of other parasites which have intermediate hosts.

We know that one intermediate host may replace another as the locality is changed. A knowledge of the intermediate host of a tapeworm in Europe may not help us very much in Canada, especially if that host does not occur here.

A somewhat similar situation is raised by the fact that many

parasites are common to both wild and domestic animals. Many intestinal parasites of carnivores pass their immature stages in the tissues of herbivores. To illustrate - a very pertinent question in this investigation would be: "To what extent can the ubiquitous English sparrow serve as a host for poultry parasites? Also, can parasite eggs accidentally ingested by sparrows while feeding pass through the alimentary canal uninjured and infect birds in another pen or another flock?"

The significance of the housefly either as a biological host or a mechanical vector is important in order to determine to what extent the expense of an elaborate system of screening to keep flies away from such places such as poultry houses is warranted. We know that the fly serves as an intermediate host for several parasites, e.g. the three species of Sabronema infesting horses. Choanotasnia infundibulum a poultry parasite is also known to use the housefly as an intermediate host. Again houseflies are known to ingest worm eggs quite freely. To what extent can such eggs, passing through the digestive tract be transferred mechanically from pen to pen?

(c) <u>The relation of age, previous infestation and breed to susceptibility and resistance</u> presents an interesting problem. It is generally safe to say that young animals of all kinds are more susceptible to infection with verminous parasites than are old ones. Is this acquired resistance due to reaction against previous infestation, or is it due to some chemical or mechanical phenomenon in the host tissues or organs concomitant with developing maturity? The importance of a knowledge of breed or racial resistance, if such occurs, is self evident.

(d) From what has been said above in connection with vectors and intermediate hosts it is evident that a knowledge of all the common paths of infection is necessary and it is proposed to carry on laboratory and field experiments to determine these. In many cases of course our knowledge of this is extensive, , though not exhaustive, as is proved by the quite common invasion of a flock or herd by parasites in spite of rigid precautions.

(e) The effects of soil composition, texture and covering, and of the various climatic factors on the viability of parasites in the soil is one of our most important problems since it is impossible to devise systems of management and pasture rotations without this knowledge. These are the problems which perhaps the most restricted and local applications. One of the most important factors governing the occurrence and distribution of parasites is the topographic and climatic condition, particularly the distribution of rainfall and possibly of high and low temperatures. In Manitoba the nodular worm of sheep which is one of the worst pests in Eastern flocks is practically unknown. We do not know yet whether this is purely accidental or whether it is due to local climatic conditions.

Many of our common parasites pass the egg stage, and some the early larval stage also, in or on the soil. The question of dessication and of freezing are therefore important.

3. The effect of parasitic invasion on the host varies from cases in which there is a violent disturbance resulting in death to cases in which the host seems to have a complete tolerance for the parasite, harbouring large numbers without any observable pathological disturbance. There are many common parasites concerning which we cannot confidently state that they are pathogenic, yet their presence naturally causes dismay to the breeder. Very often parasites occur in mixed infections. These present some interesting problems. Are the observed

symptoms due to the cumulated effects of each parasite or to the preponderating effect of some one, or to the effect of the association of parasites?

We propose to endeavor to solve these questions for the parasites which we study by studying the effect of pure and of known mixed infestations on the host.

We shall attempt also to get reliable data on symptomatology, pathological lesions, and nutritional disturbances and the effect of these on the growth and economic value of the animals. In the case of many parasites, these facts are unknown or imperfectly understood.

4. The therapeusis of parasitic diseases is still very imperfect. There are many useful authelmintics but most of these are only partially effective or very irregular in their action, probably owing in part to the imperfect development of the technique of administration. There is no satisfactory remedy for many of the common parasites such as nodular worms, trichestrongyles, whip worms, most tapeworms, etc.

Even in the case of the common ascaris of pigs, anthelminthic treatment is unsatisfactory; as one correspondent writes, "I consider it rather urgent that a more satisfactory agent than any of which I am aware should be discovered for removing ascarids from the intestines of swine. Many of the substances now used are fairly effective but that is another matter."

5. One of the most important applications of our investigations will be the working out of systems of management for the prevention of infestation. Some information on the subject is available, especially regarding the prevention of Ascaris in swine in the Middle Western United States, and also in regard to certain other parasites, but no attempt has been made to adapt these methods to local conditions in Canada, nor would the most optimistic claim that no improvements can

be made or that the possibilities of this method of prophylaxis are exhausted.

Systems of management cannot be worked out until the information referred to in the preceding portions of this memorandum are available. These prophylactic measures will be in the hands of the stockmen themselves, whereas anthelmintic treatment should be given in most cases only by the trained veterinarian.

6. Having determined on these prophylactic methods we shall endeavor to obtain the co-operation of breeders and producers in carrying out demonstrations on the methods in question. This is the logical conclusion of our work and, in carrying it out, we will naturally endeavor to work through existing organizations.

7. Finally we hope that the unit established under the grant will continue to serve as a centre for research and training in parasitology. The field is an extensive one and there are many problems besides those we mentioned in our application which should be considered. Even should we solve all of the problems listed during the time that the grant is available, there will be many others waiting to be attacked. We do not expect, however, that these problems will be all solved within five years, but hope that the work done during that time will help to define our major problems more clearly and that we shall have enough valuable results to warrant the continuation of the work. It is hoped also that the laboratories will be utilized for the training of parasitologists. In a personal letter, Dr. Maurice Hall, who has been engaged in parasitological investigations for many years, and now is in charge of the investigations carried out under the U.S. Department of Agriculture, states:

"In a general way it may be said that parasitology is a very much neglected field especially in comparison with bacteriology. It is substantially as important as bacteriology and parasitic diseases are more generally prevalent in time and space than bacterial diseases. In the United States there are probably hundreds of veterinary bacteriologists, but the bulk of the work in veterinary parasitology is carried on by the Zoological Division in default of well-trained men in the veterinary profession and at the State Institutions in this country. With the disappearance of range conditions and the extemsive shipments of stock for breeding, feeding and slaughter, over large distances, the tendency is for live stock parasites to become ubiquitous and the sooner Canada or any other country takes the measures to make headway against parasites the better. In spite of the fact that we are controlling a handful of parasites, the general trend of events is against us and parasites appear to be gaining in extent and importance throughout this country."

There can be no question of the urgent need of a combined program of research and training in parasitology. For such a program the University offers the ideal type of organization and for reasons stated in our application, we believe that Macdonald College is the logical place to establish such a centre.

Memorandum re Research in Animal Parasitology

Recognizing that the live stock industry was suffering severe losses because of animal parasites and that no adequate effort was being made in Canada to study this menace, or to deal with it, it was decided to undertake investigation work at Macdonald College. The work was begun in 1928, when it was placed in charge of a Committee composed of members of different departments who were interested in this field of study and who were in a position to participate in it.

At no time has it been possible to determine the extent of parasite infestation but estimates made by veterinarians and by live stock men engaged in education, production and slaughtering have been of value as an index of the economic importance of the problem.

Thus for instance Dr. Alfred Savage, one of our leading veterinarians writes to us, "I have yet to autopsy a country horse without finding literally handfuls of bots and numerous sclerotomes. In certain sections of the province sclerotomes, cylicostomes, etc., kill scores of yearling colts annually. As a conservative guess I should say there is a loss in Manitoba of 10 per cent of the live stock value through parasitic diseases. The extension veterinarian, with thom I have just been discussing the subject, would double that figure."

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The work at Macdonald College, while necessarily limited because of small resources for it, has aroused active interest in the whole problem. Considerable information of value in making a proper approach to the work in a larger way has been built up and certain definite findings from time to time during the past four years have been made.

In 1929 the National Research Council of Canada was interested in the work and contributed a grant of $1,000.00 to help it along and has made further contributions in 1930 and 1931.

It was early recognized that to place research work in Animal Parasitology on a proper basis would require substantial resources, but at the same time it was felt that the economic importance of the problem would compel support if sufficient progress could be made in a small way to justify it.

Accordingly, an extensive project was carefully planned and outlined by the Committee. It was submitted to the Provincial Minister of Agriculture because of the urgent need for action in Quebec, to the National Research Council because of the importance of the work for all Canada, and to the Empire Marketing Board on the ground that the problems to be studied were in many aspects common to all countries within the Empire.

A grant for the necessary building accommodation was authorized by the Minister of Agriculture and after considerable negotiation, the Empire Marketing Board and the National Research Council are favorable to the establishing of a Research Institute in Animal Parasitology at Macdonald College, and a grant of some fifty thousand dollars to be expended on the work over a period of three years has been pledged, as a joint contri-

bution from the two organizations.

To carry out the project, further organization and additional personnel are required.

It is proposed to appoint a larger committee representative of those concerned to preside over the work, and the following have been suggested:-

Sir Arthur Currie - ex-officio.
Dr. Tory - ex-officio.
Dean H. Barton
Dr. R.L. Conklin
Dr. John L. Todd
Dr. Robert Newton
Dr. E.S. Archibald
The Director of the Institute.

It is further proposed that an outstanding man in Helminthology be appointed as Director of the Institute, and that since this work will be closely related to other allied work in the Faculty of Agriculture, that the position should carry the rank of Professor of Animal Parasitology. Also that Dr. R.L. Conklin, who has done much to bring the work to its present status and who is specially qualified to deal with the more economic aspects, should be associated with the Director of the Institute in the further development of the work. In recognition of Dr. Conklin's contribution in this and other fields, it is recommended that he be given promotion from his present position of Assistant Professor of Animal Pathology to that of Professor of Animal Pathology, and that an increase in salary of $500.00 be granted from the Research funds as a consideration for his continued service in the work. It is expected that other appointments will be made from time to time on the recommendation of the Committee.

December 17, 1931.

Memorandum re Research in Animal Parasitology

Recognizing that the live stock industry was suffering severe losses because of animal parasites and that no adequate effort was being made in Canada to study this menace, or to deal with it, it was decided to undertake investigation work at Macdonald College. The work was begun in 1928, when it was placed in charge of a Committee composed of members of different departments who were interested in this field of study and who were in a position to participate in it.

At no time has it been possible to determine the extent of parasite infestation but estimates made by veterinarians and by live stock men engaged in education, production and slaughtering have been of value as an index of the economic importance of the problem.

Thus for instance Dr. Alfred Savage, one of our leading veterinarians writes to us, "I have yet to autopsy a country horse without finding literally handfuls of bots and numerous sclerotomes. In certain sections of the province sclerotomes, cylicostomes, etc., kill scores of yearling colts annually. As a conservative guess I should say there is a loss in Manitoba of 10 per cent of the live stock value through parasitic diseases. The extension veterinarian, with thom I have just been discussing the subject, would double that figure."

Sheepmen regard parasites as the chief peril of the industry, and in Eastern Canada the Dominion Live Stock Branch recommends about thirty-five as the maximum size of flock as it is well known that with larger flocks, trouble from parasites is likely to be excessive. One of the largest packing houses states that in districts where the nodular worm (Oesophagostomum) occurs the returns from casings alone is thrity-five cents a head lower than from some of their other plants where this disease is not prevalent. Mr. J.K. King, Manager of the Maritime Live Stock Board writes us: "Internal parasites are practically driving the farmers out of sheep. In analyzing the shipping statements from different sections of the Province (N.B.) over a period of five years, we find that there is a general decrease in the average weight and finish even in view of the fact that the farmers are following better breeding and feeding methods."

The information with regard to swine is less definite but producers complain persistently of the difficulty of feeding swine economically. Our own studies show the presence of a very marked infestation of intestinal worms and lung worms in parts of Eastern Canada and we are convinced that a very considerable proportion of the trouble experienced in raising pigs economically is due to the invasion of the lungs by Metastrongylus and the larvae of Ascaris, and to interference with the alimentary functions by Ascaris.

We have made also a partial survey of the poultry parasites found in several districts in Quebec and find a wide distribution of Heterakis, Ascaridia, Capillaria, several species of tape-worms, and coccidia. The presence or absence of parasites is known to be one of the limiting factors in profitable poultry production. Professor E.A. Lloyd of the University of British Columbia writes us as follows: "Parasites are probably causing greater havoc at the present time in our commercial poultry flocks in British Columbia than any other unfavorable factor that we know of. They appear to be associated, too, with other troubles, or are forerunners of other disturbances in that they weaken the resistance of birds to disease. Wherever commercial poultry is being kept on an intensive scale, parasites multiply at an alarming rate. The losses in young stock due to these parasites would approach half a million dollars a year. They might even reach one million dollars."

The work at Macdonald College, while necessarily limited because of small resources for it, has aroused active interest in the whole problem. Considerable information of value in making a proper approach to the work in a larger way has been built up and certain definite findings from time to time during the past four years have been made.

In 1929 the National Research Council of Canada was interested in the work and contributed a grant of $1,000.00 to help it along and has made further contributions in 1930 and 1931.

It was early recognized that to place research work in Animal Parasitology on a proper basis would require substantial resources, but at the same time it was felt that the economic importance of the problem would compel support if sufficient progress could be made in a small way to justify it.

Accordingly, an extensive project was carefully planned and outlined by the Committee. It was submitted to the Provincial Minister of Agriculture because of the urgent need for action in Quebec, to the National Research Council because of the importance of the work for all Canada, and to the Empire Marketing Board on the ground that the problems to be studied were in many aspects common to all countries within the Empire.

A grant for the necessary building accommodation was authorized by the Minister of Agriculture and after considerable negotiation, the Empire Marketing Board and the National Research Council are favorable to the establishing of a Research Institute in Animal Parasitology at Macdonald College, and a grant of some fifty thousand dollars to be expended on the work over a period of three years has been pledged, as a joint contri-

bution from the two organizations.

To carry out the project, further organization and additional personnel are required.

It is proposed to appoint a larger committee representative of those concerned to preside over the work, and the following have been suggested:-

Sir Arthur Currie - ex-officio.
Dr. Tory - ex-officio.
Dean H. Barton
Dr. R.L. Conklin
Dr. John L. Todd
Dr. Robert Newton
Dr. E.S. Archibald
The Director of the Institute.

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