Alternative Parasite Management--Are We There Yet

PFI producers have been researching alternative methods of parasite management for at least five years, much of that time with the aid of a grant from the Organic Farming Research Foundation. The interest in alternative parasite management has grown along with specialty markets for organically raised meats. So far, the on-farm investigations have failed to discover a "silver bullet" treatment as effective as the synthetic wormers used in conventional livestock production. We are, at least, learning how to do this kind of research.

Early Research, Commercial Products

Ear Tagging at the start of a parasite trial: Frances Zacharakis-Jutz gives Walt Ebert a hand.

Early PFI trials utilized commercially available products that are acceptable in organic production. These are mixtures of several plant ingredients, for example, walnut hulls, wormwood, garlic, cloves, psyllium seed, fennel, gentian, etc. Figure 9 show fecal parasite ova (egg) counts from two of these evaluations of commercial mixtures. In Fig. 8, two different products were generally less effective than two synthetic wormers; in Fig. 9, ova counts were all low until near the end of the trial, and then there wasn't much difference between the herbal product and the control treatment.

From the start of PFI's parasite trials, we were confronted with the realization that seasonal factors often were a bigger factor than the experimental treatments, at least for the non-synthetic treatments. When parasite pressure built up, it often did so for both the control and the alternative treatments. But the sampling dates for fecal parasites were only "snapshots," and it wasn't clear what was going on between dates. When the synthetic treatment wears off, worm egg counts can climb high because those animals have no resistance, unlike those that have had parasites all along. This resistance is known in veterinary science as "premunition."

Testing Individual Botanicals

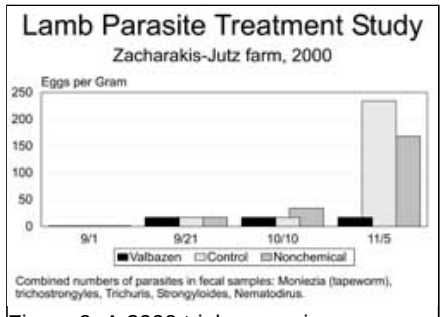

Figure 9. A 2000 trial comparing a synthetic wormer to a control and a natural product sold by 7mFarms & Herbals. Five weeks after the start of the trial,m parasite numbers in the control group and in the nonchemical treatment increased dramatically.

One advantage of the commercial mixtures is that they are quite safe. On the other hand, results of PFI trials on mixtures were unimpressive. Partly as a result, interest turned to individual botanical materials that have a history of use, either before the age of synthetics or in other countries. Some of these materials are reported to be quite powerful, with potentially harmful effects on livestock if not dosed correctly. One such material is oil of Chenopodium, the extract from Chenopodium ambrosioides, or epazote, a relative of the common lambsquarter, Figures 10, 11, and 12 show results of trials involving oil of Chenopodium.

Trials with oil of Chenopodium have yielded variable results. In the Frantzen trial included in Fig. 10, the oil treatment actually was associated with much higher ova counts for most of the experiment. In the trial shown in Fig. 11, the oil was associated with lower ova counts at all dates but one. But at one sampling date, ova counts went through the roof for the Chenopodium treatment. It happened that the spike consisted of one particular kind of gastrointestinal parasite, those in the ascarid family. The other types of ova remained low, and after the Day 15 sample, overall numbers in the treated group returned to low levels as well. Was this a real treatment effect or an aberration?

Lessons About Design

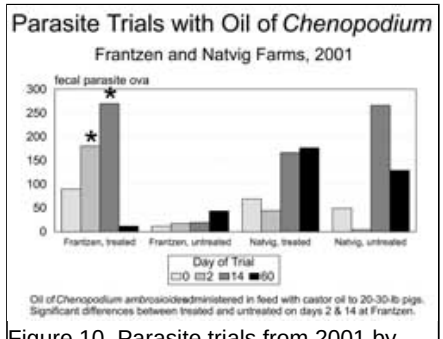

Figure 10. Parasite trials from 2001 by Frantzen and by Natvig. In the Frantzen

So what was going with these jumpy numbers? We began to wonder if the fecal samples were giving misleading results. The samples were coming from the floor of the pens. It was usually impossible to tell which animals produced the fecal pats, and it was often difficult to find intact pats to sample. In 2003, we made the decision to sample feces directly from individual animals. That way we would know the true parasite status of each group, and every individual within it. In 2003, we also began weighing individual animals. As a result, the trials can detect relationships between the parasite load and weight gain.

But here is something else: In three of the four trials shown in Figs. 10, 11, and 12, there were significant differences

between the control group of animals and the treatment groups on Day 0 - before the treatments were even applied! Add to that group the 2003 trial in Fig. 13, which did not involve Chenopodium. Trials are supposed to start with animals that are all the same.

trial, the group that received Chenopodium oil had higher parasite egg counts before the treatment was even applied. In neither trial was there a clear treatment effect.

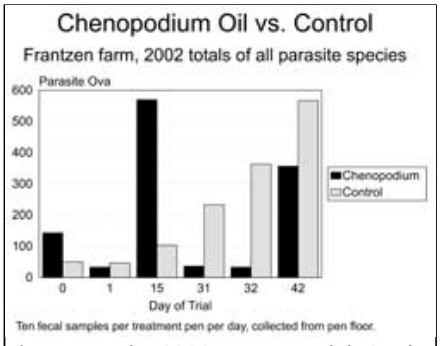

Figure 11. The 2002 Frantzen trial. On the Day 15 sampling, parasite ova jumped in the group that recieved oil of Chenopodium; the temporary increase was due to one particular kind of parasite, the ascarids.

If one group is handicapped from the beginning, how can trial results be interpreted? It is possible that the animals were poorly sorted in all these trials, but it seems likely that the basic problem is that the groups were too small. In a small group, there is less chance of coming up with a good representation of the farm's animals. Most of the treatment groups consisted of just 10 animals. Given the facilities available on many farms, it is difficult to find more or larger pens for a trial. This may be a limitation of on-farm research into alternative parasite treatments.

The idea that many of these trials needed larger groups is reinforced by statistics of the results. One of the strengths of a good research design is that it gives not just averages but an understanding of the "scatter" of the data points that make up those averages. Figures 8, 12, and 13 include "error bars," brackets that show the "95% confidence interval" around a treatment average. Another treatment is considered to be statistically different from that average only if it falls outside the confidence interval bracket; otherwise the difference can't be distinguished from chance (at least with 95% confidence of being right). There is nothing magic about the 95% confidence interval, but when it is greater than the average itself, you know the trial isn't able to tell you much about the experimental question. More animals in the trial would shrink the error bars, giving more confidence in the results.

Continuing Questions

The research with individual botanical materials has been inconclusive. This does not mean that botanical products are all ineffective; there are dozens of untested materials to choose from. It may be that the very materials tested in these trials are effective, but that they were administered incorrectly. The Chenopodium oil, for example, was given in very conservative doses because we had only 100-year-old veterinary records to help calculate the appropriate dose and method of administration. Everyone was hesitant to subject relatively healthy animals to a treatment that might be more effective but more risky.

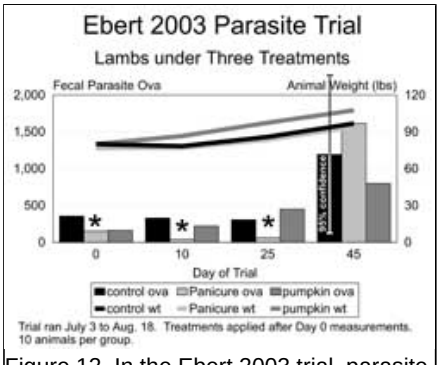

Figure 12. In the Ebert 2003 trial, parasite ova numbers were significantly different on Day 0, before any treatments were even applied. The group recieving pumpkin seeds gained a weight advantage in the first 10 days and maintained the difference. At the end of the trial, ova counts spiked for all three treatment groups.

Lacking a comprehensive program to study and develop alternative treatments, producers will probably only be able to work around the edges of this question. And on-farm research is continuing, now evaluating several commercial products that are promoted to control parasites. Fig. 13 shows results of a trial by Tom Frantzen, testing a material that contains kelp and "glabber's salt," which is magnesium sulfate. Because of the issue of animal numbers mentioned earlier, it is important that trials like this be repeated until a clear outcome emerges.

The PFI experience with parasite treatments is part of the background that is pushing some cooperators to reexamine the role of management in herd health. Producers in alternative livestock systems are some of the most skilled in the business. And part of the strategy in these operations is to create a high-health environment through the way the system is managed. Yet as rich as these systems are, it is sometimes more difficult than in conventional systems to apply principles such as the separation of stock of different ages to avoid cross-contamination or the emptying and cleaning of a facility to allow "cooling off" of disease and parasite pressure.

Just because these objectives can't be implemented in the same way as in conventional confinement systems does not mean they are impossible or that they don't bring real benefits. Back in 1942, the USDA Yearbook of Agriculture described the approach made famous by McLean County, Illinois, where livestock were managed to limit transmission of parasites. Young stock were kept separate from older, infected animals. Facilities were cleaned and sterilized. Animals were even transported from one field to another rather than allowing them to walk down parasite-infested lanes. How far down this "lane" will today's producers go? Probably as far as they can see results, and on-farm research will help develop those answers.

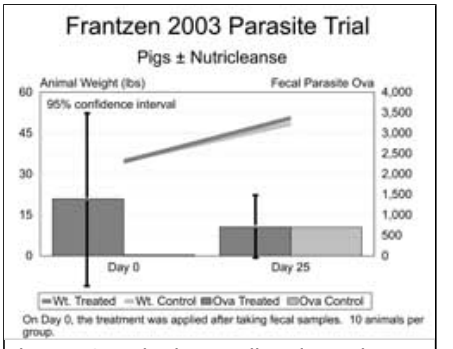

Figure 13. At both sampling dates the difference between treatments was much less than the statistical confidence interval.