

## **American Consortium for Small Ruminant Parasite Control: The First Ten Years**

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### **Introduction**

The American (formerly Southern) Consortium for Small Ruminant Parasite Control (ACSPRC) was officially formed in 2003, with a mission of 1) developing novel methods for sustainable control of gastrointestinal nematodes (GIN) in small ruminants, and 2) educating stakeholders in the small ruminant industry on the most up-to-date methods and recommendations for control of GIN (ACSRPC.org). The past 10 years have coincided with a seismic change in producer attitudes towards parasite control in sheep and goats, from prophylactic use of broad-spectrum anthelmintics on all the animals in the herd or flock to ‘targeted selective treatment’ of only those animals that need it most. The previous practice led to a world-wide epidemic of anthelmintic sheep and goat GIN (Kaplan, 2004), while the latter approach, combined with strategies to maximize the usefulness of still-effective anthelmintics (‘Smart Drenching’) and use of novel, non-chemical control technologies, has resulted in more sustainable and profitable sheep and goat production systems in the United States (U.S.) and around the world. This overview will describe the history, current status, and future plans of the ACSRPC and the role it played in this global shift toward more sustainable GIN control strategies by small ruminant producers.

### **Background**

#### ***Small Ruminant Production***

Small ruminant production has been a major component of livestock agriculture throughout the world for millennia and remains a primary resource for food and income for farm families in many developing countries. Production of small ruminants is a growing industry in the U.S. due to stable ethnic markets, rapidly increasing demand for grass-fed or organically-produced livestock (Greene and Kremen, 2003), and the growing popularity of specialty meat-type goat and sheep breeds. A major challenge to continued growth of this industry is infection with GIN, particularly *Haemonchus contortus* (barber pole worm), the predominant blood-feeding parasitic nematode throughout tropical and subtropical regions of the world.

#### ***Anthelmintic Resistance***

For the last fifty years, the predominant GIN control strategy on sheep and goat farms in the U.S. has been prophylactic treatment of all animals in the herd or flock as often as every 3-4 weeks using broad-spectrum anthelmintics. Although initially an effective strategy, treating the whole herd or flock kills off susceptible GIN, leaving a few drug-resistant parasites, which then reproduce, increasing as a percentage of the GIN population (Kaplan, 2004). Inevitably, the GIN population in a herd or flock becomes predominantly drug-resistant, leading to anthelmintic

failure on individual farms. Mirroring similar trends world-wide, reports on multiple anthelmintic-resistant goat and sheep GIN in individual herds in the U.S. started appearing 10-15 years ago, and more recently in on-farm prevalence studies (Kaplan, 2004; Howell et al., 2008). Even before this, it became obvious to scientists in the U.S. and overseas that small ruminant industries were headed for a crisis if alternatives to exclusive use of anthelmintics to control sheep and goat GIN were not quickly developed. This led to the first Novel Approaches to the Control of Helminth Parasites of Livestock meeting, held in Armidale, Australia, in April, 1995. By the time the second Novel Approaches meeting was held three years later, at Louisiana State University (LSU) in Baton Rouge, in March, 1998, research on alternative methods of parasite control was underway at various institutions world-wide, but there were few attempts to integrate these methods into a coordinated program. At the Baton Rouge meeting, scientists from Fort Valley State University (FVSU), LSU, and the Danish Centre for Experimental Parasitology at the Royal Veterinary and Agricultural University (RVAU) in Copenhagen, Denmark, met and began planning to develop funding proposals to support research on sustainable parasite control in small ruminants in the U.S. Subsequently, cooperative projects between FVSU, LSU, and RVAU were funded by USDA Scientific Cooperation and 1890 Institution Capacity Building Program grants in 1999 and 2000, respectively, and focused on documentation of anthelmintic resistance in goat herds in GA and on validation of the use of nematode-trapping fungi as an alternative GIN control method in sheep and goats.

## **American Consortium for Small Ruminant Parasite Control (ACSRPC)**

### ***History***

The foundation for the eventual development of the ACSRPC was laid at FVSU on June 7-8, 2001, in a meeting funded by a USDA Sustainable Agriculture Research and Education (SARE) Planning Grant. Parasitologists (3), forage scientists (4), animal nutritionists (2) and extension specialists (1) from Georgia, Florida, Alabama, Louisiana, U.S. Virgin Islands, Denmark, and New Zealand met for two days to brainstorm ideas for future directions of research and outreach for sustainable parasite control in small ruminants. At this meeting, several conclusions were drawn: 1) that the concept of an anthelmintic 'silver bullet' was no longer viable as the sole strategy for sustainable parasite control in small ruminants, 2) that sustainable parasite control required a combination of different strategies in an integrated program, and 3) that development and validation of such a program would require cooperation between many different institutions and disciplines, as well as between university/USDA research programs and on-farm outreach. After a second planning meeting at FVSU in August, 2001, a full SARE proposal entitled 'Novel Methods for Sustainable Control of Gastrointestinal Nematodes in Small Ruminants' was submitted in November, 2001, which included research initiatives on use of nematode-trapping fungi and copper oxide wire particles (COWP) to reduce GIN infection in sheep and goats, and producer workshops on FAMACHA© and Smart Drenching. This project, for which funding was initiated in September, 2002, was a collaboration between scientists, veterinarians, and extension specialists from FVSU, LSU, the University of Georgia (UGA), Auburn University, the University of Florida, USDA/ARS in Brooksville, FL, and Booneville, AR, the University of the Virgin Islands, RVSU in Denmark, and the Onderstepoort Veterinary Institute in South Africa, and set the pattern for research and outreach for the ACSRPC for the next decade.

Over the past 10 years, ACSRPC research efforts have focused primarily on validation and on-farm implementation of novel GIN control technologies, including the FAMACHA<sup>®</sup> system for identification of anemia (as a result of *H. contortus* infection) in sheep and goats, grazing or feeding of dried forms of anti-parasitic plants, including the tannin-rich forage sericea lespedeza [*Lespedeza cuneata* (Dum-Cours.) G. Don.], use of copper oxide wire particles (COWP) given in bolus form or mixed with the feed ration to kill *H. contortus* in the abomasum, biological control using nematode-trapping fungi to kill infective nematode larvae in feces on pasture, and vaccines against *H. contortus* (Terrill et al., 2012). These and other techniques, including grazing strategies (Burke et al., 2009), use of improved nutrition and breeding to enhance overall herd or flock resilience and resistance, respectively, to GIN infection (Torres-Acosta et al., 2004), and the Five Point Check<sup>®</sup> system of targeted selective treatment (Bath and van Wyk, 2009) have been the basis for development of integrated ‘basket of best options’ GIN control programs around the world (Jackson and Miller, 2006).

Outreach of the ACSRPC has focused on effectively delivering information on integrated parasite management (IPM) principles and the skills needed to properly implement them to producers through producer workshops (Smart Drenching, FAMACHA, IPM), as well as through the internet and other electronic means.

Support for this work has come from USDA SARE, 1890 Institution Capacity Building, Organic Research and Outreach Initiative, and Small Business Innovation Research grants, and from administrators, faculty, staff, and students at 25 institutions across the U.S. and the world.

### ***Current Status***

From its official inception 10 years ago, the ACSRPC has maintained a singular focus and a consistent approach. Our focus is on assisting small ruminant producers in acquiring information on sustainable parasite management and implementing validated novel GIN control technologies on-farm. Our approach has been multi-institutional and multi-discipline, combining the expertise of parasitologists, forage scientists, animal scientists, veterinarians, and extension specialists in developing research and outreach initiatives on integrated parasite management. This concept of using a holistic, integrated approach to sustainable parasite control using simple, inexpensive diagnostic systems (FAMACHA<sup>®</sup> and the Five Point Check<sup>®</sup>) combined with novel GIN management strategies (COWP, feeding or grazing of tannin-rich forages, breeding to improve herd or flock resistance to GIN infection) has application to small ruminant producers worldwide, in developing as well as developed countries, and to organic, reduced input (grass-fed), and conventional livestock production systems. As such, this work has positively impacted thousands of producers in the U.S., Puerto Rico, and the U.S. Virgin Islands and has the potential to impact millions more small ruminant producers across the globe.

### ***Future Directions***

As infection of small ruminants with *H. contortus* is no longer primarily a southern U.S. problem, demand for FAMACHA<sup>®</sup> workshops has spread across the country, with the system now in use in 46 out of 50 states and even into Canada. There have been more frequent reports of anthelmintic resistance in sheep and goat herds outside of the southern U.S. as well, including

the Mid-Atlantic (O'Brien et al., 2011) and northern U.S. (Grosz, 2012). To address this challenge, our Consortium has expanded its membership to include scientists and extension specialists from these regions and changed our name from the Southern Consortium to the American Consortium for Small Ruminant Parasite Control. The current conference reflects our new emphasis on having a more national, as well as international reach as an organization, and we will continue in this effort to provide information on sustainable parasite management to the producers who need it, wherever they may be.

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