

# **Master of Public Health Public Health Field Experience Report**

**DMP 840 – Kansas State University**

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## Introduction and Goals of Public Health Field Experience

This past summer Sara McReynolds, DVM, MPH, and I had the opportunity to complete our Public Health Field Experience in South America. We worked under the supervision of David Ashford, USDA APHIS, in cooperation with the Kansas-Paraguay Partners.

The goals going into the experience were very broad, intending to introduce us to our disease of interest, foot and mouth disease through the Hemispheric FMD Eradication Program, as well as to learn about public health on both national and international levels. This would involve understanding the differences and challenges of eradication programs versus control programs of FMD in developing countries, looking at the design and implementation of intensive national health programs, and understanding the details of FMD and its epidemiology. Other goals included training and experience in outbreak investigation, disease surveillance and the epidemiologic methods of cross-sectional studies. We also aimed to meet with and learn about various governmental and non-governmental organizations involved in human and animal health.

As this experience was international and involved many different agencies, organizations and people, it was not just a goal, but a necessity to be flexible with the plans we had set.

We spent the first week in Buenos Aires, Argentina taking an intensive Spanish course. The second week was spent in Rio de Janeiro, where we attended the RIMSA 15 conference and visited PANAFTOSA. However, the majority of our time was spent in Paraguay and the many of the goals established prior to our visit focused on our time in Paraguay.

While in Asuncion, Paraguay, we stayed with Marcos Medina, his wife, Delia, and their family. Marcos is a veterinarian who obtained two Masters Degrees at Kansas State University. He is currently a consultant for several ranches and also is the technical advisor to the President of the Association Rural Paraguay (ARP). He has an intimate knowledge of both the agriculture industry and the complex political situation that exists in Paraguay.

About half of our time in Paraguay was spent in Filadelfia, one of the largest cities in the Chaco region, working with the veterinarians of the Technical Assistance Fernheim (ATF) of the Cooperativa Fernheim. The Chaco was settled by Mennonites from both Canada and Russia during the late 1920's and early 1930's. The Mennonites have developed successful agricultural techniques for dairy, beef and crop production despite the uninviting climate and terrain of the Chaco. Part of their success is due to the cooperatives that were formed quickly after their settlement.

## Rio de Janeiro, Brazil

### RIMSA 15

On June 11<sup>th</sup> and 12<sup>th</sup>, 2008, we attended the 15<sup>th</sup> Annual RIMSA Conference in Rio de Janeiro, Brazil. RIMSA is the Inter-American Meeting at Ministerial Level on Health and Agriculture. The theme of the meeting was Agriculture and Health: Alliance for Equity and Rural Development in the Americas. We attended several talks including: “Development of agrofood chains: socioeconomic and environmental challenges, and windows of opportunity for equitable development and health” (Jeffrey Max Jones, Undersecretary of Agribusiness Promotion, Mexico’s Secretary of Agriculture, Livestock, Rural Development, Fisheries, and Food); “Health and Animal Production in Brazil and South America: strong points, challenges and opportunities” (Inácio Afonso Kroetz, Secretariat of Animal and Plant Health, Ministry of Agriculture, Livestock and Food Supply, Brazil); “Agrotourism, Ecotourism, Sustainable Tourism and Health: Opportunities for rural development and sanitary challenges: The case of Jamaica” (Hugh Cresser, Deputy Chief of Party for the USAID funded “Rural Enterprise, Agriculture and Community Tourism Project” in Jamaica); “Health in Rural Areas” (María Julia Muñoz, Minister of Public Health, Uruguay); and “Equitable health care: neglected diseases in neglected populations” (Ricardo Cañizares, Regional Undersecretary of Coast-Insular Health, Minister of Public Health, Ecuador).

We first met with our supervisor, David Ashford, USDA–APHIS, who became our guide throughout our time Brazil. We also had many opportunities to meet with other important figures in health and agriculture in South America. Two people of note were Phil Bradshaw, President of GIEFA, and Hugo Corrales, President of SENACSA. GIEFA is the international working group for the eradication of foot and mouth disease and SENACSA is the Paraguayan equivalent of the USDA. We also met with Dr. Raymond Dugas, Guatemala PAHO Director of Public Health, and Dorothy Geale, Senior Staff Veterinarian, Animal Health Division, Canadian Food Inspection Agency.

### PANAFTOSA

Located on the outskirts of Rio de Janeiro is PANAFTOSA, the PAHO department responsible for vesicular diseases, zoonoses and foodborne illnesses for all of South America. We spent two days visiting this facility, which has been in place for nearly 60 years. During our first day, we had the opportunity to tour the campus, which was originally a ranch until it was purchased by the government and converted to its current facility. We also listened to a talk from Jorgen Schlundt, WHO Director of Food Safety, Zoonoses, and Foodborne Illnesses, about the major initiatives the WHO is currently concerned with. That day we were among several guests including Dr. Schlundt, and Mike Chaddock and Primo Arambulo III, both of the AAVMC. We were honored to meet with the personnel of PANAFTOSA including the Director, Albino Belotto.

On our second day visiting PANAFTOSA, we had the opportunity to meet with a USDA Import Risk Analysis team, which included Stephanie Kordick, as well as Alan Terrell, USDA APHIS Area Director of Brazil. The Import Risk Analysis team was visiting PANAFTOSA to get a “big picture” look at FMD eradication efforts throughout South America. Before visiting PANAFTOSA, the team had visited several other areas in Brazil. One of these was Matto Grosso do Sul which is where a previous FMD outbreak had occurred and is also one of the highest producing agricultural states in Brazil. They discussed several concepts including regionalization, where a certain region of a country may be approved for exports, while the rest of the country is not.

We also heard basic background information about FMD and the eradication efforts in South America. A few highpoints of his talk were that 30 years ago, there were 3000 outbreaks of FMD in Brazil alone. At the time they were using an aluminum adjuvanted vaccine. In 1986, a tri-valent (serotypes O, A, and C exist in South America) oil adjuvanted vaccine was developed at PANAFTOSA. The oil-adjuvant vaccine has been much more effective than the aluminum adjuvant.

We were also told how the pattern of FMD is dependent on the movement of animals. Animals are moved to different areas within a country or a different country altogether for their different stages of development (e.g., cow/calf to finishing). They are also moved, sometimes illegally, across national borders depending on which country has the higher cattle market prices. Ecological conditions also affect the pattern of disease. The standard is that vaccination is done twice a year. In areas where intense flooding occurs, it is often only possible for one vaccination per year.

The FMD situation in Paraguay, especially the Chaco region, is unique and important in the eradication efforts. In the past 10 years, this part of Paraguay has been the center of an area with a 500km radius that has produced sporadic outbreaks of FMD with serotype O virus.

This is not surprising given the characteristics of the Chaco. In area, the Chaco region is approximately half of Paraguay, but only about five percent of Paraguay’s population lives there. Infrastructure in this region is lacking, making it difficult to travel to remote regions. The trans-Chaco highway is the only paved road going the through western Paraguay. It was only recently paved all the way to Bolivia, and even though it is paved, it is still poor quality. However, power lines are present throughout most of the Chaco region. With a lack of infrastructure and resources, it makes it difficult for government to control not only vaccinations, but also the borders.

## Asuncion, Paraguay

### Rediex

One of the organizations we visited while in Asuncion was Rediex. This is a government entity that acts as a private business with the purpose of facilitating trade, mainly exports, with other countries. There are eight “tables” within Rediex, each representing an industry within Paraguay that can be exported. The largest of these is the agriculture industry, beef being the dominating product. The goal of Rediex is to bring together all of the major players in one industry to the “table” to have an open discussion about their specific exportation goals and what it would take to achieve them. For example, representatives from SENACSA (government), the Association Rural Paraguay (producers), and slaughterhouses and packing plants are all brought to the table to discuss beef exports. Paraguay has advanced extensively in the world market because of the efforts of Rediex.

The government of Paraguay has been able to advance in trade because it is open to help from other countries. Hugo Corrales said that he wants SENACSA to be completely transparent and they welcome any help/advice from other countries. This idea of openness to international help is evident throughout the Paraguayan government. Rediex is a prime example as it was built and is operated by funds from another country, Taiwan.

### IICA

IICA is the Inter-American Institute for Cooperation on Agriculture. When the OAS (Organization of American States) was formed in 1948, IICA became the specialized agency for agriculture in the Inter-American system. The mission of IICA is to provide innovative technical cooperation to the Member States, with a view to achieving their sustainable development in aid of the peoples of the Americas. We met with the IICA office in Asuncion and they explained to us their purpose. IICA was created to provide both the public and private sectors with technical support and services in the agriculture industry. Because there are offices located in 34 countries each with experts on different subjects, the knowledge available through the IICA network is vast.

Examples of the services available from IICA include the capability to hold teleconferences. They can contact experts on a given subject within their network when a client requests. A current project of the Asuncion IICA office is laying the groundwork for the building of three new SENACSA stations located along the western part of Paraguay-Argentina border. The stations are being funded by USDA-APHIS, who then enlisted IICA to purchase the land for and organize the building of the stations. The purpose of the new SENACSA is for increased security in the Chaco region along the western Paraguay-Argentina border.

## **Association Rural Paraguay**

While in Asuncion, we had many opportunities to interact with the Association Rural Paraguay (ARP), the national organization supporting agriculture of all kinds in Paraguay. Our host, Marcos Medina, is the technical advisor to the President of the ARP. The President of the ARP is also a veterinarian, Dr. Juan Nunez, and happens to be Marcos' father-in-law. Marcos gave us a tour and explained what the Rural Association does and why it is unique among the Mercosur states. Mercosur (or Mercosul) is a regional trade agreement with the purpose of promoting free trade and the fluid movement of goods, people and currency. Its member states are Argentina, Brazil, Paraguay and Uruguay, and associate member states are Bolivia, Chile, Columbia, Ecuador and Peru. Venezuela currently has applied to become a full member but its application has not been approved.

The ARP is the only organization in Paraguay representing all aspects of agriculture. These include both farmers and ranchers. However, beef is the main industry and export in Paraguay, so much of the efforts of the ARP are focused here. The ARP is powerful within Paraguay for several reasons. One is that they have a higher economic status than most organizations and even the government. The ARP is aware of the importance of and need for government oversight of FMD vaccination when it comes to international trade. The ARP actually provides over 80% of the working budget for SENACSA in order to help facilitate this oversight. The ARP also has a private security force called COLCAT which is present at each SENACSA control point. The national government has given COLCAT the authority to search and arrest people for the illegal shipment of not only animals and meat products, but also other contraband including illegal DVD's.

The ARP differs from similar organizations in the Mercosur because it is the only organization in the country. Argentina, Brazil and Uruguay each have more than one rural association. Because it only has one rural association, Paraguay's voice is unified when it comes to agriculture in the international market.

## **EXPO**

Every year the ARP hosts a national EXPO. Several smaller Expos or rodeos are sponsored throughout Paraguay by local organizations. We were able to attend the national EXPO, which is held on the ARP grounds in Asuncion, as well as Rodeo Trebol, which takes place in August every year in the Chaco.

The EXPO is very similar to a state fair held here in the United States. The main events included cattle judging and judging of other species including goats, sheep, horses, and pigs. The most popular breeds of cattle included Nelore, Brahman and the Brahman crosses such as Brangus and Braford. Composite breeds, such as the Montana, were represented along with breeds more often seen here in the United States such as Angus, Hereford, Gelbvieh and Santa Gertrudis, to name a few. Each night the cattle which had been judged that day would be auctioned off, often in an entertaining matter.

The EXPO also provides entertainment for the whole family with carnival rides, concerts, vendors, and plenty of local food including asado (barbeque) and dulce de leche (caramel-type sweet) treats.

In addition to the entertainment and judging competitions, another goal of the EXPO is to educate producers and the public about current events involving agriculture. We had the privilege to attend several of these meetings including one from the OIE Representative for the Americas who gave a talk about OIE and their goal for countries like Paraguay to get involved in the writing of the Codex.

The EXPO is also a wonderful opportunity for Paraguay to display its products, people and ideas to the rest of the world. Members of the EU visited the EXPO this year and we were able to attend their welcome dinner.

## **SENACSA**

### *People*

SENACSA (Servicio Nacional de Salud Animal) is the Paraguayan equivalent of the USDA and the majority of our time in Asuncion was spent with the people of SENACSA. We met with several people including Dr. Hugo Corrales (President) and Dr. Primo Feltes, Director of Technical Services, but we spent most of our time with Dr. Gloria Alaracon, Dr. Victor Maldonado and Dr. Norman Ramirez, all of whom work under the technical services division.

### *Laboratory*

We were given a tour of the grounds at SENACSA which is located in San Lorenzo, a suburb of Asuncion. One of the highlights was a tour of the national laboratory. Testing for FMD, Rabies, EIA, CSF, Brucellosis, TB, AI, BSE and Exotic Newcastle Disease are all done at this lab. The lab is also responsible for quality control of all test reagents and vaccines used throughout the country. We were told that construction would begin soon on a BSL 3 lab funded by the EU.

### *FMD Vaccination protocol and ceremonial opening*

Vaccination for Foot and Mouth Disease has become an important event in Paraguay. We had the opportunity to attend the ceremonial opening of the FMD Vaccination for June 2008. It was held at a ranch just outside of Asuncion that belonged to Dr. Eusebio Manuel Cardozo, the Vice President of the Rural Association. Other important figures who attended were Hugo Corrales, President of SENACSA, Dr. Juan Nunez, President of the ARP, Dr. Manuel Barbosa, SENACSA Director of Animal Health, and the Paraguayan Minister of Agriculture, Alfredo Molinas. Many members of the media were present including reporters from both the agriculture television station and agriculture magazines.

Some of the cattle on the ranch were FMD vaccinated for the benefit of the media. However, when FMD vaccination is normally done, SENACSA follows a protocol. Every vaccination season fiscalizadores, or supervisors, are hired by SENACSA. One of these

individuals is present at every FMD vaccination and is responsible for making sure all cattle are vaccinated, the vaccine cold chain is preserved, and all of the documentation is correct.

### *SIGOR/GPS/GIS*

SENACSA employs a computer program called SIGOR II to hold a national database. This database includes every premise, cattle owner, FMD vaccination record, and COTA sanitary certificate, which authorizes movement of animals for sale or slaughter. This is a very extensive database and it has been taken a step further in the areas of concern for FMD. The areas of concern are along what is called the Zona Alta Vigilancia, a region within 15 km of the national border, nearly all the way around the country.

SENACSA has 4 GPS units in its possession and has begun to use GPS mapping systems to plot all premises within this region. It is not yet complete and the ultimate goal is to have all of the premises within the entire country mapped. However, this will not happen unless SENACSA receives more funding to buy additional GPS units. They are receiving some help from USDA-APHIS which has purchased nine GPS units for use in the Chaco area. Realistically SENACSA would need a GPS unit for each of its stations (>70) in order to map the country within the next few years.

### *SITRAP*

The EU visited Paraguay earlier this year to discuss the prospect of opening their beef market to Paraguayan exports. Traceability is one of the requirements for exporting beef to the EU. We were able to hear about Paraguay's system, SITRAP, which is monitored by SENACSA. SITRAP is a voluntary ID system that traces animals from weaning to the kill floor. The system is simple enough for the common rancher to use, yet it is accurate enough for acceptance from the EU. When we spoke with the SITRAP office, only 38 premises or ranches were enrolled. However, it was expected that many more would enter once the European market was open. The SITRAP office is prepared for this expected increase with room, technology and the budget to expand. We also visited a ranch, Las Mercedes Ganadera Tuyuyu SA, that uses the SITRAP system.

Like the United States, the EU requires inspection of all areas where meat/animals are handled prior to their export. One of the most important of these is the packing plant. Only one packing plant was actually approved by the EU. Cooperativa Fernheim owns and operates this plant, FricoChaco.

### *National/International control points*

Much of SENACSA's responsibilities lie in inspection of both animals and paperwork. We spent a day visiting many of the different types of inspection stations from which SENACSA works. Our first stop was a SENACSA control point, 21 of which are located throughout the Paraguay. All trucks driving on the road must stop and allow the SENACSA agents to inspect their paperwork and animals. COLCAT security is present at each of these stations in case of illegal animals or contraband. At this particular Para Control there was an 800 hectare quarantine area located just a few kilometers away.

Animals without proper documentation are placed in this quarantine area indefinitely until the problem is resolved. During their quarantine, the animals are given regular health checks and FMD vaccinations.

SENACSA also has checkpoints located at international borders. We visited Puerto Falcon which is located on the border between Paraguay and Argentina. At this particular location one SENACSA veterinarian and one para-technico are responsible for inspecting all of the trailers and paperwork of meat crossing the border. We also visited a private port on the Paraguay River from which meat is shipped. We were told that very few, if any, live animals cross the border. Most of the meat being exported is trucked or shipped to Santiago, Chile, and on to its final destination in Russia.

#### *Packing plant tour*

*Frigomerc* is the name of the frigorifico or packing plant that we toured. The SENACSA veterinarians in charge of inspection explained that the plant utilizes a HACCP plan. They worked with HACCP experts at Kansas State to develop it. They adhered well to their HACCP plan as we were required to sign a waiver saying we had not been sick recently and change into boots and scrubs they provided. During the tour we noticed that overall the operation was very similar to that of a packing plant in the United States. The main difference was their concern for FMD. Precautions against FMD included washing all trucks, trailers and live cattle with a sodium bicarbonate solution. Each animal's feet and mouth are inspected individually for lesions. The final precaution is a pH check of all meat to ensure it is appropriate to kill any live virus that might be present.

#### *Auction houses*

Another place where SENACSA inspectors work is Feria Ganaderos or cattle auction houses. These are different from the US in that all animals are only given a brief inspection for signs of FMD. Their documentation is also inspected. These are the main concerns of the SENACSA veterinarian. Other tests including pregnancy checks, Brucellosis and TB, are supposed to be done by a private veterinarian prior to the transportation of the animals.

#### *Trip to Brazil Border*

One area of Paraguay where FMD vaccination is of particular importance is along the border with Brazil, or frontera, where the two countries are not separated by the Rio Parana. This region is part of the Zona Alta Vigilancia and it was here within the last decade that the last outbreak of FMD occurred. The Zona Alta Vigilancia consists of the area within 15 km on each side of the border. The border here is not well defined and is only marked by posts along the road. The road actually runs on both sides of the border and it crosses the line several times. We drove along this road between the town of Salto de Guaira and Corpus Christi. At most, good wire fences on both sides separated Brazil and Paraguay. We saw cattle and people roaming in between the countries. It was easy to understand the concern of both countries for disease transmission in this area.

We stopped at several SENACSA stations in this area and learned how FMD vaccination within this section of the Zona Alta Vigilancia is done differently. SENACSA and its Brazilian counterpart work together each vaccination season to ensure all cattle within this zone are vaccinated. They begin FMD vaccination earlier here than in the rest of Paraguay. Unlike the rest of the country, cattle from this area receive an eartag with an identification number to show they are up to date on FMD vaccination. Cattle on the Paraguayan side get a red eartag with an ID number. Brazilian cattle get an eartag with an ID number that is green on one side and yellow on the other. These, however, are the main differences in the vaccination protocol. There is still a fiscalizador hired by SENACSA present at each vaccination and they perform the same duties as the fiscalizadores in the rest of Paraguay.

## Filadelfia, Paraguay

The Chaco region of Paraguay, also called the Occidental or western region, was settled fairly recently by different groups of Mennonites. Loma Plata was first settled in the late 1920's by Mennonites migrating from Canada. In the early 1930's Russia allowed the emigration of Mennonites to Paraguay and they settled the town of Filadelfia. The first settlers called the Chaco the "green hell" because, while it is green, the brush and trees are thick and full of thorns and spines, poisonous snakes, jaguars, pumas and many other unpleasant items. The rainy season is in the summer, usually lasting from November through February. Individual rains during this time can be up to 10 inches or more. The dry season is considered to be the rest of the year. With the latitude just north of the Tropic of Capricorn (approximately 23° S), the winters are not usually very cold and the climate overall is similar to that of northern Australia.

The Mennonites worked hard to turn this "green hell" into a very viable source of agricultural products including beef, dairy, peanuts, cotton, milo, saffron and others. The main products are beef and dairy and the cattle require good pasture. The forests are cleared now using bulldozers. All of the trees and bushes are knocked down and pushed into small piles throughout the pasture. Grass seed (Gatton panic is the standard) is planted immediately after clearing and the pasture is allowed to sit for at least one year, however, two years are often required. After two years or more, the remaining trees are pushed toward the center of the pasture where they are burned.

The Mennonites have worked very well with the indigenous peoples of the Chaco. They often provide the labor needed by the farmers and ranchers. At one point we saw indigenous people digging a line for water pipes on a ranch. We were told that this work could be done faster by using machinery, but since these people needed work they were given the job of digging the ditches. Apparently this happens commonly at least in the Mennonite colonies where work is available. Many other groups, including the Peace Corps and missionaries are active in working with the Chaco's indigenous peoples.

### Cooperative Fernheim and ATF

One of the reasons for the success of the Mennonites was the formation of cooperatives. They began almost immediately after the settling of the Chaco and have helped the colonies to prosper. We worked with Cooperative Fernheim based in Filadelfia. The cooperative is involved in almost every aspect of the community. We worked with Assistance Technica Fernheim (ATF) which provides many services to the members of the cooperative, including veterinary services, agricultural services such as forestry and soil consulting, and land surveying and mapping.

The ATF employs six veterinarians. Their work is mainly with cattle, dairy and beef, and horses although some small animal work is done. The large animal work done by the veterinarians is often similar to that done by veterinarians in the United States, including

palpation, breeding soundness evaluations, injuries, etc., and the quality of the large animal veterinary work done by the ATF is very high. I went on several routine calls with the veterinarians including breeding soundness exams and rectal palpation. I also was able to see several animals that presumably had “tristeza” which is the Spanish term for the bovine disease complex including anaplasmosis, babesiosis and piroplasmosis. A few very interesting calls included a horse with a very large laceration on her shoulder, presumably due to a cow horn, and a bull that likely had rabies.

The demand for small animal veterinary care has not ever been as great as it is for large animal care. The quality of care for small animals available reflects this fact. I believe that the quality of care for small animals will increase as the demand increases and better equipment becomes available.

### **Anaplasma marginale study**

This year the veterinarians at ATF have seen an increase in “tristeza” among cattle. ATF and Cooperativa Fernheim allowed us to do a serological survey to try to determine the prevalence of one the causative agents of tristeza, *anaplasma marginale*. Attached is the report of the results that was given to ATF and the ranch owners whose cattle we sampled.

## Conclusions

### Goals Met

This field experience provided the opportunity for both Dr. McReynolds and me to meet the goals set prior to our departure. We met with and learned about FMD from some of the world's foremost experts on the subject at PANAFTOSA. We learned the processes of disease (FMD) elimination that did and did not work in different parts of South America. Through the RIMSA Conference, we were able to meet and converse with several important figures in international public health. We also were able to see public health at the national level through SENACSA in Paraguay. While working with the Mennonites in the Chaco, we participated in the design and implementation of cross-sectional study of anaplasmosis in cattle. We met with several different organizations of both governmental and non-governmental nature that are involved in either human or animal health, or both. These included SENACSA, PAHO and PANAFTOSA, ARP, and IICA.

### Challenges facing Paraguay

Paraguay faces many challenges on its way to becoming a world leader in the beef cattle industry. Many of these challenges deal with the Chaco region. The Chaco lacks the nationally funded infrastructure necessary to make it an even more productive region than it is currently. At present there is only one paved road going through the entire western part of Paraguay, while all other roads are dirt. The international borders are not watched as well as in Eastern Paraguay because there are fewer checkpoints. This means that illegal transport of animals and other items across the border is much more common. Along with fewer international checkpoints, there are fewer SENACSA stations from which inspections can be done. Fewer SENACSA stations make it difficult for programs such as the FMD eradication program to be run successfully. The environment of the Chaco is a challenge in itself to the people of Paraguay. The summer months bring massive amounts of rain and make roads impassable. The winter months bring the dry season with dust storms that also make roads difficult to drive on.

Another challenge that prevents Paraguay from being as successful as it could be is the national government. Very little funding is provided to governmental organizations like SENACSA. SENACSA then depends on the private sector in Paraguay as well as international funding to perform basic duties. The attitude of the public towards veterinarians in general and especially those working in public health and for the government is much different than here in the United States. The level of respect for veterinarians held by the general public is not nearly as high as it is here.

### **Advantages for Paraguay**

While the Chaco presents numerous challenges to those that live there and the government to both develop and control it, the Mennonite colonies have mastered many of these challenges already. The Cooperatives have done an excellent job of providing the infrastructure necessary to make the Chaco a livable and productive environment. The Mennonites provide an excellent example for the rest Paraguay with their technical skills, organization, and the work ethic necessary to advance in the world market.

The government of Paraguay simply cannot provide all of the resources necessary to make the country as competitive as it can be in the international market. Fortunately many members of the government are very open to international help. Hugo Corrales, President of SENACSA is a great example. He welcomed not only Dr. McReynolds and me as students, but also any interested party in an effort to show complete transparency in the way Paraguay and SENACSA operate. This attitude of openness has led to help and funding from the United States, the European Union and other countries. USDA-APHIS is currently in the process of funding three new SENACSA outposts along the western border between Argentina and Paraguay. The European Union is funding a brand new national BSL 3 lab at SENACSA. These gifts will help Paraguay to be more secure, both in public health with an up to date laboratory as well as national security with more of the border being closely monitored. Another gift that Paraguay has put to good use is Rediex. Taiwan actually funded the construction of the building as well as the salaries of the workers. Rediex has helped all types of Paraguayan products to be more competitive on the international market.

### **Final thoughts: The FMD situation in Paraguay**

Paraguay has made huge strides recently in becoming an international exporter of beef. This is due in large part to the willingness of the ARP and Mennonite communities of the Chaco to push the country forward in terms of technology and productivity. Examples include the SITRAP national identification system and FrigoChaco, the only packing plant approved to export meat to the EU. International help (monetary, technology and expertise) has been accepted openly by Hugo Corrales and SENACSA and has been an important part of the progress made in international trade.

Several areas of Paraguay, mainly in the Chaco, are still not well regulated by SENACSA. Much of the international border in the Chaco is still very susceptible to illegal movement of animals and animal products. The last outbreak of FMD occurred on the border with Brazil and extra vigilance has been taken in this area to prevent another outbreak. If another outbreak occurs, and a likely location is in the remote areas of the Chaco, along Paraguay's unprotected borders with Argentina, Bolivia and Brazil. It seems that another outbreak might be the only way to make the government and people aware of how important it is to protect the borders. As mentioned earlier, progress is being made with three new SENACSA outposts being built on the Argentina Paraguay border. This is a start, but is not nearly enough to be able to handle an outbreak or to stop illegal movement of animals and products across the border.

The most important obstacle facing Paraguay is the national government. Very little monetary support is given to SENACSA to perform its necessary duties, which forces SENACSA to depend on help from the private sector and international partners in trade. SENACSA would be taken more seriously by the people and by other countries if it were independent from the private sector. An underlying theme that we heard about during our time in Paraguay is the corruption present in the national government. Solving this problem would be a tough task, but I think it is important in order for Paraguay to be taken more seriously in the international community, in general and in the trade issues discussed earlier.

### **Challenges for us as students**

Many challenges presented themselves during this field experience. First and foremost was the language barrier. Both Dr. McReynolds and I would have benefited greatly from more training in the Spanish language. I did, however, feel very comfortable during our stay in Filadelfia in the Chaco region of Paraguay. Many of the Mennonites speak English and German, which I studied in high school, so I was able to converse in two languages.

We were forewarned that in international work, plans often change without notice and that we needed to be flexible. This was certainly the case during our field experience. Our plan prior to going to the Chaco was to do a project such as designing a vaccine efficacy study with SENACSA. These plans fell through due to a number of reasons, the most important ones being miscommunication and the language barrier. We were able, however, to help design and implement the anaplasmosis cross-sectional study during our time in the Chaco.

### **Recommendations for future students**

I would recommend an experience like this to any student willing. This experience will last me a lifetime. It gave me a better understanding, not only of public health and animal health in Paraguay and South America, but also of life in general outside of the United States. My time in Paraguay really opened my eyes both to what the rest of the world has to offer to us, and also to what we in the United States can offer to the rest of the world. There are multitudes of opportunities in this field and I hope to be involved with international public health in the future.

## Anaplasma marginale serosurvey

Cooperativa Fernheim

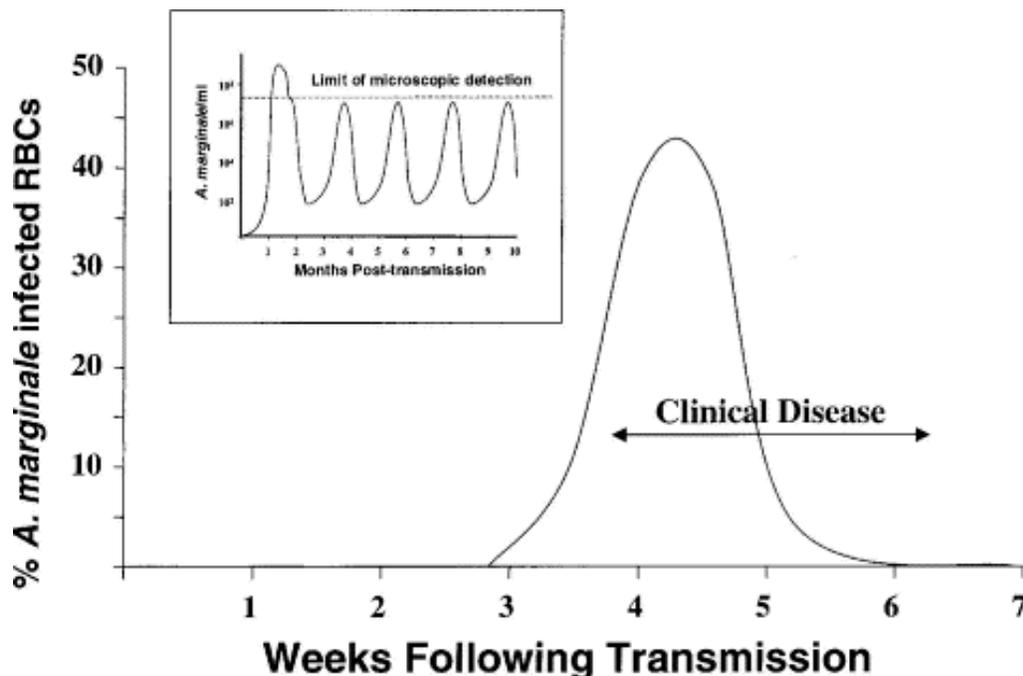
August 26, 2008

Sara McReynolds and Joan Talbott

There is a growing concern over the presence of “tick fever” or tristeza in cattle herds in Cooperativa Fernheim. Tristeza is responsible for important economic losses due to mortality and decreases in meat and milk yield. Indirect losses also result from treatment of the disease and application of control measures

Tristeza describes three diseases, Anaplasmosis, Babesiosis and Piroplasmosis. All three of these diseases are caused by a microscopic organism called a piroplasm which attacks the red blood cells. These hemoparasites cause a marked anemia, a decrease in red blood cells, which can result in fever, depression, dehydration, difficulty breathing and animals going off feed. Infected animals exhibit these clinical signs during the acute phase of the disease. When they recover from the initial infection, they have not completely cleared the disease and are called carrier animals. Carrier animals can also result from in utero infection.

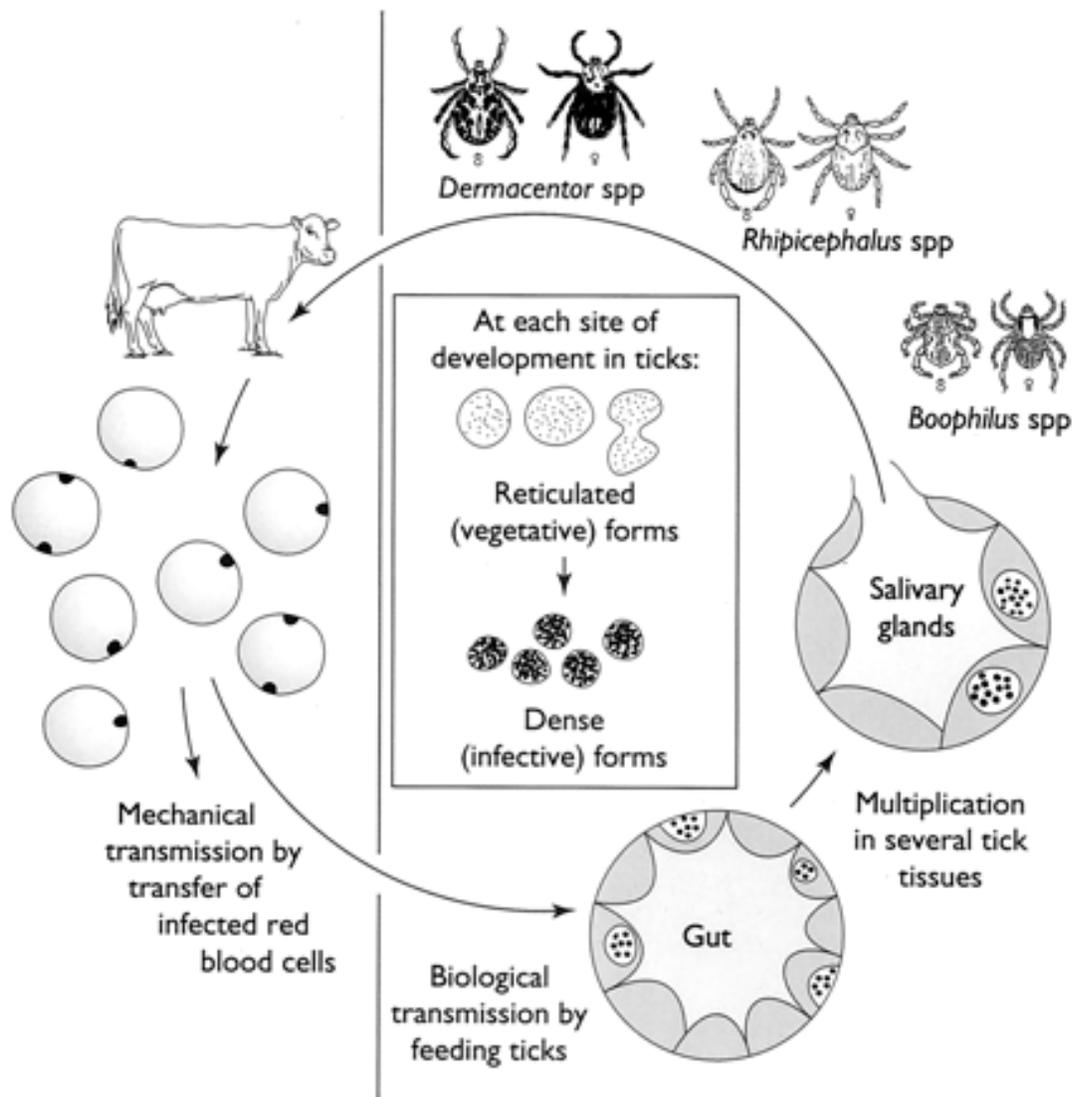
The table below shows the cyclic nature of the disease in carrier animals. As the number of infected red blood cells rises, so does the immune response of the animal. Usually the number of infected red blood cells is lower than the detection threshold by blood smear and complement fixation and can only reliably be detected by c-ELISA.



Hans Coetzee, BVSc, Cert CHP, MRCVS

*Anaplasma marginale* is spread between cattle by several different species of ticks. Between 27% and 50% of ticks biting carrier animals become infected and can then spread the disease. It can also be transmitted via fomites such as needles and tagging as well as by other insects such as biting flies.

Below is an illustration of the life cycle of *Anaplasma marginale*.



Kocan et al, Clin Micro Reviews, October 2003, p. 698-712, Vol. 16, No. 4

Two types of tests available to determine the presence of antibodies to *Anaplasma marginale* are the complement fixation test (previous standard) and the c-ELISA. Studies have shown that the c-ELISA test is much more sensitive than the complement fixation test. This means that the c-ELISA test is much more likely to detect antibodies in carrier animals.

## Study

The object of this study was to determine the prevalence of positive antibodies to one of these species, *Anaplasma marginale*, among cattle in several different herds, both beef and dairy, associated with Cooperativa Fernheim. Blood samples were drawn from the caudal tail vein. The blood was spun down, chilled, and the serum was sent to Prof. Dr. Antonio Rodriguez Sanchez at Centro de Diagnostico Veterinario for testing using the c-ELISA method. The results are in the following table.

Location	Number of Samples	Number Positive	Percent Positive
Estancia Aguila	45	45	100.00%
Chacra Experimental	33	33	100.00%
Dos Banderas	38	38	100.00%
Corrales	31	29	93.55%
Litchfelde	12	12	100.00%
LP 1 - Stahl	43	42	97.67%
LP - Lowen	28	20	71.43%
LP 2 - COOP	54	44	81.48%
LP 3 - COOP	43	41	95.35%
LP 4 - COOP	35	34	97.14%
Erwin Weins	26	26	100.00%
Konrad Reiger	9	9	100.00%
Campo I	50	48	96.00%

## Conclusions

In six of the 13 herds studied, 100% of the animals tested positive for antibodies to *Anaplasma marginale*.

Some people believe that certain animals appear to have more resistance (ex. Brahman and Brahman crosses) while others appear to be more susceptible to these diseases (European breeds.) This study looked only at the antibody response of cattle to infection and based on this study, we found no evidence to support that Brahman cattle are less likely to have an antibody response to infection. Further studies should be done to determine whether or not Brahman and Brahman crosses show more, less, or the same clinical signs as European breeds.

The purpose of vaccination is to create an antibody response to the disease in question. In this case, almost all of the animals tested already have an antibody titer against *Anaplasma marginale*. Vaccination in this case is not recommended because the desired response of the vaccine is already present.

Because the majority of the animals in these herds have an antibody titer, it is likely that a naïve animal introduced into the herd would contract the disease and exhibit severe clinical signs.

**Recommendations**

New animals introduced into these herds should already have an antibody titer against *Anaplasma marginale* (either by vaccination or natural exposure.)

Clinically ill animals should continue to be treated with the current protocol. This includes the appropriate dose of a tetracycline such as terramycin, an NSAID such as flunixin meglamine when a high fever is present, and other ancillary therapy such as vitamins when deemed necessary by the veterinarian.

## Appendix

### Abbreviations

AAVMC – Association of American Veterinary Medical Colleges  
AI – Avian Influenza  
ARP – Association Rural Paraguay  
ATF – Technical Assistance Fernheim Cooperative  
BSE – Bovine Spongiform Encephalopathy  
BSL – Bio-safety level  
Chaco – western or “occidental” region of Paraguay  
CSF – Classical swine fever  
EIA – Equine Infectious Anemia  
EU – European Union  
FMD – Foot and Mouth Disease  
Fiebre Aftosa (Spanish)  
GIEFA – International-American Group for the Eradication of FMD  
IICA - Inter-American Institute for Cooperation on Agriculture  
Mercosul (Mercosur) – Regional trade agreement between Argentina, Brazil, Paraguay and Uruguay  
OAS – Organization of American States  
PAHO – Pan-American Health Organization  
PANAFTOSA – PAHO Department responsible for vesicular diseases, food-borne illness and zoonoses for South America  
RIMSA – Reunion Interamericana a Nivel Ministerial en Salud y Agricultura, Inter-American Meeting at Ministerial Level on Health and Agriculture  
SENACSA – Servicio Nacional de Salud Animal, Paraguayan national animal health department  
SITRAP – Paraguayan traceability system  
TB - Tuberculosis  
USDA-APHIS – United State Department of Agriculture Animal and Plant Health Inspection Service  
WHO – World Health Organization