2013 News & Events

Letter to Minister Ritz
December 11, 2013

The CSBA has been informed that the Animal Pedigree Act is at risk of being repealed. There is very little information available to explain why this could happen or to suggest possible alternatives. Please view the CSBA's letter to Minister Ritz and contact your local Member of Parliament to express your concern. – Review the letter here

Bluetongue Virus
November 29, 2013

Stakeholder memo concerning Bluetongue Virus – English /Français

Barberpole Worm in Nova Scotia
October 2013

Barberpole Worm in Nova Scotia Fact Sheet – Click here
Le ver "Barberpole" en Nouvelle-Écosse – Click here
Epidemiology of the Barberpole worm (Haemonchus contortus) in sheep in Nova Scotia – Click here

October 2013 Press Release
Shearwell CSIP Double Tags - Now Available - Click Here
Wool Growers Contact Infomation - Click Here

2013 Sheep Symposium
October 18 - 20, 2013

Alberta Sheep Breeders Association

Genetic Access In Brazil
September 11, 2013 - Ottawa ON

Harper Government Expands Livestock Genetic Access in Brazil - English...

Le gouvernement Harper élargit l�accès au marché brésilien pour le matériel génétique du bétail - Français.

Manitoba Annual Sheep Show and Sale
August 23-23th, 2013 - Rivers, MB

Quebec Evaluated Sheep Sales - Catalogues Available
Rimouski - August 4, 2013 Richmond - August 17, 2013 -

7th Annual Terminal Sire Ram Sale
July 15, 2013

Canadian Lamb Producers Cooperative Inc. Press Release
Monday June 17, 2014 - Click Here (English)

Canada Expands Export Opportunities for Sheep and Goat Genetics to Turkey - English

Le Canada accroît ses débouchés à l'exportation pour le matériel génétique de moutons et de chèvres en Turquie - Français

Tuesday May 7, 2013

Canadian Sheep Breeders' Association
RR 2, Site 7, Box 46 Bluffton, AB T0C 0M0
Toll free: 1-866-956-1116 Fax: 1-877-207-2541
office@sheepbreeders.ca www.sheepbreeders.ca
La Société Canadienne des Éleveurs de Moutons

December 11, 2013

The Honourable Gerry Ritz, Minister of Agriculture
Agriculture and Agri-Food Canada
1341 Baseline Road, Tower 7, Floor 9, Room 149
Ottawa, Ontario
K1A 0C5

Dear Minister Ritz:

RE: Animal Pedigree Act

I am writing on behalf of the Canadian Sheep Breeders' Association to express serious concern regarding the possibility that the Animal Pedigree Act may be repealed.

The CSBA is an organization of breeders of purebred sheep across Canada, representing over 40 breeds of sheep. As a democratic organization, operated by provincial directors elected by the membership, the CSBA is dedicated to working for the interests of sheep breeders across the country, whatever breed they may represent. The CSBA was incorporated 1905 and, like many other breed associations, relies heavily on the Animal Pedigree Act to ensure the integrity of Canadian genetics. The Animal Pedigree Act is good legislation that provides the framework for pedigreed animal associations to exist.

Repealing the act would adversely affect the international recognition of Canadian pedigrees for all species and would dissolve Canada's reputation for breed integrity. Several expected additional negative impacts resulting from the loss of the Animal Pedigree Act are: 1) loss of small and rare breeds, 2) loss of international markets, 3) fragmentation of existing breed associations, 4) dilution of genetics, and 5) loss of guidance in managing breed genetics. International livestock organizations and individual producers often seek out Canadian associations to assist with managing purebred genetics within their own country, where they currently lack an Animal Pedigree Act.

The CSBA is also concerned about the lack of consultative process and transparency surrounding the possibility of repealing the Animal Pedigree Act. The entire Canadian livestock industry would be impacted by the loss of the Act; however, most organizations are unaware of the current situation. No one has been able to provide concrete ideas, direction, possible outcomes or formal comment.

Repealing the Animal Pedigree Act would cause turmoil, uncertainty and disruption to the sheep industry and the entire livestock sector. On behalf of all Canadian sheep producers, I ask that the Animal Pedigree Act be left in place to continue to provide the groundwork for the registration of purebred animals.

Thank you for your consideration of this matter. If you have any questions or concerns, please contact me at 1-819-826-3066 or trenholm.pauline@gmail.com.

Sincerely,

Trenholm Nelson

Trenholm Nelson
CSBA President

To Stakeholders, November 29, 2013

The Canadian Food Inspection Agency (CFIA) has confirmed an incursion of Bluetongue virus (BTV) serotype 11, in two of the sentinel herds in the Okanagan Valley. This finding is a result of monthly testing (June to October every year) of the six sentinel herds that were established in 1988. The previous detection of BTV in the Okanagan Valley was almost 10 years ago (2004).

Bluetongue (BT) is a viral disease affecting sheep, goats, cattle, deer, bighorn sheep and antelopes. BT may cause serious illness and death in sheep, deer and ruminant wildlife. Affected cattle self-cure without clinical signs. BTV has 26 serotypes and the only significant route of transmission between animals is via certain species of Culicoides (midges), which are limited in their distribution in Canada. Currently there is no evidence of overwintering of the virus in Canada.

In 2007, the five serotypes considered endemic in the U.S. (serotypes 2, 10, 11, 13 and 17) were removed from the reportable diseases list and placed on the list of immediately notifiable diseases. Import testing requirements were removed, except for animals from the state of Florida where exotic serotypes of BTV are known to exist. No disease control actions are taken for these 5 serotypes. The remaining 21 of the 26 known BTV serotypes are still reportable and considered exotic to Canada.

Since 1969, Canada has experienced five incursions (1975, 1987, 1988, 1998 and 2004) of two U.S. serotypes of BTV in the Okanagan Valley of British Columbia. These are believed to have been a result of southerly winds carrying infected midges from the U.S. BTV transmission in Canada outside of the Okanagan Valley has never been found. Canada's claim to freedom from BTV outside of the Okanagan is supported through our national Bovine Serological Survey (BSS), which is conducted every 3-5 years. The last BSS was conducted in 2007-2008. Planning is well underway to convert the periodic BSS into an on-going surveillance system, with sampling anticipated to start in December. Substantial information is also generated on a regular basis through testing conducted for export, import, artificial insemination units and disease control requirements.

The CFIA will work with trading partners to address any export related issues and to minimize impact on trade.

Dr. D. Ian Alexander,
Chief Veterinary Officer for Canada/ Vétérinaire en chef du Canada
Executive Director/Directeur exécutif
Animal Health Directorate/Direction Santé des animaux
Canadian Food Inspection Agency/Agence canadienne d'inspection des aliments
(613) 773-7472
ian.alexander@inspection.gc.ca

Aux parties intéressées/intervenants, Le 29 novembre 2013

L'Agence canadienne d'inspection des aliments (ACIA) a confirmé une incursion du virus de la fièvre catarrhale du mouton (BTV, pour Bluetongue virus) sérotype 11, dans deux des troupeaux sentinelles de la vallée de l'Okanagan. La détection résulte du dépistage mensuel, fait de juin à octobre, dans six troupeaux sentinelles qui ont été établis en 1988. Le cas précédent de détection du BTV dans la vallée de l'Okanagan remonte à près de dix ans (2004).

La fièvre catarrhale du mouton (FCM) est une maladie virale qui touche les ovins, les caprins, les bovins, les cervidés, les mouflons d'Amérique et les antilopes. La FCM peut causer une grave maladie et la mort chez les ovins, les cervidés et les ruminants sauvages. Les bovins affectés guérissent naturellement sans présenter de signes cliniques. On connaît 26 sérotypes du BTV, et la seule voie notable de transmission entre les animaux se fait par certaines espèces de moucherons du genre *Culicoides*, dont la répartition est limitée au Canada. À l'heure actuelle, rien n'indique que le BTV survive à l'hiver au Canada.

En 2007, les cinq sérotypes considérés comme endémiques aux États-Unis (sérotypes 2, 10, 11, 13 et 17) ont été retirés de la liste des maladies déclarables et placés sur la liste des maladies à notification immédiate. Les exigences de dépistage à l'importation ont été levées, sauf pour les animaux provenant de Floride, où on retrouve des sérotypes exotiques du BTV. Aucune mesure de lutte contre la maladie n'est appliquée pour les cinq sérotypes endémiques aux États-Unis. En ce qui a trait aux 21 sérotypes restants des 26 sérotypes du BTV connus, ils font toujours partie des maladies déclarables et sont considérés comme exotiques au Canada.

Depuis 1969, le Canada a connu cinq incursions (1975, 1987, 1988, 1998 et 2004) de deux des sérotypes endémiques aux États-Unis, et ces incursions ont eu lieu dans la vallée de l'Okanagan en Colombie-Britannique. On pense que ces incursions sont dues à des vents du sud qui auraient transporté des moucherons infectés des États-Unis jusqu'au Canada. La transmission du BTV au Canada n'a jamais été observée à l'extérieur de la vallée de l'Okanagan. Le statut du Canada comme pays indemne de la fièvre catarrhale du mouton à l'extérieur de la vallée de l'Okanagan est corroboré par notre enquête sérologique nationale sur les bovins effectuée tous les 3 à 5 ans. La plus récente de ces enquêtes a été menée en 2007-2008. Notre projet de convertir l'enquête sérologique périodique en système de surveillance continue est bien engagé, et l'échantillonnage devrait commencer en décembre. En outre, les analyses de routine faites dans le cadre des exportations, des importations, de l'insémination artificielle et des exigences de lutte contre la maladie fournissent des renseignements précieux.

L'ACIA collaborera avec ses partenaires commerciaux pour régler les questions liées à l'exportation et réduire au minimum les impacts sur les échanges commerciaux.

D^{r} D. Ian Alexander
Vétérinaire en chef du Canada/Chief Veterinary Officer for Canada
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BARBERPOLE WORM IN NOVA SCOTIA

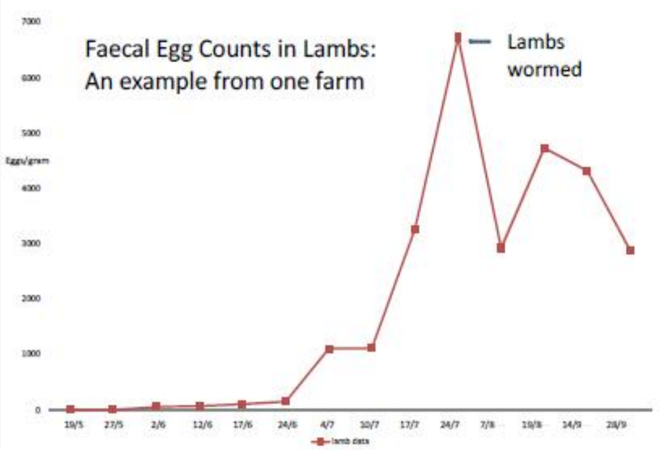
OCTOBER 2013

Barberpole worm (Haemonchus) is a serious pathogen. It is very common, and increasingly resistant to available wormers

How big a problem is it?

How can I tell when I have a problem?

What can I do about it?



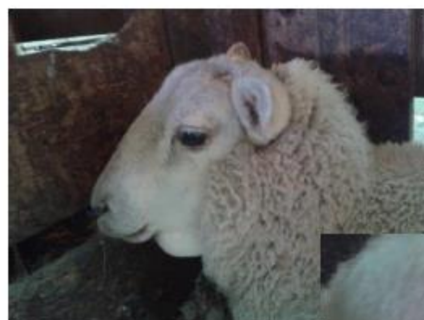
- Levels of infection in lambs rise rapidly from late June onward, throughout the summer
- Resistance to one or more wormers was seen in 7 of 8 farms sampled
- Ewes have high worm counts after lambing, for 2-3 months, and can be severely affected

What are the options?

- Monitor lambs often: eyelid colour, weight gain, faecal egg counts
- Monitor ewes after lambing, especially young ewes
- Wean lambs onto clean grazing if possible
- Do not dose all the flock at once, especially in winter; leave a few untreated
- Do not dose and move immediately to clean pasture

What to look for:

- The colour of the lower eyelid: pale pink or white (anaemic)
- Loss of condition
- Bottle jaw: this is seen in heavy infections
- This worm causes blood loss. It does not cause scouring



Bottle jaw

This eyelid is white

Photos: D. Thibault

This lamb has a severe infection with barberpole worm

IF ANY OF THESE SYMPTOMS APPEAR CONSULT YOUR VETERINARIAN FOR ADVICE

For more information:

Handbook for the Control of Internal Parasites of Sheep and Goats
http://www.uoguelph.ca/~pmenzies/Handbook_Home.html

Partial funding for this project was provided by Agriculture and Agri-Food Canada through Agri-Futures, Nova Scotia's Canadian Agricultural Adaptation Program (CAAP) Council.

SPANS Sheep Producers Association of Nova Scotia

Purebred Sheep Breeders Association of Nova Scotia

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Agri-Futures

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

LE VER "*BARBERPOLE*" EN NOUVELLE-ÉCOSSE

OCTOBRE 2013

Le ver *Barberpole* (Haemonchus) est un agent pathogène grave. Il est très fréquent, et de plus en plus résistant aux vermifuges disponibles

Est-ce un gros problème?

Comment puis-je savoir si j'ai un problème?

Que puis-je faire?

- Les niveaux d'infection chez les agneaux augmente rapidement à partir du mois la fin de Juin, tout au long de l'été
- Une rèsistance aux quelques vermifuges a été observée dans 7 de 8 fermes etudiées.
- Les brebis ont des nombres élevés de vers après l'agnelage, pendant 2-3 mois, et peuvent être gravement

Quelles sont les options?

- Surveiller les agneaux souvent (la couleur de la paupière, le gain de poids, nombre d'œufs fécaux
- Surveiller les brebis après l'agnelage, surtout les jeunes brebis
- Sevrez les agneaux sur le pâturage propre si possible
- Ne pas vermifugez tout le troupeau aux meme temps, surtout en hiver (laisser un peu non traitée
- N'administrez pas le vermifuge et déplacer les agneaux immédiatement au pâturage non contaminée
- Administrez le vermifuge correctment à la bonne dose

Ce qu'il faut chercher:

- La couleur de la paupière inférieure: rose pâle ou blanc (anémique)
- Perte d'état
- *"Bottle jaw"*: (dans les infections lourdes)
- Ce ver cause la perte de sang. Il ne provoque pas la diarrhée

"Bottle jaw"

Photos: D. Thibault

Cette paupière est blanche

Cet agneau souffre d'une infection grave

SI L'UN DE CES SYMPTÔMES SE MANIFESTE, CONSULTEZ VOTRE VÉTÉRINAIRE

Pour plus d'informations:

Handbook for the Control of Internal Parasites of Sheep and Goats http://www.uoguelph.ca/~pmenzies/Handbook_Home.html

Financement partiel pour ce projet ete fourni par Agriculture et Agroalimentaire Canada dans le cadre Agri-Futures, Nova Scotia's Canadian Agricultural Adaptation Program (CAAP) Council.

SPANS Sheep Producers Association of Nova Scotia

Purebred Sheep Breeders Association of Nova Scotia

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Agri-Futures

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

Epidemiology of the Barberpole worm (Haemonchus contortus) in sheep in Nova Scotia

FINAL REPORT

Agri-Futures Nova Scotia
NS0400

Applicant
Sheep Producers Association of Nova Scotia
60 Research Drive
Bible Hill, NS B6L 2R2

Project Leader
Dr. Gwyneth Jones

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Summary
We analysed faecal samples from lambs, mature ewes and rams, goats and llamas from May 1 to October 31, 2013. These were provided by producers (over 2,150 samples) or collected at the Atlantic Stock Yards (over 300 samples). We also carried out faecal egg count reduction tests for 8 producers to estimate the efficacy of one or more anthelmintics. We cultured faecal samples to identify L3 larvae of *Haemonchus contortus, Teladorsagia* circumcincta and *Trichostrongylus spp*, which cannot be identified as eggs; other species (*Nematodirus battus*, *Nematodirus* sp., *Strongyloides papillosus* and *Trichuris ovis*) were identified as eggs and recorded separately.

Five producers gave samples on 6 or more occasions. These showed a consistent pattern, with FECs rising rapidly through July (flocks lambing in February-March) or August (lambing in June). Ewe FECs remained high for 2-3 months after lambing.

Atlantic Stock Yards sampling suggested that half the lambs consigned from July to September are barn-raised. Some lambs with high FECs and signs of haemonchosis were seen in late summer and fall.

Resistance to one or both available anthelmintics was seen in 7 of 8 participating farms. Efficacies of 30-77% were recorded for avermectins and 60-70% for benzimidazoles. Levamisole or pyrantel were effective, and preliminary observations show that closantel is also effective against *Haemonchus*.

Most larvae in cultures were *Haemonchus* (>90%); 4 other species (<10%) were recorded on Farm 1. On two other farms, only *Haemonchus* were found. After dosing with an avermectin or a benzimidazole, only *Haemonchus* was still seen in samples from Farm 1. No *Haemonchus* were seen after dosing with levamisole or closantel, although 4 other species were recovered after closantel use.

Nematodirus battus was very common, on 24 of 25 farms with FECs >50 epg in lambs. Eggs were seen about 1 week earlier than other GINs, with peak counts in June and a decline through July. *Nematodirus* spp. was uncommon, and mainly seen in late summer. *Trichuris* and *Strongyloides* were seen mainly in spring or early summer.

We conclude that resistance to the two available classes of anthelmintics is probably widespread, and *Haemonchus* is a serious problem for the sheep industry in this region.

Sommaire
Nous avons analysé des échantillons de selles des agneaux, brebis adultes et les béliers, chèvres et lamas du 1er mai au 31 Octobre 2013. Ces échantillons ont été fournis par les producteurs (plus de 2150 échantillons) ou prélevés à l'Atlantique Stock Yards (plus de 300 échantillons) . Nous avons également effectué des tests de réduction de nombre d'œufs fécaux pour 8 producteurs d'estimer l'efficacité d'un ou plusieurs vermifuges. Nous avons cultivé des échantillons fécaux d'identifier L3 larves de Haemonchus, Trichostrongylus Teladorsagia et qui ne peut être identifié que les œufs, d'autres espèces (. Nematodirus battus, Nematodirus spp, Strongyloides et Trichuris) ont été identifiés comme des œufs et enregistrés séparément .

Cinq producteurs ont donné des échantillons sur 6 ou plusieurs fois. Ils ont montré un modèle cohérent, avec FEC augmente rapidement à Juillet (troupeaux agnelage en Février-Mars) ou Août (agnelage en Juin) . Ewe FEC est resté élevé pendant 2-3 mois après l’agnelage.

ASY échantillonnage suggéré que la moitié des agneaux en provenance de Juillet à Septembre sont grange soulevé. Certains agneaux avec FEC élevés et les signes de hémonchose ont été observés à la fin de l'été et de l’automne.

La résistance à une ou deux anthelminthiques disponibles a été observée chez 7 ou 8 fermes participantes. Efficacités de 30-77 % ont été enregistrées pour les avermectines et 60-70% pour les benzimidazoles. Lévamisole ou le pyrantel étaient efficaces, et des observations préliminaires montrent que closantel est également efficace contre Haemonchus.

La plupart des larves dans les cultures étaient Haemonchus (> 90 %) ; 4 autres espèces (<10 %) ont été enregistrés à la ferme 1. Sur deux autres fermes, seulement Haemonchus ont été trouvés. Après le dosage avec une avermectine ou un Benz imidazole, ne Haemonchus était toujours vu dans des échantillons provenant de la ferme 1. Pas de Haemonchus ont été vus après l'administration de lévamisole ou closantel , mais ont été récupérés 4 autres espèces après utilisation de closantel .

Nematodirus battus était très commun, sur 24 des 25 fermes avec FEC > 50 EPG chez les agneaux. Les œufs ont été vus environ 1 semaine plus tôt que les autres GINs, avec les chiffres de pointe en Juin et une baisse à Juillet. Nematodirus spp . Était rare, et surtout vu en fin d'été. Trichuris et Strongyloides ont été observés principalement au printemps ou début de l'été.

Nous concluons que la résistance aux deux classes disponibles de vermifuges est probablement répandue, et Haemonchus est un sérieux problème pour l'industrie ovine dans cette région.

Introduction

Haemonchus contortus is a nematode parasitic in the abomasum of sheep and other small ruminants. It is characteristically a warm climate species, and so, until recently, has not been considered a serious problem in northern regions of North America and northern Europe (Kaplan & Vidyashankar 2012). In cold winter climates this parasite does not survive to any extent overwinter on pasture (Menzies et al. 2012), and short summer grazing periods mean that parasite populations have not built up to dangerous levels. It has posed a problem in Nova Scotia only occasionally in hot; dry summers when sheep have spent considerable periods of time congregating around water sources in a restricted area (E. Semple, personal communication). However, within the last 4-5 years this parasite has become far more prevalent, and has emerged as a serious pathogen of grazing small ruminants in this region, as well as in southern Ontario (Falzon et al., 2013), Britain (Abbott et al., 2012) and other northern climate areas (Domke et al. 2012a; Manninen 2008). There is also growing concern that, worldwide, this species is rapidly developing resistance to anthelmintics (Kaplan & Vidyashankar, 2012), and that this is occurring rapidly in countries where winter climates prevent larvae overwintering in the soil (Waller et al. 2004; Falzon et al., 2013; Domke et al, 2012 a, b).

While there is considerable information on the epidemiology of *Haemonchus* in countries where it has long been a major pathogen, there is relatively little information in Canada. Most Canadian studies have been carried out in southern Ontario, and virtually no information is available for any of the Atlantic Provinces. Many Nova Scotian producers have faced sudden losses of lambs, and even mature ewes in the last few years, and are not sure how the problem can be managed; some have turned to raising lambs in confinement, or have left the industry. The purpose of this study, therefore, has been to document how widespread *Haemonchus* is in Nova Scotia, to demonstrate the pattern of seasonal changes through one grazing season, and to investigate whether resistance to either or both of the available classes of anthelmintics is emerging on local farms.

Whereas *Haemonchus contortus* is a subtropical species that is becoming more prevalent in colder climates, *Nematodirus battus* is an arctic species that seems to be extending its range south (van Dijk & Morgan 2010). It has been associated with early spring disease outbreaks in Britain (Abbott et al 2012), but is seldom considered significant in Canada (Menzies et al., 2012). It is relatively easy to identify, however, and since it is a major pathogen on British farms, a secondary objective during this study was to determine whether *Nematodirus battus* is also prevalent on farms in this region.

Biology of *Haemonchus*

The most important nematodes parasitic in small ruminants belong to the family Trichostrongylidae; this includes not only *Haemonchus* but also the brown stomach worm, *Teladorsagia circumcincta* and the stomach hair worm and black scour worm, *Trichstrongylus* spp. (Menzies et al. 2012). All have similar direct life cycles, with larval development occurring in faecal deposits and adjacent soil (Figure 1).

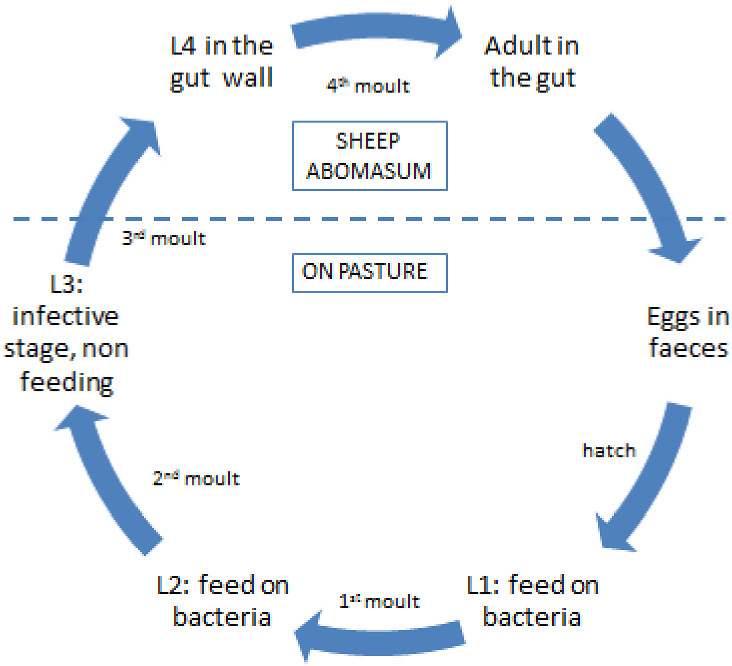

Figure 1: Life cycle of trichostrongyle nematodes

Four larval (or juvenile) stages occur, and the larval cuticle is moulted between each stage. The third stage is infective, and is enclosed in a sheath formed from the retained cuticle of the second larval stage; thus it is non-feeding and its persistence on pasture depends on its stored food reserves. Climate conditions during the grazing season strongly influence the length of time infective larvae can survive on pasture.

Infective larvae move to a limited extent between faecal pellets, the surrounding soil and herbage. A water film is necessary for movement, which can limit exposure to the larvae in hot, dry conditions, at least when there is no dew on the grass Abbott et al. 2012; Menzies et al. 2012). However, typical seasonal conditions in Nova Scotia over the last few years have been suitable for a buildup of high worm burdens of *Haemonchus*.

The infective larvae, when eaten along with pasture plants, cast off the sheath as they pass through the forestomach chambers, and moult to the fourth larval stage and subsequently to the adult. The prepatent period (the time from ingestion of larvae to the appearance of eggs in the faeces) is approximately 16-21 days Menzies 2012).

Adult *Haemonchus* in the abomasum feed on blood, puncturing the mucosa with a single large tooth. Blood loss, through feeding and through haemorrhage from the punctures, is approximately 0.05 ml per worm, but heavy infections are common and anaemia can be severe and rapidly life-threatening. Adults also have high fecundity, with reports of 10,000 eggs per female worm per day or even more (Pritchard 2001; Abbott 2012). High levels of pasture contamination with infective larvae can result in early summer, and lambs can acquire heavy worm burdens very rapidly on such pastures.

An effective immune response develops slowly in lambs or in yearlings if they are in their first grazing season (Douch & Morum 1993; Menzies et al., 2012), and requires continuous exposure to infective larvae for 3-4 months; thus lambs remain susceptible throughout the summer under most management conditions, but by fall often show reduced output of eggs in the faeces. Mature sheep are generally capable of mounting an effective response, so that they produce few or no eggs and do not show signs of disease. Yearlings and two or three year old animals may, however, still show a higher susceptibility, particularly during and after lambing (Menzies et al., 2012).

Most gastrointestinal nematodes in ruminants have two strategies for overwinter survival. They can survive freezing, so can overwinter in the soil and become active once soil temperatures rise in the spring; however, if they have been ingested by ewes or lambs during the fall, they can undergo a period of dormancy (larval arrest, or hypobiosis) in the gut wall. Around the time of lambing (the periparturient period), the immune response is weaker, and the larvae emerge from arrest, resume development, and produce eggs that can contaminate pastures heavily in spring. This periparturient egg rise (PPER) occurs from about two weeks before lambing to six or more weeks after lambing, during lactation (Menzies et al. 2012) In spring, therefore, lambs are exposed to infective larvae that have overwintered in ewes as well as those that have overwintered on pasture. However, *Haemonchus* is not well adapted to cold winter climates, and any L3 larvae that do survive on pasture are poorly infective (Menzies et al., 2012). Therefore, infective larvae are overwhelmingly those from the PPER. This is a major factor in the rapid increase in resistance to anthelmintics shown by *Haemonchus* in regions with cold winters, including Canada (Menzies et al., 2012; Falzon et al. 2013) and Scandinavia (Waller et al. 2004; Domke et al. 2012).

The PPER has two consequences. Ewes that pick up large numbers of larvae in the fall can themselves become severely affected when the larvae emerge and mature, particularly young ewes and those raising multiple lambs. Sudden death is increasingly common a few weeks after lambing. In addition, it is common practice to worm all ewes when they are housed during the winter; since this means that effectively all the worms in the population may be exposed to the anthelmintic used, this practice is strongly selective for resistant worms. The only source of infective larvae in spring will be from worms that have survived anthelmintic treatment. Only two classes of anthelmintics have been in use in Canada for approximately ten years, and there is evidence that resistance of *Haemonchu*s to one or both is increasing, and is now common in Ontario (Falzon et al. 2013).

Previous Studies

Studies in southern Ontario and Quebec in 2007-8 found little or no evidence of resistant *Haemonchus*; however, more recently resistance has been demonstrated in over 80% of sampled farms in Ontario (Mederos et al. 2010; Falzon et al. 2013).

In Nova Scotia, there is very little information on parasite populations in small ruminants. However, a survey was carried out through the summer of 1997, with funding from Agriculture Canada, to follow worm burdens in a group of lambs on three farms (Maal-Bared, 1998; G. Jones & Y. Papadopoulos, unpublished observations). One of these farms, belonging to the author, was sampled again during the summer of 2012, in an unfunded study by Saint Mary's University students G. Jones, K. Hipwell & R. Betts, unpublished observations). This survey, though very limited, showed a major change in FECs between these two summers (Figure 2). In 1997 FECs increased during August and peaked in early September then declined. Maximum intensity of infection was almost 1000 epg. In 2012 FECs increased through July, August and early September, and remained high into October. Maximum intensity of infection was approximately 4000 epg, and was still close to this level in early October.

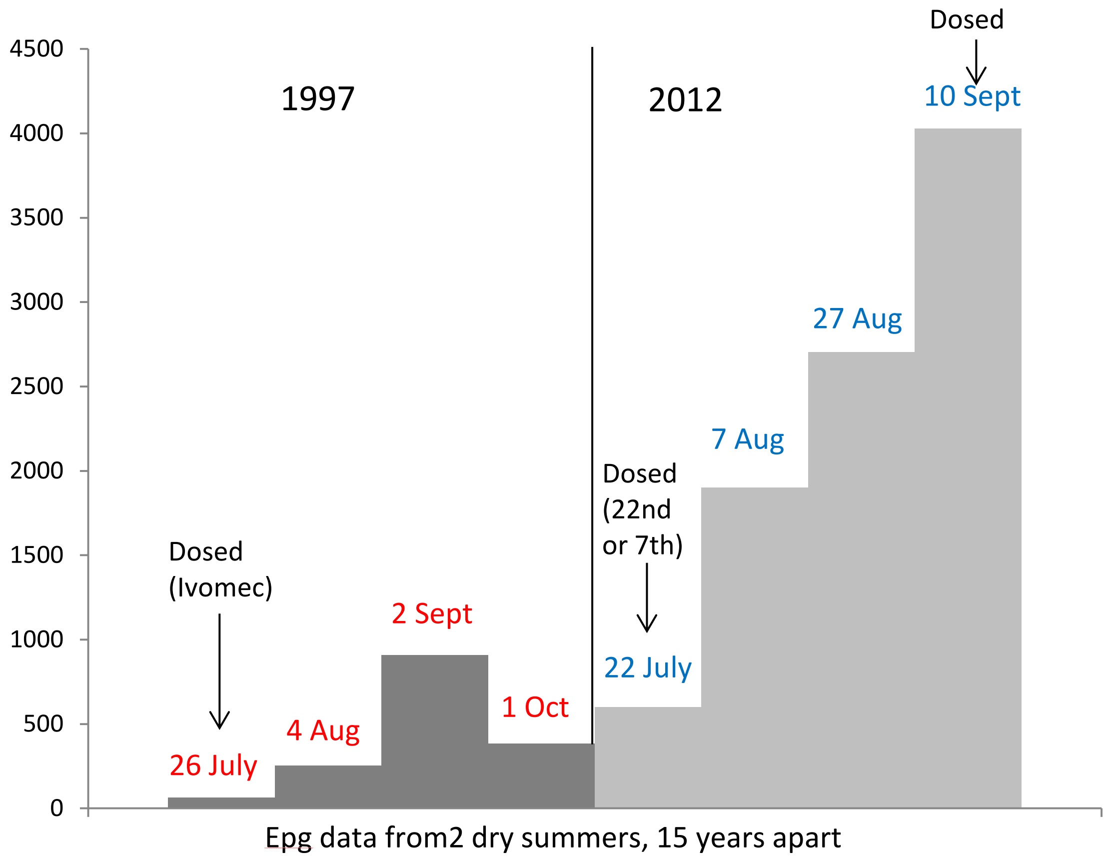

Figure 2: FECs from Farm 1 surveyed in two different seasons

In 2012 a single faecal egg count reduction test was performed on this farm, to investigate the efficacy of one anthelmintic, V ars. This test indicated an ef) resistance.

Figure 2: Comparison of patterns of infection in lambs on one farm, 15 years apart

During August 2012 a number of producers throughout the province reported losing significant numbers of lambs, and severe loss of condition in surviving lambs after dosing.

These observations indicated that problems of parasitism, especially *Haemonchus*, are now sufficiently severe that a larger scale study would be helpful to inform producers of the need to monitor for haemonchosis and to investigate potential anthelmintic resistance.

Methods
Samples were collected for this project from both participating producers and from regular visits to the Atlantic Stock Yards (ASY) in Murray Siding, N.S. We invited producers to submit samples through direct contact with those who had attended one of two parasite workshops in the previous fall, through contacts during collection at ASY, and through advertising on the SPANS website and the NSFA e-news site. Over 40 producers responded with samples; five farms provided multiple (6 or more) samples throughout the study period while the remainder provided one or a few. Most samples were submitted from lambs, with fewer from mature sheep; a few samples from goats and three from llamas were also analysed.

The majority of producers submitted samples to us in person or through the co-operation of Holly Hines at Dalhousie Agricultural Campus, Cathy Vallis at Atlantic Woolgrowers, and the Pathology Laboratory in Truro. Where necessary, a student (Danielle Thibault) travelled to the producer's farm to assist in collection.

Sample collection at ASY was carried out by Danielle Thibault, weekly from July to September, and by Kelsey Brydon during October. Lambs were randomly sampled in the pens, and no attempt was made to identify the farm of origin unless specifically requested by their consignor. Ewes and goats were also sampled when time permitted. In October, numbers of lambs from islands off the South Shore are transported to ASY. Since these lambs are likely to have had minimal worming, they were identified at sampling as island lambs, but not traced to a specific island or producer.

During the annual PSBANS Fall Sale in Truro, a booth was set up to receive any samples provided, and to collect samples from consigned animals at the request of the consignor.

Sample Collection and Analysis
Faecal samples were collected rectally using disposable gloves wherever possible, or were picked up as fresh deposits from the ground, with minimal contamination from bedding, soil or plant material (Gibbons et al, accessed 2013). They were labelled and transferred to a cooler with ice packs and kept refrigerated until analysis.

Faecal egg counts (FECs) were performed according to standard parasitological methods (MAFF 1986; Coles et al. 2006; Gibbons et al., accessed 2013) using a modified McMaster technique with a detection limit of 50 eggs/gram (epg). Analyses were carried out at Saint Mary's University, Department of Biology, in Halifax.

For each analysis, 3 grams of faeces were suspended in 45 ml of saturated salt solution (400 gm/l), filtered through a metal tea strainer to remove large debris and stirred thoroughly. Both chambers of a McMaster counting slide (Chalex Corporation, USA) were quickly filled by pipette from this suspension, and the slide left for at least 5 minutes for eggs and debris to separate. The eggs from both chambers were counted, and the total multiplied by 50 to estimate epg. Samples were counted as soon as possible after collection, or stored for up to 3 weeks in the refrigerator if necessary.

Eggs can only be reliably identified for a few species of nematodes. Those that are identifiable were recorded separately; this included *Trichuris ovis, Strongyloides papillosus, Nematodirus battus and Nematodirus spp.* All others, including *Haemonchus,* were grouped as gastrointestinal nematodes (GIN).

Faecal Egg Count Reduction Tests (FECRTs)
Eight producers sent samples before and one or two weeks after worming with one or more anthelmintics. These were analysed as above, and the efficacy (% reduction in FEC) calculated for each anthelmintic. Most participants tested one or two anthelmintic classes together with a control group that was left untreated; one tested three anthelmintics, and two did not use a control group.

An Emergency Drug Release (EDR) was granted to permit the veterinarian to import a single sample of closantel, an anthelmintic specifically effective against *Haemonchus,* and a limited efficacy trial was performed on 4 farms. The anthelmintic was not available until October, and analysis is still underway for two of these farms.

Larval Identification

A limited number of faecal samples collected before and after treatment with anthelmintics, were also used to set up faecal cultures. These samples were not refrigerated for more than 1-2 days, since *Haemonchus* has poor cold tolerance. Faecal samples were maintained at room temperature for 1-2 weeks and L3 larvae then extracted using a Baermann funnel (Gibbons et al. accessed 2013). The cultures were moistened if necessary, or mixed with vermiculite if too loose.

Larvae were collected by draining the funnel into a petri dish. This was scanned using an inverted microscope for the presence of larvae, and a sample transferred to a microscope slide. A drop of Gram's iodine was added to kill and stain the larvae, which were then identified by comparison with published keys (Gibbons et al. accessed 2013; MAFF 1986; van Wyk et al. 2004).

Statistical Analysis

Surveys and Seasonal Dynamics

For each farm and the ASY samples, we recorded data as follows:

- Prevalence: proportion or percentage infected
- Mean intensity: average (arithmetic mean) FEC per infected animal
- Range: maximum and minimum counts in the sampled group

For the five farms that gave samples on 6 or more occasions, we also calculated the average FEC (mean ± standard deviation) for early, mid-month or late periods each month (day 1-10, 11-20, 21-30/31) from May to August.

FECRTs

Anthelmintic efficacy can be calculated in several ways (Dash et al. 1988; Martin et al. 1989; Falzon et al. 2013).

- T_1: count in treated group before dosing
- T_2: count in treated group after dosing
- C_1: count in control group before dosing
- C_2: count in control group after dosing

If no control group was included we calculated the FECR as $100(1-T_2/T_1)$

If a control group was included we calculated the FECR as $100(1-T_2/C_2)$

If counts in the control group are rising rapidly or falling an additional correction can be made (Dash 1988); we calculated the FECR at these times also as $100(1-T_2/T_1 \times C_1/C_2)$. We compared these formulae to check for bias in the calculations.

We based these calculations on arithmetic means for the whole group (i.e. including zero counts), not on mean intensity which is a statistic appropriate to ecological investigations, in this case broad surveys and seasonal dynamics. Between-group comparisons can be based on arithmetic or geometric (log transformed data+25) means but arithmetic means are less likely to overstate efficacy at % reductions close to 90% (Dash 1988).

Observations

Forty-seven producers provided samples between May 1 and October 31; of these, five submitted 6 or more samples. These gave useful information on the seasonal dynamics and risk period for *Haemonchus.* In addition, samples were collected at ASY from July 4 to September 12, and again on October 3 and October 31; thirteen animals were also sampled at the annual Sheep Sale on August 31. Approximately 2,150 samples were analysed from these submissions, plus approximately 300 from sale consignments. Faecal egg count reduction tests were conducted on 8 farms, with partial data from several others.

The Typical Pattern

One farm provided samples on 19 separate occasions, with minimal use of anthelmintics. Data from this farm (Farm 1) were used as an example, and a baseline study to compare with other, more limited samples. This farm uses set stocking with a low stocking density, and lambs in late February-mid March, with a smaller group lambing in late April. The ewes and lambs from early lambing were turned out on April 29, and ewe lambs continued to run with the ewes until September 21. Lambs were wormed in July, for a FECRT, and not wormed again unless showing signs of parasitism, or for additional FECRTs. The ewes were only wormed if they were showing signs of haemonchosis, notably a high FAMACHA score (Kaplan et al 2004), on July 7, or occasionally, with evidence of bottle jaw, in June or July.

The results from this flock are shown in Figure 3. Ewe FECs were high through May and much of June, but then dropped rapidly. A subsequent apparent rise in July was associated with unusually high counts in two ewes with bottle jaw; apart from these, ewe counts remained low through the summer and fall.
Lamb counts did not begin to rise until late June, but increased rapidly through July. Three groups of lambs were treated with anthelmintics on July 10 for FECRTs; these are not included in the July 24 FEC. Lambs in the control group were wormed on July 24. After this worming the counts dropped, but they were rising again by mid-August. At this time only lambs with high counts were wormed. This partial flock treatment resulted in a drop in mean intensity of infection for the whole flock.

Subsequently, in a group of 12 ewe lambs that had remained on pasture with the ewes and had not been dosed, unless anaemic, since July 24, mean intensity was still 3100 epg on October 11 and declined only to 2900 epg by October 25. A second group of 15 ewe lambs was treated with closantel on October 11 for an additional FECRT.

Prevalence increased from 20% on June 12 and June 17 to 100% throughout July and August, declining only to 90% in September and October.

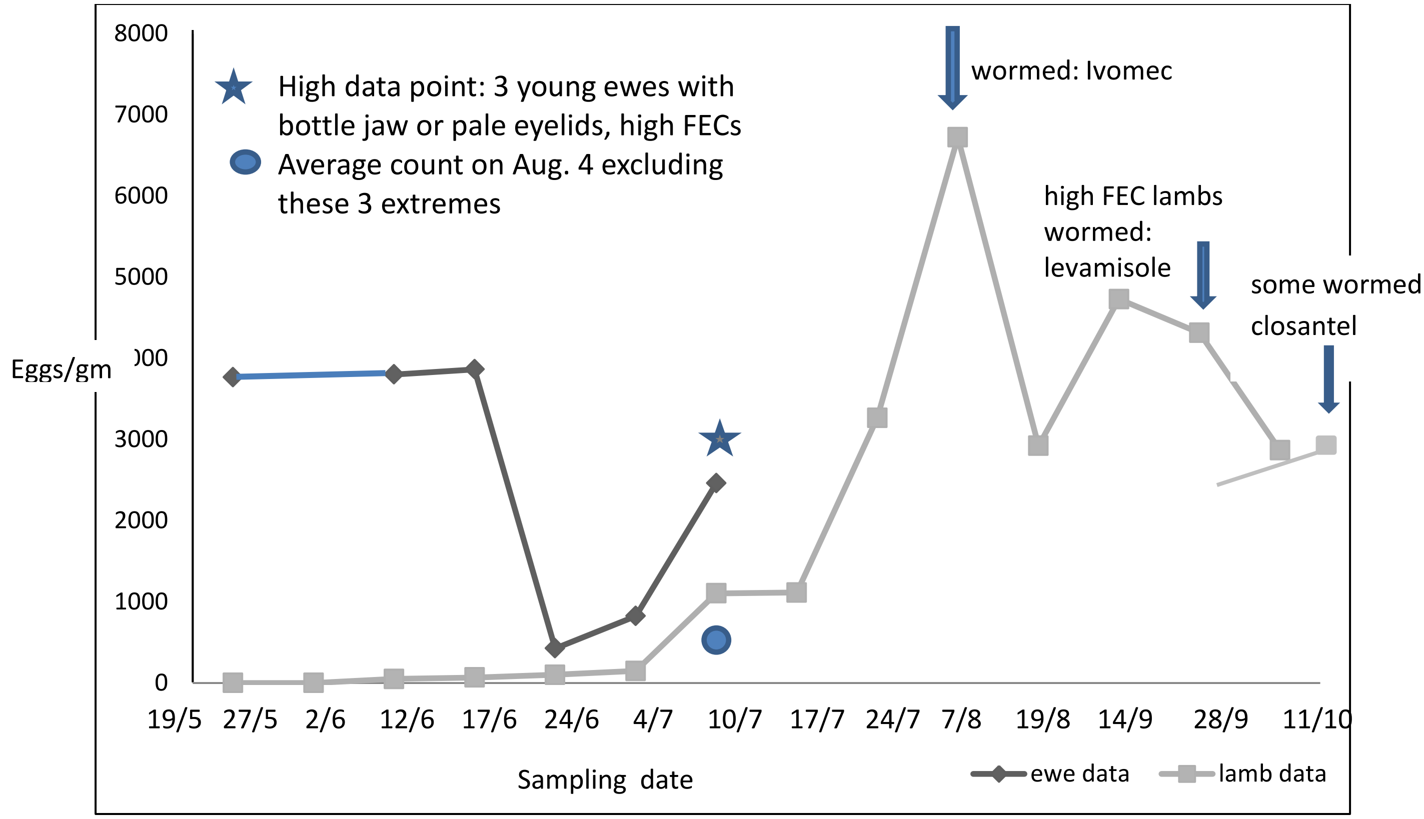

Figure 3: Seasonal variation in FECs; ewes and lambs from Farm 1

These results are comparable to those from the other farms that submitted multiple samples (Figure 4, 5). There is considerable variation in epg,s among the flocks, particularly from mid-July onwards, which reflects different management practices, especially frequency of worming. The pattern of infection, however is the same. Fewer samples were received during September and October from these farms, so these data are only analysed to the end of August. Prevalences were typically 100% in July and August, except for the late lambing flock.

Four of the five farms practiced set stocking or limited rotations, e.g. alternating between two fields, and were lambing in a similar time frame (Figure 4). Ewe FECs for these four farms followed the same general pattern as in Farm 1, although fewer samples were available and consequently variance was much higher (Figure 4). The PPER even in early lambing flocks is still evident when animals are turned out, which can result in rapid contamination of the pastures at the start of the pasture season.

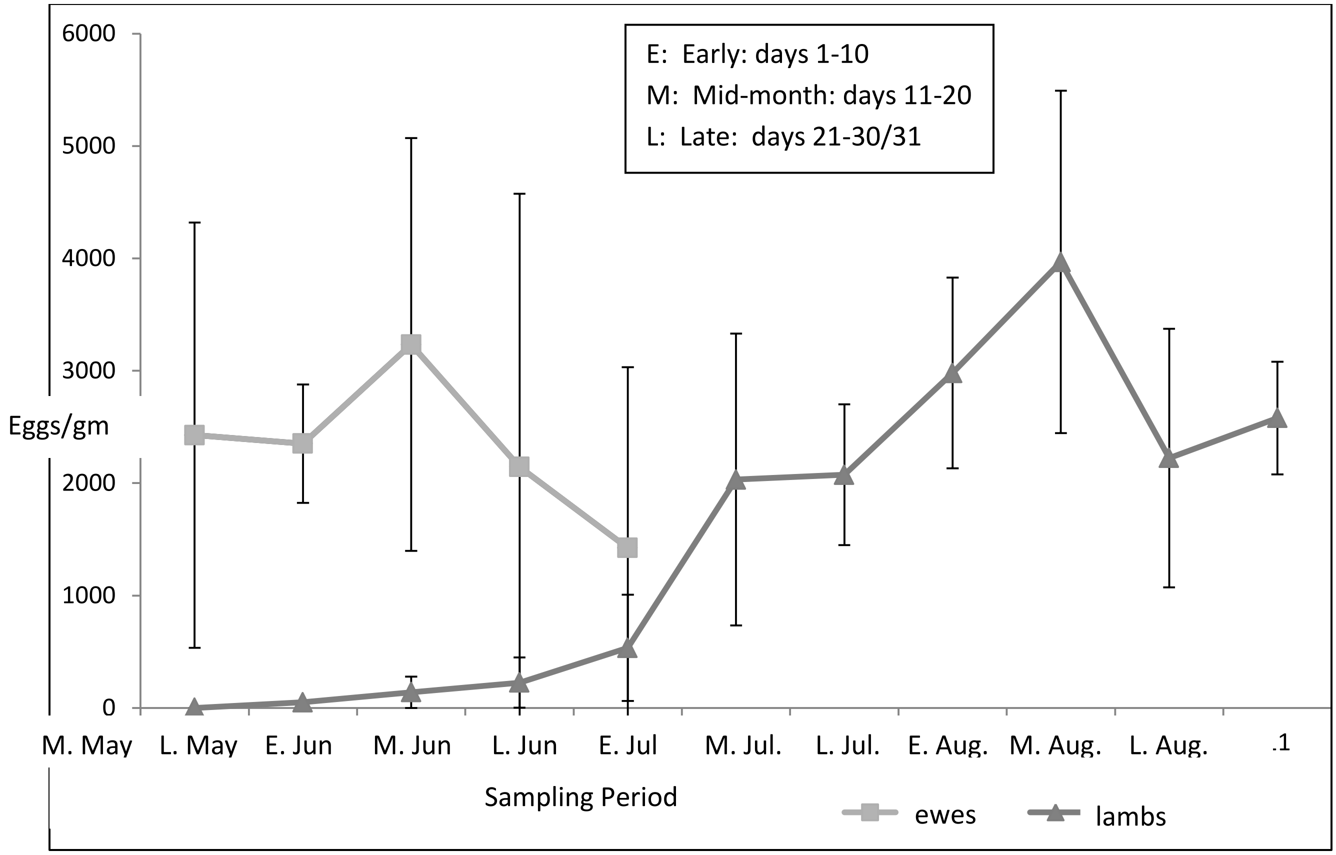

Figure 4: FECs for four flocks lambing in February-March (mean intensity ± S.D.). Ewe FECs show very high variabilit because only 2 or 3 farms were sampled in each sampling period

One farm lambed later, from June 10, and rotated through one large field with portable electric fencing to make variable paddocks. Fig. 5 shows a summary of the data from this flock; the rapid increase in FECs occurred in August, a month later than for early lambing flocks.

Samples analysed in September were mainly provided during the PSBANS annual Fall Sale, and included two submissions from New Brunswick and 5 from Prince Edward Island.

A summary of data for the remaining producers (those submitting samples on 1-4 occasions through the sampling period) is given in Table 1. These data confirm the general pattern shown in Figure 3. Lamb FECs rise during the first half of July and remain high into the fall. However, in most cases information on pasture management and worming practices was not provided.

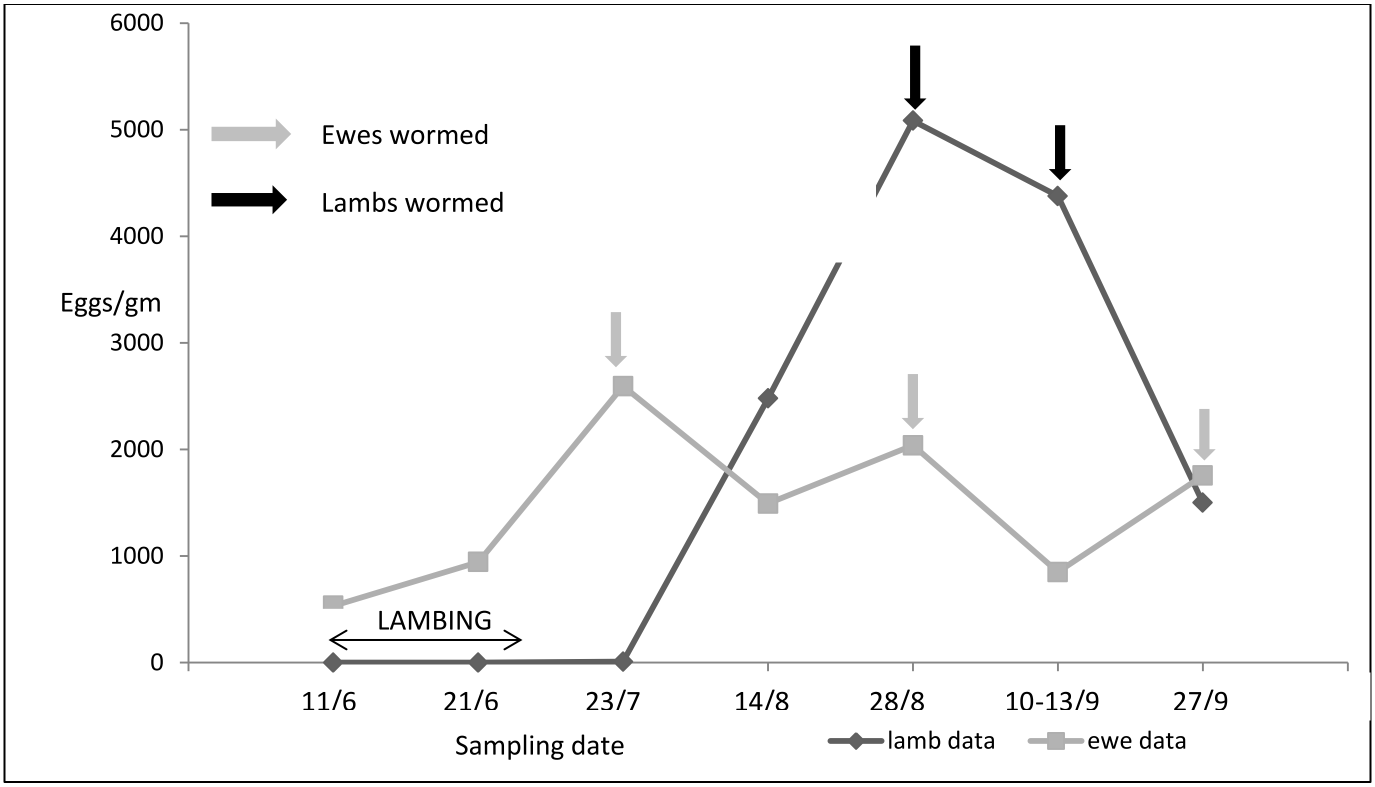

Figure 5: FECs in a late lambing flock

Table 1: FECs in lambs and mature sheep: random samples submitted by producers. This does not include data from animals of unknown or mixed ages, or from goats and llamas.

	LAMBS			EWES/RAMS		
Month	No. of farms	Prevalence (%)	Mean intensity	No. of farms	Prevalence (%)	Mean intensity
May	1	0	0	2	1	1540-3670
June 1-15	2	0-0.1	0-50	6	0.1-1	50-6005
June 16-30	3	0-1	0-550	3	0.1-1	50-1768
July 1-15	3	0-1	0-2950	3	0.7-1	233-13,050
July 16-31	3	0.9-1	2919-3217	1	0.8	1000
August 1-15	3	0.3-0.9	2125-5500	3	0.4-1	238-2140
August 16-31	10	0.1-1	50-4817	8	0-1	0-2750
September	4	0.9-1	1599-51,200	1	0.5	217
October	4	0.3-1	50-2525	2	1	250-363

Samples from ASY also confirm this seasonal pattern (Table 2). However, prevalence varied from 0.2 to 1 (20 – 100%), averaging about 50%. About half the lambs consigned had zero counts.

Individual lambs with high or extreme counts were seen particularly from mid-August, notably one lamb with a FEC of 69,100 epg and signs of severe haemonchosis. Many or all lambs consigned on October 31 were from an unidentified island or islands; prevalence and worm burdens were high in these samples, even at the end of October (Table 2).

Table 2: FECs in lambs and mature sheep sampled at the Atlantic Stock Yards

		LAMBS		
Date	N	Prevalence	Mean Intensity	Range
Jul-04	9	0.45	88	0-200
Jul-11	10	0.5	610	0-1050
Jul-18	20	0.45	1906	0-8250
Jul-25	9	0.2	1900	0-3600
Aug-01	26	0.8	2248	0-7950
Aug-08	3	0.3	2200	0-2200
Aug-15	30	0.6	8186	0-69,100
Aug-22	17	0.8	5318	0-19,950
Sep-12	24	0.5	1850	0-10,400
Oct-08	86	0.8	1064	0-17,700
Oct. 31	60	1	12,012	150-52,300
		MATURE SHEEP		
	N	Prevalence	Mean Intensity	Range
Jul-04	9	0	0	0
Jul-11	1	0	0	0
Jul-18	1	0	0	0
Jul-25	27	0.8	1474	0-6700
Aug-01	4	0.5	1150	0-2550
Aug-08	6	1	1867	100-7400

Anthelmintic Resistance

Eight producers sent samples in July or August, before and after worming, to test for anthelmintic efficacy. These results are summarised in Table 3.

Reduced efficacy for one or both routinely available classes of AH was evident in 7 of these farms. Levamisole was still highly effective, as was pyrantel (Strongid). However levamisole does not have a persistent effect, and on two farms counts after 4 weeks were similar to those with less effective AH's (Figure 6).

For 3 farms, faecal cultures after treatment with AV or BZ contained only *Haemonchus.* Since levamisole and pyrantel were highly effective, no larvae were recovered from cultures. Faecal cultures from samples collected from the ground were contaminated with large numbers of freeliving nematodes. On Farm 1, pretreatment cultures contained at least 4 species of GIN (*Teladorsagia, Trichostrongylus, Strongyloides* and an unidentified species, possibly *Oesophagostomum* or *Chabertia)* in addition to *Haemonchus*, although *Haemonchus* comprised over 90% of the samples.

Table 3: Summary of FECRT results for eight participating farms (% reduction in FECs). Post- treatment counts were made after 7 days for Levamisole or 14 days for AVs, Strongid or BZs

Farm	AV group	BZ group	Levamisole or Strongid	Note
1	30	64	100	
2	38	-	95	
3	56	-	91	1 high Lev count - missed dose?
4	-	44% incr.	98	
5	-	-	99.5	
6	-	63	97	
7	77	-	-	Alternated dosing ewes and lambs
8	97	100	-	Lambs on clean grazing

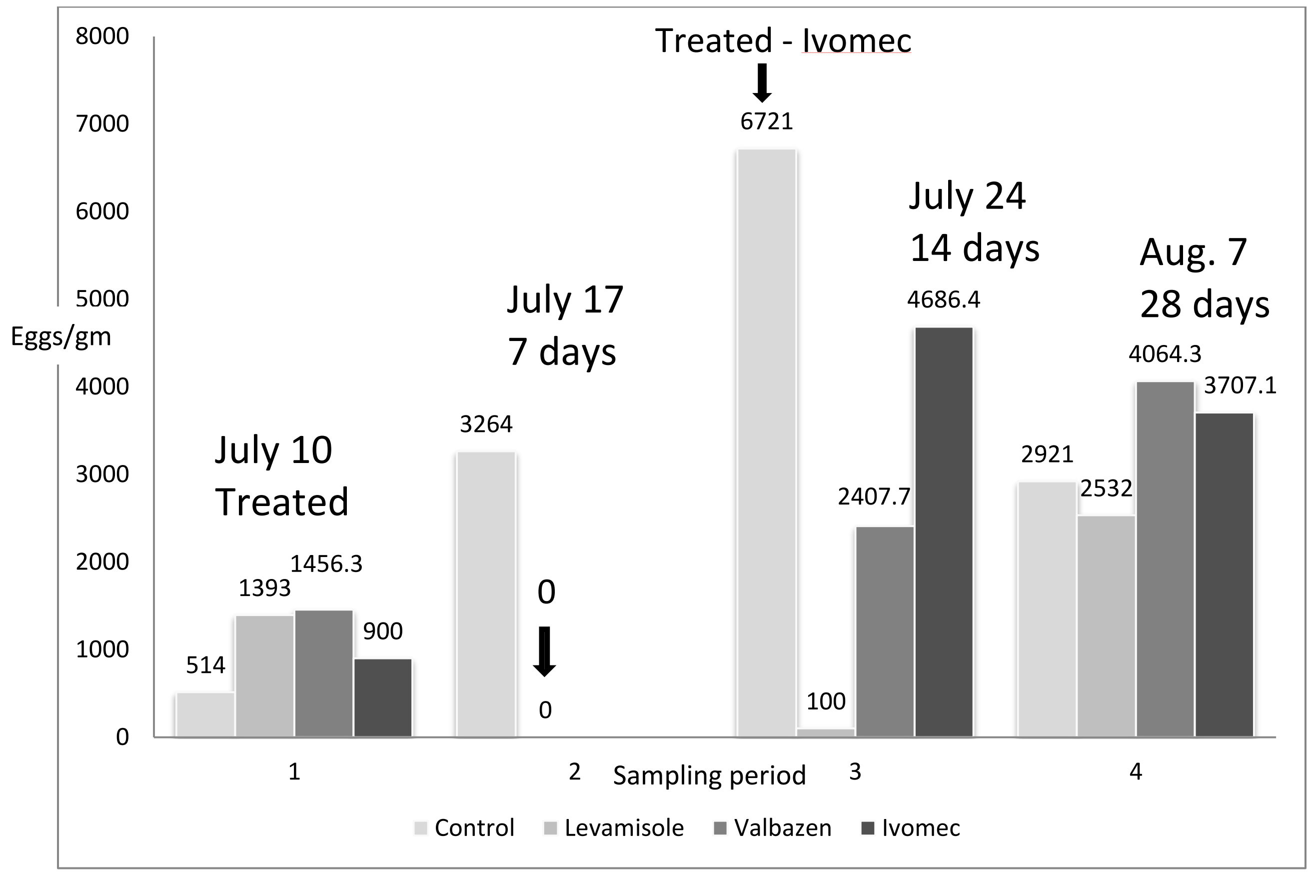

Figure 6: Comparison of efficacy for three AHs 1, 2 and 4 weeks after dosing, on Farm 1

Farm 1 tested an AV (Ivomec) again at twice the recommended dose per kg body weight. By doubling the dose, efficacy increased from 30% to over 70% although this was a small sample of 8 lambs. Individual FECRs ranged from 59% to 90% when the same lambs were compared before and after treatment.

Only two farms have tested closantel to date; two others are being counted and one is delayed due to unforeseen circumstances. The results suggest this AH is highly effective (Table 4).

Table 4: Efficacy of closantel on two farms. Efficacies were calculated with 2 FECRT formulae since C1 and T1 mean epgs were not similar in Farm 1 and control counts were declining in both farms.

	Control	Control	Closantel	Closantel	Efficacy	Efficacy
Farm	C1	C2	T1	T2	100(1-T2/C2)	100(1-T2/T1xC1/C2)
1	3100	2690	4013	823	69%	76%
2	2054	1465	2894	50	97%	96%

Since these tests were carried out in October, when lamb immunity is more effective, these efficacies may be less accurate than those estimated in summer. Larval identification from post-treatment cultures is preliminary: four species (*Teladorsagia*, *Trichostrongylus, Strongyloides* and unidentified larvae (possibly *Oesophagostomum* or *Chabertia*) have been observed but *Haemonchus* has not been verified.

Selection for Low FECs

Farm 1 recorded lamb weights and FECs from late July to October 2012 to identify ram lambs with consistently low FECs as well as lambs with consistently high counts which were culled. Lambs with low FECs were retained, and resampled in 2013 when turned out as yearlings (Table5). Rams showed a faster immune response as yearlings and those with lowest counts in this group as lambs also had low counts in 2013.

Table 5: Yearling Ram Data: 2012, 2013 (eggs/gm faeces and Famacha score)

	2012				2013		
Ram ID	22/7(or 30/7)	7/8	27/8	10/9 (or 4/10)	14/5	17/6	19/8
27Z	100 Iv	800	1000	2600 Iv F3	50	100	150
31Z	300 V	1000	3600 Iv	2550 - F3	1100	5900	400
38Z	550 V	250	2650	2300 Iv F3	150	-	50
39Z	1100 V	4750	-	2800 Iv F4	300	450	50
53Z	- V	-	900	2200 Iv F2	1450	3350	550
58Z	1300 Iv	9500	2700	3250 Iv F3.5	50	6100	900
61Z	250 Iv	550	-	700 Iv F3	-	-	600
66Z	5250 V	1650	750	650 Iv F2	350	2450	750
68Z	2100 V	6700	2450	1450 Iv F3.5	150	-	100
88Z	-	-	-	0 Iv F2	100	600	200
Mean intensity	*1369*	*3150*	*2475*	*2055*	*411*	*2707*	*375*

- Iv: Ivomec drench
- V: Valbazen drench
- F: Famacha score for anaemia (1 – 5: 1=red, 5=white)
- -: not sampled or not dosed

Nematodirus battus

Nematodirus battus was recorded on 24 of 36 farms providing lamb samples, but on 11 of these FECs were 0 or <50 epg; *N. battus* was present in 24 of 25 farms with lamb FECs >50 epg . This suggests a prevalence of 96%.

N. battus was the first nematode recorded in lambs, about 3-4 weeks after turnout at the beginning of May. FECs increased through May and June, but decreased in July and were sporadic thereafter Figure 7). Counts on Farm 1 and 2 reached levels in some lambs that are associated with scouring and weight loss in Europe (>300 epg: Abbott et al. 2012), but no evidence of this was seen (producer observations). Maximum FECs of 550 epg were found on June 24 and July 4 in Farm 1, and 850-950 epg on May 27 and June 16 in Farm 2.

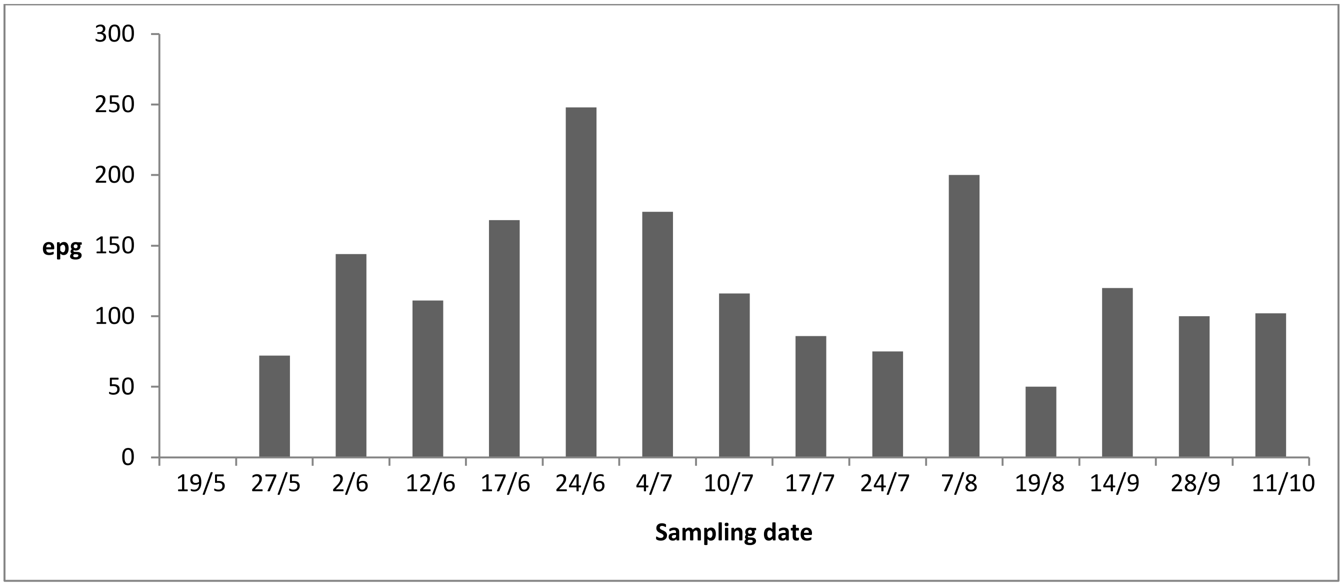

Figure 7. Mean intensity of *Nematodirus battus* on Farm 1

A second species, *Nematodirus* sp. (possibly *N. filicollis*) was less common, occurring on 20% of farms with lamb FECs > 50 epg. It was first recorded in early July, and occasionally thereafter. Counts were generally <200 epg for *N. battus* and < 100 epg for *Nematodirus* sp. in random samples from producers and from ASY. Both species were found in late October samples from island lambs. In these lambs, *N. battus* had a prevalence of 0.6 (60%) and mean intensity of 409 epg (range 0 – 2400 epg). *Nematodirus* sp. Had a prevalence of 0.4 (40%) and mean intensity of 107 epg (range 0 – 750 epg). GIN FECs were also high in these lambs (Table 2).

Case Studies

Two incidental observations demonstrated the rapid buildup of *Haemonchus* larvae on pasture:

- Farm 1 lent 2 ewe lambs for 4-H. They went from the lambing barn to a beef farm with no history of sheep or goats and had never shared pasture with adult sheep. They had a ¼ acre paddock through the summer. One other lamb, from the home pasture, shared this paddock for 10 days from July 4; on this date the lamb mean intensity was 1100 epg. There was no further contact with ewes or lambs. By mid-September both lambs were anaemic (FAMACHA score 4) and one had a FEC >33,000 epg.

- In a late lambing flock (May or June) all ewes were treated with levamisole on July 1 and the flock turned onto clean pasture not previously grazed by sheep. Lambs were not treated but had a prevalence of 30% and mean intensity of 117 epg. In the first week of September several lambs died suddenly and others were anaemic. One lamb had a FEC >50,000 epg.

Discussion
Haemonchus has become the most serious parasite affecting small ruminants throughout the world (Kaplan & Vidyashankar 2012). Although it is primarily a warm climate species (Kaplan & Vidyashankar 2012; Taylor 2012) it has become more prevalent in northern climates, including Ontario (Falzon et al., 2013), the U.S. (Kaplan & Vidyashankar 2012) and Scandinavia (Waller et al. 2004; Domke et al. 2012, 2013; Manninen & Oksanen 2010). In these regions, increased prevalence is probably correlated with milder spring and fall conditions (Sargison 2012). High fecundity results in a fast buildup of pasture contamination, as shown in the comparison of 1997 and 2012 data and the case studies in this study. The difference in mean intensity of infection between these two years is a reflection of the fecundity of female *Haemonchus,* which can produce 10.000 eggs/day (Abbott et al. 2012). In 1997, and traditionally (Mederos et al. 2010), the main sign of GIN parasitism was scouring and loss of condition in late summer-early fall. Anaemia was seldom seen (E. Semple, personal communication). No information has been found on *Haemonchus* in Canadian sheep between 1973 and 2008 (Mederos et al, 2010).

In Nova Scotia *Haemonchus* has become a problem that could threaten the economic sustainability of pasture production of small ruminants. The results of this study agree with those of other regions with similar winter climates (Falzon et al. 2013; Domke et al. 2012, 2013). In southern Ontario 88% of farms sampled had drench failure, and high levels of resistance were recorded to ivermectin and/or fenbendazole (Falzon et al. 2013). One farm sampled also had some resistance to levamisole, although this AH has not been marketed in Canada for about 10 years.

Haemonchus has very poor overwinter survival on pasture (Menzies et al. 2012), but undergoes arrested development in the gut wall when ingested in late fall (Menzies et al. 2013; Taylor 2012).The relaxation of immunity that occurs in late pregnancy and lactation allows larvae to resume development, and this periparturient egg rise (PPER) is the source of pasture contamination in the spring (Menzies et al. 2012). A number of Nova Scotian producers have had cases of bottle jaw or losses of ewes several weeks after lambing from heavy worm burdens (producer observations). It is common practice to dose ewes when housed in winter to prevent the PPER, but this exerts a strong selective pressure for resistance because only resistant worms will be left to contaminate pastures in the spring (Troell et al. 2006; Menzies et al. 2012; Taylor 2012). Similarly, dosing all animals and moving immediately to clean pasture gives resistant worms a competitive advantage (Sargison 2012).

Seasonal Dynamics
Our observations in Nova Scotia, and limited samples from New Brunswick and PEI, agree with those from other published studies. The first FECs were recorded from early June, about 30 – 35 days after turnout. At this time of year soil temperatures are too cold for rapid development of *Haemonchus* to the L3. Development can take less than a week at 25^{O}C, but 2 months in cool conditions (Menzies et al. 2012). These early FECs are probably from more winter-hardy species such as *Teladorsagia*, and it would be useful to recover larvae from herbage early in the season to determine when *Haemonchus* first appears. By early July, however, counts were beginning to rise rapidly, and this suggests that *Haemonchus* has become established. Typically, the first submissions to the Pathology Laboratory in Truro for GIN parasitism in lambs are in mid-July (G. Spearman, personal communication). Larval cultures in July were dominated by *Haemonchus.*

Sampling at ASY showed that many producers are raising market lambs in the barn or in drylot. This is effective in preventing parasite problems, but can have extra costs in labour and feed. It will also not prevent parasitism if replacement ewe lambs are sent to pasture for the first time as yearlings, although an immune response develops more rapidly in older animals (Douch & Morum 1993; Stear et al. 2000).

It is apparent from comments and conversations at ASY that many producers do not yet realise how widespread and severe problems of haemonchosis can be (D. Thibault, C. Vallis, and personal communications). Occasional lambs were consigned with signs of severe haemonchosis.

Lambs consigned from unidentified island pastures in late October had a high prevalence and intensity of infection, with extreme FECs over 50,000 epg and 2400 epg of *Nematodirus battus*. This is potentially a concern, since these animals may not be readily gathered for monitoring and treatment and AH use may be minimal. Further study of this management system would be helpful.

FECRTs

Only one out of eight farms showed high AH efficacy with routinely used drugs; although a small sample, this is similar to observations in Ontario (Falzon et al. 2012). Ivermectins (AV) in particular showed low efficacy on some farms. Resistance can arise through gene flow (introduced animals), repeated AH use at suboptimal dose (underestimating weights or poor drench technique), or whole-flock dosing when animals cannot pick up larvae which were not exposed to the AH (in winter housing, or moving to clean grazing immediately after dosing)(Sargison 2012). Resistance will develop more rapidly if one or a few genes are involved and if the alleles are dominant (AVs), incompletely dominant or recessive (BZs) or autosomal recessive (levamisole) (Dobson et al 1996). It was predictable in hindsight that ivermectins, especially used on all ewes in winter housing, would rapidly lose efficacy in cold winter regions.

Levamisole is still highly effective, since it has not been available in Canada for 10 years (Falzon et al. 2012). This AH can be obtained to a veterinarian from a veterinary compounding pharmacy; but when compounded it does not have a specified withdrawal time (E. Semple, personal communication). It is not effective against arrested larvae (sheepandgoat.com). Strongid T (pyrantel), formulated for horses, was used by one producer; while also effective, it is seldom used in livestock (Menzies et al. 2012) and no withdrawal time is available. It does not kill larvae (sheepandgoat.com). No other record of its use in sheep was found in the literature.

Choices of AH in Canada are more limited than in many countries with larger sheep industries (Abbott 2012). Closantel (Flukiver™; Elanco, U.K.) is an AH used for many years against liver fluke in Britain, but it is also effective as a narrow spectrum AH against *Haemonchus* (Abbott 2012). It may be preferable to use a narrow spectrum product where only one species is the main problem because this will not select for resistance in non-target species (Abbott 2012). The results with closantel in this study are very preliminary, with two of four farms analysed so far, but are encouraging. When *Haemonchus* is not the only GIN present, however, efficacies below 95% will not necessarily indicate AH resistance. On one farm, only one lamb had a FEC >0 when resampled 2 weeks after dosing, which perhaps indicates a missed dose, or metabolic effects or reduced bioavailability of the drug in this lamb rather than resistance (Falzon 2012). On the other farm, apparent resistance (<95% reduction) is probably due to the presence of several non-target species, although further culturing would be useful from these animals. Closantel has a long withdrawal time (6 weeks: Abbott et al 2012), and if this AH were to be more widely available this must be taken into account when dosing lambs close to market weight.

If these FECRT results are typical for many small farms in the province, reliance on AHs alone will not be enough to control *Haemonchus*. Other strategies, such as early weaning onto clean grazing, targeted dosing, protein supplementation and liveweight monitoring (Hoste & Torres-Acoste 2011; Bisset & Morris, 1996; Kenyon & Jackson 2012) are essential. Evidence from other countries suggests that this will not be simple (Patten et al. 2011; McMahon et al. 2013; van Wyk et al. 2008; Hostes & Torres-Acoste 2011; Woodgate & Love 2012). One response is to leave a proportion of the flock untreated (Menzies et al. 2012) or to target treatment to identified at-risk individuals (Kenyon & Jackson 2012).

Selection for Low FECs

There is considerable interest in genetic selection for sheep resistant to GINs, especially *Haemonchus* (Jackson & Miller 2006; Karlsson & Greeff 2012; Kelly et al. 2013). Both resistance (an effective immune response) and resilience (the ability to withstand worm burdens without developing disease) are under genetic control (Jackson & Miller 2006; Bisset &Morris 1996; Kelly et al. 2013).Identification of superior animals, based on FECs, is incorporated into some genetic evaluation programmes, such as Lambplan in Australia (sheepgenetics.org.au) and Signet in Britain (signetfbc.co.uk).

It is possible to select for low FECs in lambs when they have been exposed to larval challenge for 3-4 months, and this is more reliable if repeated FECs are estimated from each animal (Bishop et al. 2006). Lambs with low counts also have low counts as yearlings and show a faster response at this age (Douch & Morum 1993). However, unless time and facilities allow FECs from many animals to be followed, improvements may be slow.

Selection for resilience, based on the ability to maintain weight gain and other production parameters in spite of the worm burden, may be a practical alternative for many farmers (Hoste & Torres-Acosta 2011).

Other Nematodes

While the predominant nematode recorded was *Haemonchus,* other species were also identified as eggs or larvae. Most of these (*Trichuris ovis, Strongyloides papillosus, Nematodirus* sp. and an unidentified species which may be *Chabertia* or *Oesophagostomum*) are of low pathogenicity or usually found in low numbers (Abbott et al. 2012; Menzies et al. 2012). However, *Teladorsagia* and *Trichostrongylus* spp. are the main pathogens, causing scouring, inappetance and loss of condition, when *Haemonchus* is less prevalent in temperate regions (Abbott 2012). Scouring is well known as a symptom of GIN parasitism in late summer, but the presence of large numbers of *Haemonchus* obscures this, and instead faecal pellets tend to be dry and hard in haemonchosis. This can cause a mistaken impression that GINs are not a problem when scouring does not occur (producer observations).

Nematodirus battus was first described in Britain (Crofton & Thomas 1951), and later in Europe and North America (Rickard 1987). The first record in Canada was from the Maritimes (Smith & Hines 1987; Smith & McIntosh 1988). It appears to be an arctic species now adapting to milder climates (van Dijk & Morgan 2010).

The life cycle of *N. battus* differs from that of other GINs: eggs usually only hatch after winter chilling when temperatures rise above 10-11^{O}C (van Dijk & Morgan 2008). This can result in mass hatching in spring, and outbreaks of scouring in young lambs are well known in Britain (Abbott 2012). There is evidence of adaptation to longer pasture seasons in southern Britain, where a proportion of larvae now hatch in the same summer without chilling. This can lead to disease outbreaks in the fall (Abbott 2012) and may be a bet-hedging strategy against unpredictable changing climates (van Dijk & Morgan 2008).

This species is not considered an important pathogen in Canada (Menzies 2012), although three producers in Nova Scotia were familiar with nematodirosis and its potential to cause problems should not be overlooked. Calves can also harbour *N. battus* and contaminate pastures to levels causing disease in young lambs in Britain (Coop et al. 1991).

Little attention has been paid to this nematode since it was described from lambs with severe scouring on two PEI farms in June-July 1986 (Smith & Hines 2987). However, it is clearly widespread and in several flocks some individual FECs were at levels (>300 epg) associated with disease in Britain (Abbott 2012). No scouring was reported even in these lambs and it is still not clear whether this species has clinical significance at the individual or flock level.

Options for Producers

Management practices can limit parasitism; these can include reduced stocking density, early weaning onto clean grazing, finishing on aftermath or stockpiled forage, protein supplementation and bioactive forage as well as a potential long-term focus on genetic selection for resistance or resilience (Jackson & Miller 2006; Menzies 2012, Hoste & Torres-Acosta 2011.) However, this will not be simple. These approaches cannot achieve the same control as a highly effective AH (Ketzis et al. 2006). Educational programmes have had some success (McMahon et al. 2013; Whitley et al. 2013), particularly in promoting monitoring (FAMACHA, weight gain, FECs). A wider availability of low cost FECRTs could be very helpful to producers in slowing the development of AH resistance and preserving the efficacy of any new AH. Both levasmisole and closantel are very promising AHs if they become available, and with careful use they could be useful components in a parasite management program.

The experience of the last decade, and particularly the last 3-4 years, shows that AH resistance can develop rapidly. Once resistance is established, it is unlikely that there will be any reversion to susceptibility (Sargison 2012), and so it is essential that strategies are developed to protect the AHs we have and minimise the onset of resistance as far as possible if any new AHs are approved for use in Canada.

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La Société Canadienne des Éleveurs de Moutons

Press Release

Shearwell CSIP Double Tags – Now Available

The Shearwell double tag is now available for purchase through the Canadian Cooperative Wool Growers Limited. Many CSBA members have been anxiously awaiting the approval of the Shearwell double tag due to its small size and excellent reputation for rate of retention.

CSBA members may use a double tagging system with two tags approved and bearing the official identification number under the Canadian Sheep Identification Program as an alternative for tattooing registered sheep. While the option to use approved double tags in place of tattoos has been in effect since October 2006, only Allflex double tags were approved until now.

Shearwell CSIP Double Tag details:

- Sold in sets of 20 (40 tags in total)
- Must be taken off of the strip in consecutive pairs with matching numbers
- The RFID tag is marked with the CSIP maple leaf emblem
- The RFID tag must be placed in the right ear
- The companion tag (no maple leaf emblem) must be placed in the left ear
- Confirm that both tags bear the same number before application
- A new, black insert for the Shearwell tag pliers will be required for tag application

The registration application must include the national ID number, which will be recorded on the registration paper in place of the tattoo. The animal's name should still include a within-flock number, followed by the designated year letter used to signify the year of birth.

Lost tags must be replaced within 21 days with a duplicate tag bearing the same national ID number. CSBA members should contact the CSBA to order replacement tags or complete the online order form on the CSBA's website. The CSBA will place the order with Shearwell and collect payment from the member.

Please contact the CSBA if you have any questions: 1-866-956-1116.

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Canada

News Release

For immediate release

Harper Government Expands Livestock Genetic Access in Brazil

Ottawa, Ontario, September 11, 2013—Canadian sheep and goat producers will now benefit from more export opportunities in Brazil with the support of the Harper Government.

Agriculture Minister Gerry Ritz announced today that imports of sheep and goat genetics from Canada have now been approved by Brazil, a market the Canadian Livestock Genetics Association (CLGA) estimates to be worth approximately $1.5 million to $2 million annually for Canadian exporters.

“Today’s announcement enhances our trading relationship with Brazil and further demonstrates how this Government is working to deepen Canada’s engagement in the Americas,” said Minister Ritz. “Through a science-based approach to trade, our Government is working closely with industry to open and reopen markets, increase prosperity for producers, and build a stronger economy for all Canadians.”

“The interest in Canadian small ruminant genetics continues to grow past our expectations,” said Michael Hall, Executive Director, CLGA. “Our members and small ruminant breeders in Canada are very excited about Brazil as a positive market opportunity. We would like to thank the team from the Government of Canada for all their work in helping us reopen this market to Canadian exporters and producers.”

The Harper Government is working to discover the mutual economic opportunities that will foster lasting relationships between Canada and its partners in North and South America. Two-way trade between Canada and Latin America and the Caribbean has increased by 32.1 per cent between 2007 and 2012.

Total Canadian global exports of animal genetics reached $103.6 million in 2012, representing an important export commodity for Canadian producers, while Brazil imported a total of $31 million in animal genetics. Producers will now have access to another strong market for their high-quality agricultural products. Earlier this year, the Harper Government negotiated access to Nepal, Trinidad and Tobago, Philippines, Costa Rica, and Turkey for Canada’s high-quality livestock genetics.

This announcement is a concrete example of the Harper Government’s action to enhance competitiveness and long-term growth in Canadian agriculture—priorities under the *Growing Forward 2 (GF2)* policy framework. In addition to multi-year funding for risk management programs, GF2 includes $3 billion in strategic initiatives for innovation, competitiveness, and market development.

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Communiqué

Pour diffusion immédiate

**Le gouvernement Harper élargit l'accès au marché brésilien
pour le matériel génétique du bétail**

Ottawa (Ontario), le 11 septembre 2013 - Les producteurs canadiens de moutons et de chèvres bénéficieront maintenant d'un plus grand nombre de possibilités d'exportation vers le Brésil grâce au soutien du gouvernement Harper.

Le ministre de l'Agriculture, Gerry Ritz, a annoncé aujourd'hui que les importations de matériel génétique du mouton et de la chèvre du Canada ont maintenant été approuvées par le Brésil, un marché que l'Association canadienne de l'industrie du bétail et de la génétique (CLGA) évalue entre 1,5 million et 2 millions de dollars par année pour les exportateurs canadiens.

« L'annonce d'aujourd'hui améliore notre relation commerciale avec le Brésil et est une preuve de la façon dont notre gouvernement s'emploie à renforcer l'engagement du Canada dans les Amériques, a déclaré le ministre Ritz. Adoptant une approche scientifique du commerce, notre gouvernement collabore étroitement avec l'industrie à ouvrir et à rouvrir des marchés afin d'accroître la prospérité des producteurs et de consolider l'économie au profit de tous les Canadiens. »

« L'intérêt pour le matériel génétique des petits ruminants canadiens continue à grandir et à dépasser nos attentes, a déclaré Michael Hall, directeur exécutif de la CLGA. Nos membres et les sélectionneurs de petits ruminants du Canada sont très enthousiastes au sujet de l'ouverture du marché brésilien. Nous aimerions remercier l'équipe du gouvernement du Canada pour le travail qu'elle a réalisé afin de nous aider à rouvrir ce marché au profit des exportateurs et des producteurs canadiens. »

Le gouvernement Harper travaille à identifier les possibilités économiques mutuelles afin d'entretenir des relations durables entre le Canada et ses partenaires du nord et du sud de l'Amérique. Le commerce bilatéral du Canada avec l'Amérique latine et les Caraïbes a augmenté de 32,1 % entre 2007 et 2012.

Les exportations canadiennes totales de matériel génétique animal dans le monde se sont chiffrées à 103,6 millions de dollars en 2012, faisant de ce matériel un important produit d'exportation pour les producteurs canadiens, alors que le Brésil a importé au total 31 millions de dollars de matériel génétique animal. Les producteurs auront maintenant accès à un autre vigoureux marché pour leurs produits agricoles d'excellente qualité. Un peu plus tôt cette année, le gouvernement Harper a négocié l'accès de matériel génétique animal canadien de grande qualité au Népal, à la Trinité-et-Tobago, aux Philippines, au Costa Rica et à la Turquie.

Cette annonce est un exemple concret de l'action du gouvernement Harper pour améliorer la compétitivité et la croissance à long terme de l'agriculture canadienne - priorités du cadre stratégique *Cultivons l'avenir* (*CA 2*). En plus d'un financement pluriannuel de programmes de gestion des risques, CA 2 prévoit 3 milliards de dollars pour des initiatives stratégiques visant l'innovation, la compétitivité et le développement des marchés.

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Pour de plus amples renseignements, les médias peuvent communiquer avec :

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Canadian Lamb Producers Cooperative Inc.
Lamb producers the first to benefit from Exemption Agreement

Saskatoon, Saskatchewan May 22, 2013: In a move that could bring major benefits to Canada's agriculture industry, the *Canadian Securities Administration* has granted a ground-breaking Exemption Agreement to the Canadian Lamb Producers Cooperative Inc. Lamb producers from across Canada will benefit immediately from the agreement, which will make it easier to become members of the Saskatoon-based Cooperative.

The agreement, announced on May 22, 2013 will permit the selling of the Cooperative's Membership and Investment shares to lamb producers across Canada without the need to file a costly prospectus in each province. The agreement also eliminates the need for the Cooperative to incorporate independent cooperatives in each province in which the Cooperative wishes to sell shares to lamb producers.

"The Exemption Agreement will permit the rapid expansion of the Canadian Lamb Producers Cooperative across Canada," stated Canadian Lamb Producers Cooperative President Pat Smith. Mr. Smith, one of the largest lamb producers in Canada, also noted that, "The Cooperative has established a new way of developing agriculture cooperatives in Canada. Now cooperatives composed exclusively of members from a single producer group can incorporate federally, apply for an exemption agreement and, once granted, develop members across Canada."

Prior to the granting of this precedent setting exemption agreement, agriculture cooperatives were required to establish separate, independent cooperatives in each province in order to sell memberships and investment or production shares to producers in that province. This requirement was a major impediment to the development and expansion of national agriculture cooperatives in Canada. This agreement paves the way for the development of new federally incorporated agriculture cooperatives in Canada.

The formation of the Canadian Lamb Producers Cooperative was an initiative of the Saskatchewan Sheep Development Board. Funding for this innovative initiative was provided by Agriculture and Agri-Food Canada through the Canadian Agricultural Adaptation Program (CAAP), which is administered in Saskatchewan by the Agriculture Council of Saskatchewan. Funding to obtain the exemption agreement was obtained, in part, from the Agriculture and Agri-Food Canada's Cooperative Development Initiative. Funding for the initiative was also provided by Saskatchewan lamb producers through the Saskatchewan Sheep Development Board.

Federally incorporated in July 2012, the Canadian Lamb Producers Cooperative is the first national cooperative with a mandate to increase the farm cash receipts of lamb producers. The Canadian Lamb Producers Cooperative will purchase lambs from producer members in all provinces at a premium above the benchmark Ontario auction barn price and process the lambs in federally-approved facilities in Western and Eastern Canada.

Membership requests to join the Canadian Lamb Producers Cooperative have been received from lamb producers in seven provinces. The Cooperative plans on recruiting approximately 650 lamb producers over the next 36 months.

The Cooperative is in the process of forming a subsidiary company, the *Canadian Lamb Company*, to conduct the day-to-day business affairs of the Cooperative. The new federally incorporated Company will be responsible for marketing a new national brand of value-added retail and food service lamb products for Canadian and export markets. The marketing office for the Canadian Lamb Company will be located in Guelph, Ontario.

For more information on the Canadian Lamb Producers Cooperative please contact:

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News Release

For immediate release

Canada Expands Export Opportunities for Sheep and Goat Genetics to Turkey

Ottawa, Ontario, May 7, 2013 – Beginning today, Canadian producers will benefit from more export opportunities in the Middle East. Agriculture Minister Gerry Ritz announced today that Turkey has approved imports of sheep and goat genetics from Canada.

"We are pleased that Turkey recognizes the safety and high quality of Canadian agricultural products," said Minister Ritz. "This agreement is an important achievement in our continued efforts to expand market access so Canadian producers can continue to grow our economy."

Access to the Turkish market flows from the Government's trade expansion goals and is the result of its focused efforts to create new opportunities and science-based trade for Canadian producers. Successful expansion of the Turkish market will also result in better awareness of Canadian products and services in the surrounding countries, leading to potential new market opportunities. Advancing trade with other countries in this region has been at the forefront for Canadian producers, as Turkey is viewed as a priority and emerging market.

"The Canadian Livestock Genetics Association (CLGA) thanks the Government of Canada for finalizing these protocols," said Rick McRonald, President of the CLGA. "The demand in Turkey for Canadian sheep and goat genetics is growing, so the resolution of the interruption in technical market access came at a crucial time. Canadian exporters will now be able to engage with their Turkish clients and partners in the confidence that technical barriers to trade in semen and embryos have been removed."

Total Canadian exports of animal genetics (semen and embryos) reached $103.6 million in 2012, representing an important export commodity. Producers will now have access to another market open to our high-quality agricultural products. The CLGA estimates the potential value of this market to be $250 000 over five years.

End-of-year trade statistics indicate that 2012 was Canada's best export year on record for the agriculture and food industry. In 2012, exports of Canadian agricultural and seafood products reached $47.7 billion, up 7.4 per cent from $44.4 billion in 2011.

Today's announcement is another example of what is being accomplished to enhance competitiveness and long-term growth in Canadian agriculture—priorities under the *Growing Forward 2 policy* framework. In addition to multi-year funding for risk management programs, *Growing Forward 2* includes $3 billion in strategic initiatives for innovation, competitiveness, and market development.

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Canada

Communiqué

Pour diffusion immédiate

Le Canada accroît ses débouchés à l'exportation pour le matériel génétique de moutons et de chèvres en Turquie

Ottawa (Ontario), le 7 mai 2013 – À compter d'aujourd'hui, les éleveurs de bétail canadiens profiteront d'autres débouchés sur les marchés d'exportation du Moyen-Orient. Le ministre de l'Agriculture Gerry Ritz a annoncé aujourd'hui que la Turquie a approuvé les importations de matériel génétique de moutons et de chèvres du Canada.

« Nous sommes ravis que la Turquie reconnaisse la salubrité et la qualité supérieure des produits agricoles du Canada, a déclaré le ministre Ritz. Cet accord est une réalisation importante dans le cadre de nos efforts soutenus pour élargir l'accès aux marchés de façon à ce que les producteurs canadiens puissent continuer de contribuer à la croissance de notre économie. »

L'accès au marché de la Turquie va dans le sens des objectifs fédéraux d'expansion du commerce canadien et fait suite aux efforts soutenus que déploie le gouvernement pour créer de nouveaux débouchés et établir des règles commerciales fondées sur la science dans l'intérêt des producteurs canadiens. L'expansion réussie du marché turc fera aussi mieux connaître les produits et services canadiens dans les pays voisins, ce qui pourrait se traduire par de nouveaux débouchés. Promouvoir le commerce avec d'autres pays dans cette région est l'une des priorités des producteurs canadiens, car la Turquie est perçue comme étant un marché émergent prioritaire.

« L'Association canadienne de l'industrie du bétail et de la génétique (ACIBG) remercie le gouvernement du Canada d'avoir mis la dernière main aux protocoles, a dit Rick McRonald, président de l'Association. La demande de matériel génétique de moutons et de chèvres canadiens en Turquie est en plein essor, de sorte que le rétablissement de l'accès technique au marché est arrivé à point nommé. Les exportateurs canadiens pourront maintenant faire affaire avec leurs clients et partenaires turcs en sachant que les obstacles techniques au commerce de la semence et des embryons ont été supprimés. »

Les exportations canadiennes de matériel génétique animal (semence et embryons) ont atteint 103,6 millions de dollars en 2012, ce qui en fait un produit d'exportation important. Les producteurs auront maintenant accès à un autre marché qui accepte nos produits agricoles de qualité élevée. L'ACIBG évalue la valeur potentielle de ce marché à 250 000 $ sur cinq ans.

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Les statistiques commerciales de fin d'année indiquent que 2012 a été la meilleure année jusqu'ici pour les exportations du secteur agroalimentaire du Canada. En effet, les exportations canadiennes de produits agricoles et de produits de la mer ont totalisé 47,7 milliards de dollars en 2012, ce qui représente une hausse de 7,4 % par rapport à 2011 (44,4 milliards de dollars).

L'annonce d'aujourd'hui est un autre exemple des mesures prises pour améliorer la compétitivité et la croissance à long terme du secteur agricole canadien — des priorités du cadre stratégique *Cultivons l'avenir 2*. Outre le financement pluriannuel des programmes de gestion des risques de l'entreprise, *Cultivons l'avenir 2* prévoit des investissements de trois milliards de dollars dans des initiatives stratégiques d'innovation, de promotion de la compétitivité et de développement des marchés.

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