



Fasciola hepatica: Impact on Dairy Production and Sustainable Management on Selected Farms in South Africa

(PRJ-0060-2015)

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Year 2015 (January 2015 till December 2015)

Project goals

Goal 1 - Investigations on four dairy farms, selected on the strength of farmer perception of the production effect of *Fasciola* sp. on milk production on their farms.

Achievements

Background: The liver fluke (*Fasciola* sp.) is a trematode parasite, the adults of which reside in the livers of cattle and small ruminants, amongst other hosts, and has a serious erosive effect on the production of its hosts. The parasite is completely dependent on a restricted number of fresh water / mud snail species as intermediate hosts, which allow large-scale, non-sexual reproduction of the parasite, and without which the parasite cannot complete its life cycle.

MILKSA members, in consultation with Dr Heinz Meissner, selected five farms for the project, of which three had a history of severe fasciolosis, and two were practically free from the parasite.

For preliminary discussions on the planning for execution of the present project, Dr J.A. van Wyk (JAvW) visited the Tsitsikamma region of the Eastern Cape in the company of Dr Heinz Meissner (as MILKSA advisor) for discussions with farmers on the planning of the project. At the same time a variety of different farms that were selected by MILKSA for the project, were visited for discussions, on the strength of which 5 different farms were included in the project. Four of the farmers concerned, committed for the 2015 contract period, but the fifth farmer (from one of the two practically *Fasciola*-free farms) withdrew before the project could be launched, on the grounds of a shortage of time and labour on the farm.

The levels of importance and seasonal cycling (thus epidemiology) of the parasite to dairy cattle on the selected farms have been evaluated from April up to, and including December 2015, through monthly snail surveys in 6 marshy (mud) spots per farm and faeces and blood sampling of 240 trial cattle was done for worm egg counts and various serological evaluations. In the process, approximately 3000 faecal worm egg counts were performed, of which half comprised counts of nematode- and the rest of trematode eggs in the faecal samples. While the egg counts were completed monthly, as the faecal samples were received, the serum samples were frozen for later laboratory analysis of selected samples for enzymes originating from liver cell damage by the migrating immature *Fasciola* worms.

The results of the snail recoveries and faecal egg counts are illustrated and discussed in Document 1 and 2, which are uploaded as attachments to the report. In short, numerous snails that are susceptible to *Fasciola* sp. and/or paramphistomid trematode parasites were recovered on three of the four farms, and almost none on the fourth farm, known to be free from trematode parasites, especially the liver fluke, *Fasciola* sp. Hence the findings substantiated the purposeful selection of the farms by MILKSA.

No Non-achievements / underperformance has been reported

Goal 2 - Small-scale questionnaire survey on appraisal of farmer perception and knowledge of *Fasciola* sp. specifically and worms of cattle in general for use in Phase 1 and as background to later phases, should the results of Phase 1 be judged to merit further investigation.

Achievements

Preparation of the questionnaire was scheduled for the first two months of 2015, and was duly completed on time. No date was scheduled, however, for the execution of the small survey, and, as reported during 2015, a shortage of funding resulted in the survey being rescheduled to 2016, subject to the necessary funding then being available.

While the initial survey is small in extent, the questionnaire approach is regarded as of considerable importance as a relatively low-cost method for evaluating farmer impression of the importance of fasciolosis per individual farm, and thus per region. Farmers are regularly reminded, through the condemnation of the livers of their cattle for human consumption, of the presence of the parasite due to the pathological damage to these organs. However, the farmers do not realise that, in addition to the continual losses due to condemnations of the livers of infected cattle, this opportunist parasite tends to cause explosive outbreaks of fasciolosis with resultant severe financial loss, especially since control is so severely complicated in dairy farming, by the paucity of drugs that may be used in dairy cows, the milk of which is destined for human consumption.

No Non-achievements / underperformance has been reported

Goal 3 - Evaluation of prevalence and seasonal cycling of *Fasciola* sp. on the selected farms.

Achievements

Comprehensive *Fasciola* intermediate snail host surveys were done monthly for each of six previously selected marshy spots on each of the trial farms.

Snail sampling: As explained in the previous quarterly reports, small numbers of the snails recovered from the various marshy spots on the four farms were dissected for evaluation as to the presence of the parasites, and intermediate stages of both *Fasciola* sp and paramphistomid (conical, or stomach fluke) parasites were recovered from some of the snails. However, the small numbers involved mainly confirm the presence of both types of parasites, than to show trends in their epidemiology.

Investigation of the mode of parasite development and transmission per farm: The background to the evaluation of parasite seasonal cycling has been thoroughly described in previous reports. In short, it comprises primarily the following approaches, for the reason that each has limitations regarding accurate estimation of worm burdens and levels of challenge to the host at any given point in time. And, as listed below under Goal 6, further approaches are being formulated for evaluation in later phases of the project, granted sufficient funds to do the necessary systems development in the laboratory for the testing.

Faecal worm egg counts : The results of the egg counts are presented as a series of graphs in Document 1 (uploaded to this report). While the nematode egg counts varied to an extent per farm, both these and the trematode counts remained relatively low, and it is suggested that this is largely due to intensive worm control drenching programmes per farm. On the other hand, on the fourth farm, selected as having no problems with fasciolosis, no *Fasciola* sp. ova were encountered in the faecal examinations.

Snail survey results : As above, the results of the snail surveys are shown in Document 2 (uploaded) as graphs that have been updated to present all the results up to the end of the report period. While large numbers of snails were recovered on three of the four farms per monthly mud

sampling occasion, negligible numbers of the principal intermediate host snails of *Fasciola* on the fourth farm were detected on the fourth farm. This corresponds with the fact that this latter farm is practically free from liver fluke infection.

Parasite infection in intermediate host snails : The levels of infection of the intermediate host snails with the predominant trematode parasite genera of importance to farmers in the Tsitsikamma region, are tabulated in Document 2 (uploaded). While a number of the snails were found to be infected with paramphistomid immature stages, only very few were infected with *Fasciola* sp. stages. This is according to expectation, since fewer than one tenth of the numbers of *Fasciola* sp. parasites are required to have a given severe effect on cattle, than in the case of the paramphistomid parasites, of which tens of thousands are required before host production is much affected.

Blood serum analysis for liver enzymes : This is an assay of intracellular enzymes, which are set free from the liver cells and enter the bloodstream during the hepatic migratory phase of the immature parasite, which literally eats its way through the liver tissue over a period of some weeks, on its way to its final destination in the bile ducts of the host. Selected serum samples are to be analysed for liver enzymes during the course of the project.

ELISA testing for *Fasciola* sp. antigen and/or antibodies in milk and host serum : This aspect of the investigations is relatively expensive, but discussions have been initiated for cooperation with a private company, Deltamune, which is in the process of developing the system for analysis of bulk milk tank samples.

No Non-achievements / underperformance has been reported

Goal 4 - Evaluation of mode of transmission on each farm, for the parasite to be able to cycle to the extent of causing losses in milk production.

Achievements

An important aspect of Goal 4 is that it is through attention to detail in the different steps in the intricate life cycle of the parasite that novel approaches to control/management of the parasite are to be expected. To this end, both Goals 3 and 4 are of prime importance against the background of the extreme losses to fasciolosis, to this day, in developed countries such as the UK, Ireland and France - in other words, no effective means of management have been developed for grazing dairy cattle. Thus every avenue for arrival of the fluke worm eggs on the marshy spots and subsequently to gain access to the final host are being contemplated and evaluated in the search for weak spots that could be utilised for engineering a break in the intricate chain of events required for successful transmission of the parasite. For instance, it is to be expected that the worm eggs would not only be voided on pasture by infected cattle, but could also be disseminated through irrigation with the water run-off from the milking parlours, and, as indicated in brackets in the following examples of approaches in the project, such factors merit special focus as the project progresses :

(i) Dissemination of the worm on pasture [[[*Novel investigation*: evaluate role of worm eggs in the water from milking parlours]]];

(ii) Need for open water for the small worm larvae to hatch from the eggs, infect the snail intermediate hosts and multiply by development to infective stage on vegetation

[[[*Novel investigations intended*:

(•) **Effect of earthworks** - carried out per chance on one of the farms during 2015 for drainage of marshy sites - on the presence of snails;

(•) **Novel plan for system of temporary fencing**:

(•) **Extent of migration of the host snails from primary marshy spots**, with potential for affecting success with the envisaged fencing system]]];

(iii) Infective stages of the parasites on pasture herbage. It is planned to initiate investigation of the above on a small scale (as far as the budget will allow) during 2016, for instance to ascertain to what extent the worm eggs in the water run-off from milking parlours gain access to the pastures, and to find ways to prevent this if indeed found to be of importance.

No Non-achievements / underperformance has been reported

Goal 5 - Small-scale evaluation of anthelmintic efficacy against the *Fasciola* sp. populations per farm, in order to get a preliminary impression concerning the presence or absence of anthelmintic resistance. The reason for the limited extent of this aspect of the project is to obtain data for evaluation of the need for later inclusion of more farms in anthelmintic testing.

Achievements

In order to evaluate the efficacy of the anthelmintics used, individual farmers have been requested to collect samples of faeces from about 15 cattle, both before and after treatment for *Fasciola* infection, but none have complied, and thus also no samples have been forthcoming to date. The need for specific testing is being scheduled for discussion with the farmers involved during the continuation of the project in 2016. On the other hand, the formulation of options is scheduled for the end of the project, but it is being approached as a continuous process of contemplation of possible options and it should be possible during the second half of Phase I of the project (during 2016), or during Phase II, to offer suggestions for further steps that may be required to this end, and for potential solutions.

No Non-achievements / underperformance has been reported

Goal 6 - Formulation of options for sustainable management of *Fasciola* sp. on each of the farms.

Achievements

As indicated in the initial application for this project, the methods of control used elsewhere, are focus on drug use at times which are inimical to sustainable drug efficacy, and this is to be avoided, since it is progressively leading to resistance of the parasites to the limited number of available anthelmintics.

Even though the formulation of options for sustainable management can, as is to be expected, be finalised largely towards the end of the project, the following include some of the preliminary planning:

1. Expand the project to involve additional farms, especially of developing farmers, in order to obtain a wider indication of the need for a country-wide initiative for the management of fasciolosis;

2. Develop a series of early-warning systems for the possibility of a build-up of *Fasciola* infective stages on pasture :

Conduct chemical analysis of water and soil as indication of suitability for *Fasciola* snail intermediate hosts, with the prime aim of developing a rapid method for surveying farms for potential for problems with fasciolosis. Note that this does not entail the analysis of water and mud for the presence of the snails, but just for suitability, and thus the potential for being able to harbour the snails;

Develop a method of laboratory analysis of mud and water for the presence of snails in marshy spots as a novel approach (in support of the present method of snail recovery by sifting of mud samples) to detection and estimation of levels of snail infestation in their natural habitat, for the purpose of serving a warning when fasciolosis may be on a rise on a given farm;

Conduct a plant survey as indication of suitability of marshy spots as snail host habitats, as has been used in countries abroad, and can complement the above, for rapid surveys of farms;

Investigate to what extent worm eggs in run-off water from milking parlours may be

disseminated onto pasture by irrigation from the different reservoirs involved per farm. This will be dependent on the extent to which the design of the different irrigation systems allow access to water close to the point of access from the relevant milking parlour run-off dam(s);
Train farmer personnel in snail recovery, as indication of level of *Fasciola* build-up from time to time.

No Non-achievements / underperformance has been reported

Goal 7 - Telemetric activity monitoring (with the use of a low-cost system) as possible adjunct to worm management. Of importance, however, is that the nature of the telemetric data is such as to require specialised data evaluation expertise. Evaluation of the large data sets to be obtained from the production of the dairy cows will be facilitated by inclusion with the telemetric data evaluation. However, due to the complexity of the analyses, results of only preliminary nature are to be expected in Phase 1.

Achievements

Goal 7 was aimed at monitoring animals for real-time detection of changes (both overt and subtle) in the activity of individual animals, and as far as possible to relate these to changes in specific animal health and management conditions.

Detailed plans were prepared for installation of the telemetric system at hand on one of the four farms, but unfortunately the system interfered with the electronic system of the farmer for management of the milking routine, with the result that it could not be applied. As a consequence, this goal is being discontinued.

Non-achievements / underperformance

It has not been possible to install a telemetric system on any of the farms presently in the project.

Reasons for non-achievements / underperformance

As explained above, the lack of success is due to non-compatibility of the available system with those in use on the project farms.

Planned remedies for non-achievements / underperformance

No remedy is to be applied for the non-achievement of this goal, since it is being discontinued.

Income and expenditure statement

Income and expenditure statement	A0Y005-MilkSA Annual Financial Report-2015.pdf
Unnecessary spending during period	No

Popular Report

No file has been uploaded

Additional documentation

[MILKSA Fasciola-Annual Progr.Rep.-EPGs-2015b RC.docx](#)
[MILKSA Fasciola-Annual Progr.Rep.-Snails-2015d_RC-d.docx](#)

Statement

Levy funds were applied only for the purposes stated in the contract	Yes
Levy funds were applied in an appropriate and accountable manner	Yes
Sufficient management and internal control systems were in place to adequately control the project and accurately account for the project expenditure	Yes
The information provided in the report is correct	Yes