

SUMMARY OF RESULTS: New England Small Ruminant Producer Survey

Conducted by the New England Small Ruminant IPM Working Group

With support from the Northeastern IPM Center

Report developed by Sam Anderson, New Entry Sustainable Farming Project, April 2013

METHODS

The survey was drafted based on initial input collected from Working Group members. Two iterations were reviewed and the final version approved by the Working Group. Respondents were recruited via farmer-oriented email lists and 165 completed the online survey. Respondents were given the option to complete the survey anonymously. Preliminary feedback from farmers and some Working Group members suggested that a number of sheep and goat farmers would balk at a survey asking for details about their operation unless assured of the possibility of anonymity, largely because of concerns about forced inclusion in the National Animal Identification System. For the same reason, it was also important to communicate that the survey was not being conducted by a government agency; nevertheless, we received several reports of producers who were unconvinced and thus refused to take the survey.

PROFILE of RESPONDENTS

All respondents raised sheep and/or goats in 2012. Broader demographic questions were not asked (age, sex, ethnicity etc.), and the only location-specific data gathered were state and ZIP code (again, due in part to concerns about preserving the option of anonymity). Responses came from across New England, weighted heavily toward Maine, Massachusetts, Connecticut and Rhode Island, due to the geographic distribution of the e-lists accessed for survey outreach. Vermont and New Hampshire were admittedly under-represented, but Working Group members generally accepted that the body of responses was adequately representative of New England. (Several responses from New York were also included.)

Animals raised

Both sheep and goats: 36 respondents

Sheep only: 76

Goats only: 51

Number of animals raised

Sheep, average: 61

Sheep, median: 18

Goats, average: 19

Goats, median: 12

Total (sheep + goats), average: 52

Total (sheep + goats), median: 20

Number of years running current sheep/goat operation

Average: 11 years

Median: 6 years

RESULTS

The survey's primary aim was to determine the most pressing IPM challenges for small ruminant producers in New England; the scope of those challenges; what strategies are being used to deal with these challenges; and producer knowledge of existing IPM strategies. Preliminary information gathering overwhelmingly pointed to internal parasites as the most pressing health challenge with both need for the adoption of IPM strategies and existing IPM strategies ready to be adopted. It was also generally believed that internal parasites are the most pressing overall health concern for small ruminant producers in the Northeast; more than a few of us believed from the start that internal parasites are the most important of any management concern facing Northeast sheep and goat farmers.

Survey responses clearly supported these assumptions. Respondents consistently and overwhelmingly indicated that internal parasites are the most pressing IPM issue for most New England small ruminant producers. When asked to select the three most costly management issues on their operation, 88% included internal parasites among their top 3, including 59% who selected internal

parasites as their single most costly problem. For comparison, the second-most mentioned concern was foot rot/scald: 25% of all respondents listed it among their top 3 concerns, and just 4% ranked it their single most costly problem.

Q: What are the first, second, and third most costly management issues on your operation?

	1 st	2 nd	3 rd	Total
Internal parasites	97	33	15	145
Foot rot/scald	7	18	17	42
Mastitis	8	10	12	30
External parasites	1	23	5	29
Predation	7	8	8	23
Pneumonia/respiratory	4	6	12	22
Pregnancy toxemia (ketosis)	2	9	5	16
Abortions	2	3	9	14
Abscesses/CL	5	3	3	11
Pinkeye	0	1	7	8
Soremouth	1	2	2	5
White muscle disease	1	1	2	4
OPP	1	0	2	3
Enterotoxemia	0	2	1	3
Listeriosis	0	0	3	3
CAE	2	0	0	2
Other	27	46	62	135

(Note: "Other" responses included a text box for elaboration. The most common response by far was "N/A" or "none," followed by problems related to feed cost and/or quality—7 wrote in hay or grain cost/quality as their most costly management issue; numerous others included feed issues in their additional comments at the end of the survey.)

The survey also asked respondents about the presence of a wide range of sheep and goat health issues on their operation, in terms of how often each issue impacts the herd/flock. Again, internal parasites were clearly the most important concern. About half of all

respondents reported internal parasites as "Common (most years)" or "Endemic (every year)"—three times more than the next most reported condition, external parasites. Only 10% said internal parasites were "Not present or N/A." For external parasites, 31% answered "Not present or N/A," and for all other conditions at least 56% of respondents gave the same answer. 72% of respondents observed an internal parasite impact in 2012; external parasites were next most common, at 37%. Foot rot/scald was third most common, with 28% observing it in 2012; no other condition registered over 13%.

Q: How often does each of the following impact your flock/herd? (With some significant numbers highlighted)

	Internal parasites	External parasites	Foot rot/scald	Mastitis	Ketosis	Pneumonia / respiratory	Pinkeye	Abscesses / CI	Abortion	Predation	Soremouth	Enterotoxemia	White muscle disease	Listeriosis	Tetanus	OPP	CAE	Other
Endemic (every year)	24	6	4	0	0	1	0	0	0	2	2	0	0	0	0	0	0	0
Common (most years)	62	20	20	5	1	5	2	4	3	4	4	1	0	0	0	0	1	0
Rare (observed in 2012)	28	35	23	13	17	15	14	12	9	4	8	6	4	0	2	2	1	7
Rare (observed in last 5 years)	25	46	23	44	33	26	24	23	27	26	21	18	19	18	9	8	6	8
Not present or N/A	17	51	93	97	107	110	118	120	117	117	123	130	130	133	146	133	134	58
Don't know	9	7	2	6	7	8	7	6	9	12	7	10	12	14	8	22	23	5

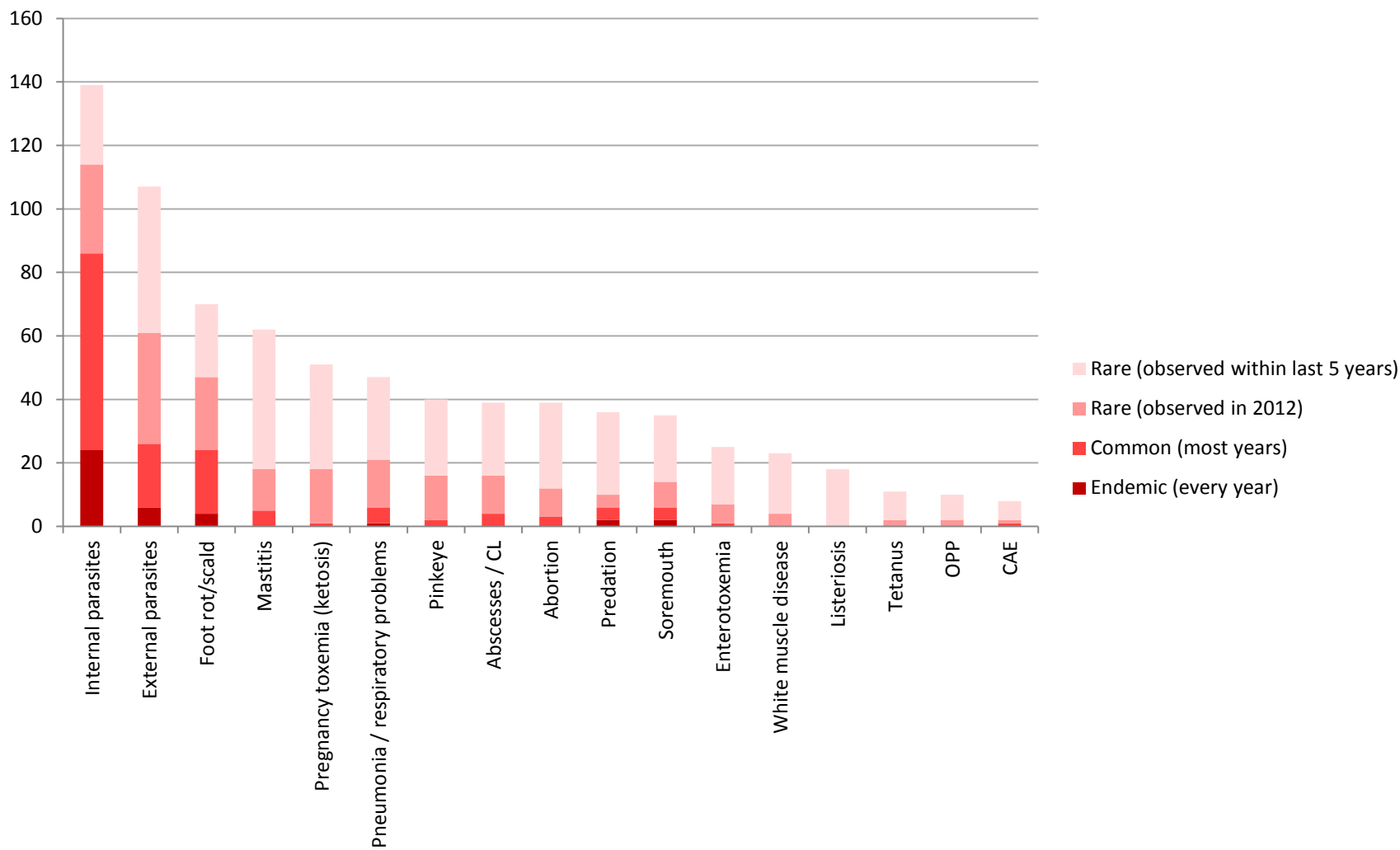
(Also see graphs on following pages)

Notes on the conditions listed:

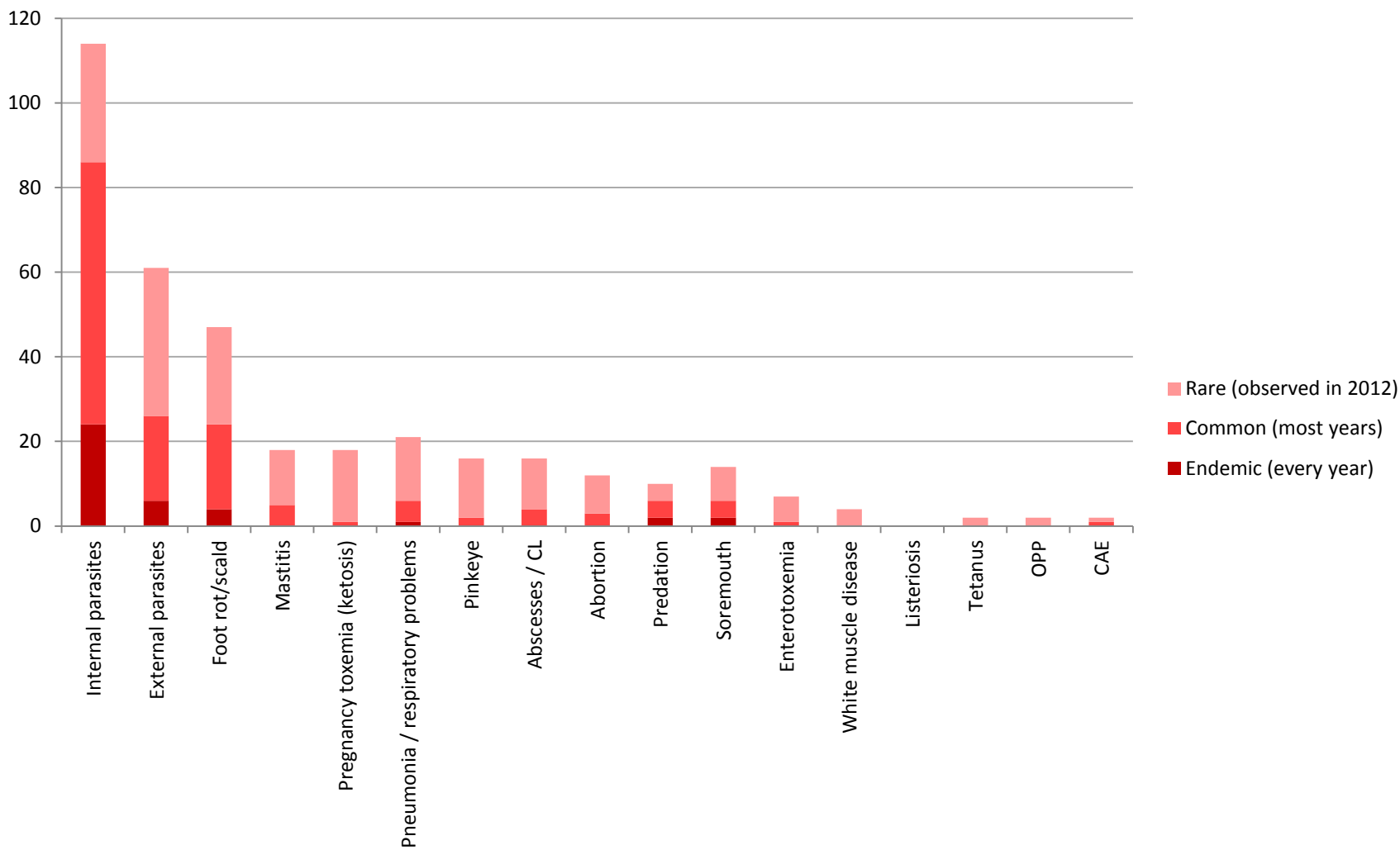
- Several of the conditions are shortened to fit in the chart above—more detail was provided in the survey itself. For example, OPP and CAE were listed as "Ovine progressive pneumonia (OPP)" and "Caprine Arthritic Encephalitis (CAE)," enterotoxemia was listed as "Enterotoxemia (overeating disease)," and external parasites were listed as "External parasites (ticks, fly strike etc.)."
- All listed conditions affect both sheep and goats, except for OPP (sheep only) and CAE (goats only).

- Several conditions were omitted from the list, but with only 15 "other" responses, the above list appears adequately comprehensive. Of the 15 who listed an "other" condition, the only condition mentioned more than once was meningeal worm (4 responses), which is actually an internal parasite.
- While "predation" may at first appear out of place in this list, those consulted unanimously agreed that it should be included. Predation is certainly, in the most literal of terms, a health concern for sheep and goats. It is also highly relevant for purposes of an IPM grant: Predators are certainly "pests," and farmers choose to manage predators using either IPM strategies (e.g. guardian dogs/llamas/donkeys, secure fencing, bringing animals in at night) or non-IPM strategies, which generally involve killing the predator (e.g. poison, trapping, or the "Smith & Wesson solution").

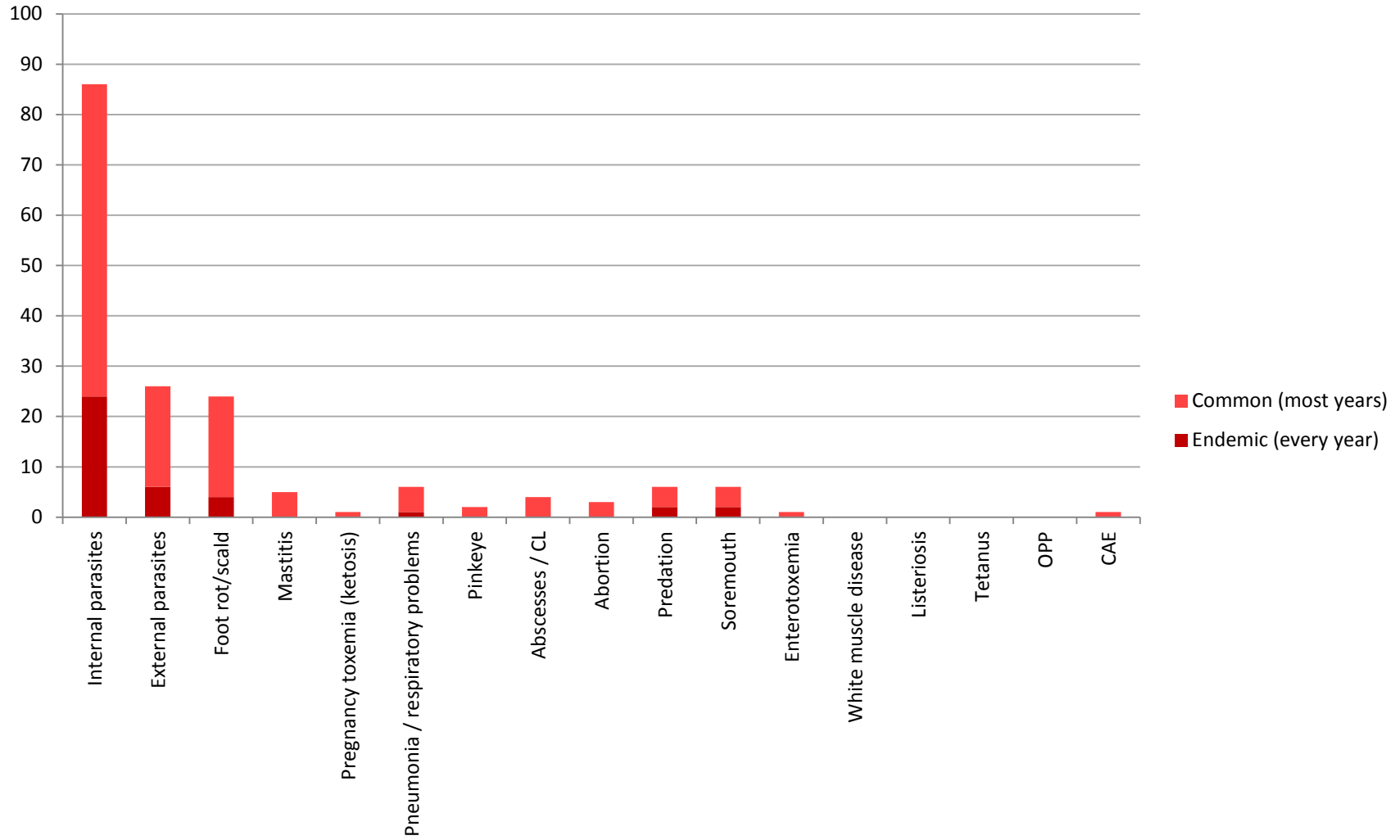
Q: How often does each of the following impact your flock/herd?



Same question – *As observed in 2012* (showing responses: "Endemic," "Common," or "Rare [observed in 2012]")



Same question – "Common" or "Endemic"



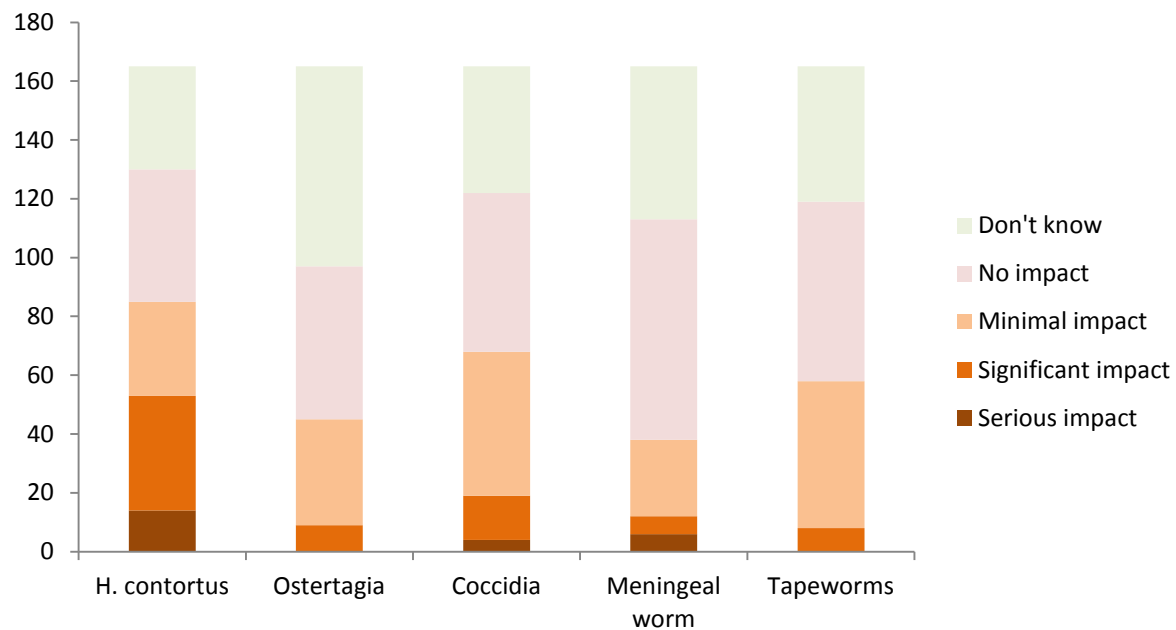
Internal parasites

The survey asked more detailed questions about internal parasites (on a separate page of the survey, following the above questions, to avoid skewing those results). There are several different species of internal parasites that impact small ruminants in different ways. *Haemonchus contortus*, or barberpole worm, is commonly considered the most important of these, and survey responses affirmed this (see graph below). Responses also affirmed some assumptions about other internal parasites—for example, that meningeal worm is uncommon but has a serious impact when present; that tapeworms are common but have little impact; and, as some of us suspected, that producers have less awareness of ostertagia (or "brown stomach worm") than other types of internal parasite.

The survey also provided an interesting opportunity to test an assumption about coccidia, the internal parasite which causes coccidiosis, a potentially deadly condition for young lambs and kids. Whereas the other important internal parasites are "worms" (nematodes, roundworms or flukes) coccidia is a protozoa. Like other internal parasites, coccidia "eggs" (oocysts) are passed through manure; unlike other internal parasites, coccidia are often acquired in a lambing barn, feedlot, or other crowded areas, rather than on pasture. Several veterinarians involved in the Working Group referred to coccidiosis as "a management problem" because it is usually the cause of poor sanitation, especially keeping young lambs or kids in a crowded environment without regularly providing clean bedding. These same unsanitary conditions lay the groundwork for mastitis (infection of the udder) in lactating ewes and does. The survey results back up the characterization of coccidiosis as a "management problem": Firstly, as expected, all of those noting a "serious" or "significant" coccidia presence also noted that their lambing or kidding takes place in a barn (rather than strictly on pasture). There is also a clear connection to mastitis. Of those who observed a "serious" or "significant" coccidia presence, 42% also listed mastitis as one of their top three management costs; among those who *didn't* have a "serious" or "significant" coccidia presence, only 15% listed mastitis among their top three problems.

(See following page)

Q: What impact do these internal parasites have on your operation?



	H. contortus	Ostertagia	Coccidia	Meningeal worm	Tapeworms
Serious impact	14	0	4	6	0
Significant impact	39	9	15	6	8
Minimal impact	32	36	49	26	50
No impact	45	52	54	75	61
Don't know	35	68	43	52	46

IPM Strategies

Background

The survey also sought to determine producer awareness and adoption of existing IPM strategies for controlling internal parasites, especially *H. contortus*, which presents the most serious threat. If left untreated in susceptible animals (especially lambs and kids) *H. contortus* is often fatal. It can also cause less obvious production losses by stunting animals' productivity. *H. contortus* is an especially important IPM concern because the nematode has a well documented ability to become resistant to every type of chemical dewormer on the market. This occurs essentially through natural selection: When chemical dewormer is used, nearly all of the targeted gastrointestinal worms will be killed, but often some are genetically resistant and survive to reproduce (particularly when the animal is under-dosed). Those eggs are shed in the pasture, and the resulting nematodes have effectively been selected for resistance to the dewormer used. If sheep or goats remain on the same pasture, a greater and greater proportion of the *H. contortus* will be resistant to that dewormer, until it becomes ineffective and the producer must switch to a new type of dewormer. However, if the producer switches dewormers too often and does not rotate pastures carefully enough, *H. contortus* populations will develop which have resistance to multiple dewormers. Particularly in the southern U.S., *H. contortus* have been observed with resistance to all three of the main classes of dewormers. This highlights the importance of IPM practices to replace a reliance on chemical dewormers.

The three main classes of dewormer are:

- **Benzimidazoles** or "white dewormers." Brands include Safeguard and Valbazen. Parasite resistance to this class is believed to be widespread.
- **Nicotonic agonists** or "clear dewormers." Brands include Prohibit and Levasol. There may be fewer parasite populations resistant to this family because Levasol was kept off the market in the U.S. in recent years. It returned to the market in the summer of 2012.
- **Macrocylic lactone**, including ingredients ivermectin and moxidectin. Brands include Ivomec (ivermectin) and Cydectin (moxidectin). Ivermectin products are broad-spectrum dewormers and commonly used in sheep and goats as well as many other species (including humans). Moxidectin products are essentially more potent versions of ivermectin, and some Working Group members regard Cydectin as the most potent dewormer available—and therefore the wormer of last resort. A parasite population may be resistant to Ivomec but still susceptible to Cydectin; however, parasite populations that do not respond to

Cydectin are unlikely to respond to Ivomec. *Note: Because of this distinction, Ivermectin and Moxidectin were listed separately in the survey.*

Results

Of the producers surveyed, 88% use chemical dewormers. Of those who listed internal parasites as their most costly management problem, 94% use chemical dewormers.

Producers were asked which types of chemical dewormers they used in 2012 and in prior years. Of producers who used at least one chemical dewormer in 2012:

77% used ivermectin

65% used benzimidazoles

23% used moxidectin

10% used nicotinic agonists

Looking more closely at these responses, we can see what combinations of dewormers were used:

42% used one type of dewormer in 2012

45% used two types

11% used three

2% used all four

One of the basic IPM best practices for retaining dewormers' effectiveness against internal parasites is to switch between dewormer types infrequently—ideally, only when parasites begin to become resistant to the type of dewormer you have been using. Switching between dewormers too frequently can lead to parasites resistant to multiple types of dewormers, which can eventually leave the farmer with no effective treatment for animals carrying life-threatening parasite loads.

However, when producers were asked to self-assess the level of parasite resistance to dewormers on their farm, they were surprisingly positive in their assessments:

Serious resistance - chemical dewormers no longer effectively controlling parasites	2%
Significant resistance - at least one type of dewormer has become ineffective	12%
Modest resistance - wasn't a problem this year	39%
No resistance	29%
Don't know	17%

These figures do not align with the reports we have received from small ruminant veterinarians and many farmers; nor, for that matter, do they align very well with some of the other data gathered in this same survey, leaving some unanswered questions. If only 15% noticed dewormer resistance in 2012, why did 58% use multiple types of dewormers? Is this discrepancy related to survey design, or a lack of farmer awareness, either regarding how to identify dewormer resistance or how to prevent it (i.e. by not switching dewormers until the one you have been using begins to lose effectiveness)?

There is probably not enough data in the survey results to properly answer this question, but one interesting figure may hint at an answer. Out of the 19 respondents who used either three or all four types of dewormer—theoretically an action of last resort, where the farm's parasite population has developed resistance to multiple types of dewormer—only 3 reported either "serious" or "significant" resistance. The sample size is too small to draw sweeping conclusions, but it is indicative of a lack of knowledge, among some producers, of the basic IPM principles to avoid creating multi-resistant internal parasites.

Producers were directly asked about their familiarity with and adoption of various IPM strategies for internal parasites, particularly *H. contortus* and other pasture-based worms. One of these strategies, called FAMACHA, is often emphasized as a simple way for producers to ensure that they only deworm the animals who need it (by checking the animal's eyelid color, an indicator of anemia). FAMACHA is generally endorsed by the Working Group members and many others, with the caveat that it is only one piece of effective internal parasite IPM. FAMACHA only detects *H. contortus* since the other parasite types do not necessarily cause anemia,

and it only detects how much the animal is *affected* by the parasites, not the actual amount of parasites present. Many sheep and goats are *resilient* against *H. contortus*—meaning they can carry many of the nematodes in their gut without it significantly impacting them physiologically—but not *resistant*. A resistant animal's gut is inhospitable to the parasites, limiting their ability to reproduce; however, an animal that is resilient but not resistant can become essentially a carrier—carrying a heavy parasite load and dispensing their eggs in its manure, increasing the chances that other animals pick up the parasites.

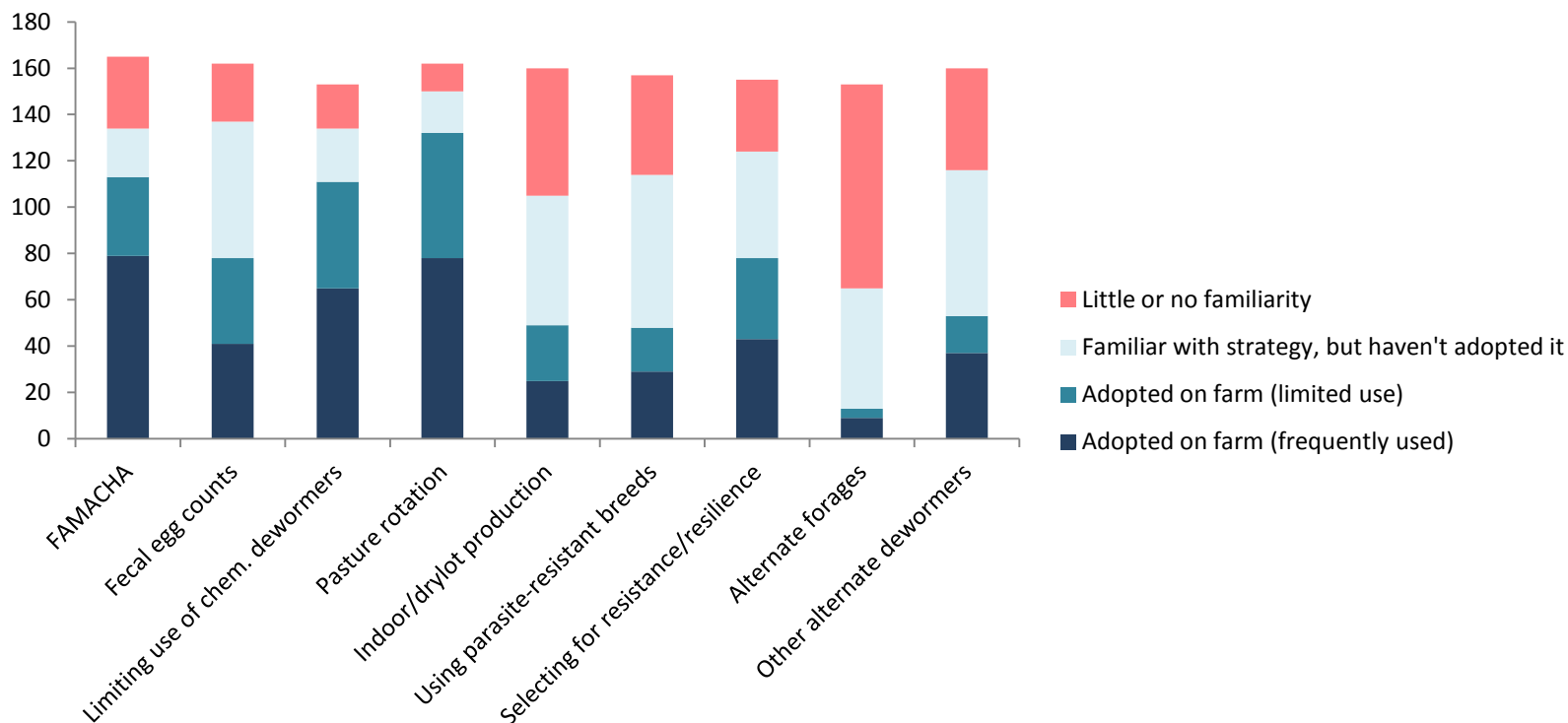
Fecal egg counts (FECs) are a favorite method of veterinarians for their precision, compared to an approximated measure such as a FAMACHA score. By sending a fecal sample to a laboratory, farmers can learn the actual number of parasite eggs being shed by the animal. FECs can be used to measure an animal's *resistance*, which allows the producer to make selective breeding decisions to choose animals whose offspring are more likely to be resistant to internal parasites. Genetic resistance to internal parasites has been demonstrated in both sheep and goats, to the extent that some populations (e.g. Gulf Coast Native sheep) often live their entire lives without ever needing to be dewormed. Producers can increase their herd or flock's genetic resistance by using breeds known to have inherent parasite resistance, or by simply weeding out the animals in their own herd or flock which are most susceptible to parasites, which in turn reduces the amount of eggs being shed and thus the rest of the herd/flock's parasite exposure.

Aside from pasture rotation, FAMACHA was the most widely adopted IPM strategy among respondents; however, it bears notice that among producers who listed internal parasites as their most important management concern, 16% have "Little or no familiarity" with FAMACHA.

Fecal egg counts and selecting for resistance/resilience are important IPM strategies with much lower rates of adoption. Only 48% of respondents have used FECs and 50% have adopted selecting for more resistant or resilient animals.

The least-adopted method by far is the use of alternate forages, such as chicory or sericea lespidoza, which have been shown in some studies to reduce parasite loads. Only 8% have tried alternate forages; one might be tempted to say this is because more studies are needed to prove some forages' effectiveness as natural anthelmintics and how best to use them, but in this survey it has more to do with lack of awareness, as 58% of respondents had "little or no familiarity" with the use of alternate forages.

Q: Please indicate your familiarity with the following concepts as strategies for detecting and preventing internal parasite problems.



	FAMACHA	Fecal egg counts	Limiting use of chem. dewormers	Pasture rotation	Indoor/drylot production	Using parasite-resistant breeds	Selecting for resistance/resilience	Alternate forages	Other alternate dewormers
Adopted on farm (frequently used)	79	41	65	78	25	29	43	9	37
Adopted on farm (limited use)	34	37	46	54	24	19	35	4	16
Familiar with strategy, but haven't adopted it	21	59	23	18	56	66	46	52	63
Little or no familiarity	31	25	19	12	55	43	31	88	44

Conclusions

The survey responses contain significantly more data, and further analysis of the data may reveal more findings. However, the analysis carried out so far does suggest some answers to questions about IPM for New England small ruminant producers.

What are the most pressing IPM challenges for New England small ruminant producers?

Pests:

- The most pressing pest concern is clearly internal parasites, especially *Haemonchus contortus*.
- Secondary concerns include foot rot/scald, external parasites, mastitis, and predation.

Knowledge and resources:

- While many producers have adopted FAMACHA, other important IPM strategies for internal parasite management, such as fecal egg counts and selecting for parasite-resistant animals, have not yet been widely adopted.
- Questions remain about producers' knowledge of limiting dewormer use to prevent multi-resistant parasites.

What is the scope of these challenges?

- Internal parasites are the most important IPM concern across New England for both sheep and goat farmers who raise their animals on pasture, and for farms of all sizes.
- More information is needed to estimate internal parasites' actual cost to producers; however, survey responses made clear that these costs are very significant.
- The scope of dewormer-resistant parasites in New England is unclear from the survey results: Over half of respondents using chemical dewormers reported some level of parasite resistance, but data from elsewhere in the survey suggests that dewormer resistance levels may be higher. Either way, given that the majority of respondents using chemical dewormers last year used two or more different types of dewormer, and given what we know about the ways parasites develop resistance, the survey provides indications that we can expect an increase in dewormer-resistant internal parasite populations in New England unless sheep and goat farmers adopt additional IPM strategies.