

The Effect of Oral Omeprazole on Third Compartment pH in Clinically Normal Alpacas

ARF Investigator Profile by Ingrid Wood
Jennifer Lynn Johnson DVM, MS

Before perusing the most recent research information about a product called GastroGard, readers may want to review an article which appeared in the Spring 2006 edition of Alpacas Magazine under the title *Bioavailability and Pharmacokinetics of Oral Omeprazole in Camelids*.

In that interview, Dr. Geoffrey Smith shared the surprising results of his study with GastroGard. His research subjects were a small group of llamas. Although Dr. Smith doubled and even tripled the dosage normally administered to horses, he found that the drug's "bioavailability was only 2% of the dose." In other words, the paste form of omeprazole was poorly absorbed and did not reach the llamas' blood stream and presumably could not alter the pH of the third stomach compartment (C-3). "Some veterinarians and owners may not believe the results of my research," Dr. Smith had speculated at the time. He suggested that a future study should explore the efficacy of GastroGard by monitoring stomach pH.

The board members of the Alpaca Research Foundation obviously agreed with this premise and funded the follow up study. As we shall see, its scope was considerably broadened.

Enter Jennifer Lynn Johnson, DVM, a young woman who carried the weighty title of Large Animal Internal Medicine Resident while conducting this research. Quite fittingly, her research on *The Effect of Oral Omeprazole on Third Compartment pH in Clinically Normal Alpacas* took place at the Veterinary Medical Center Large Animal Hospital at the University of Minnesota.

Dr. Johnson received her Bachelor of Veterinary Science degree as well as her Doctor of Veterinary Medicine from Washington State University. As part of her advanced training, she completed an internship in Food Animal Medicine, Surgery and Field Services at Colorado State University. At the time of our interview, Dr. Johnson had just completed a Large Animal Internal Medicine residency at the University of Minnesota and is continuing her education in the pursuit of a PhD in transplant immunology.

She was too modest to mention the numerous educational honors and awards she had received while following her career path. (I found that impressive list in the Principal Investigator information packet ARF board member Patricia Craven mailed to me prior to the interview.)

While the very pleasant receptionist at the University of Minnesota Veterinary Medical Center tracked the busy Dr. Johnson down for me, I idly scanned the personal information provided in the packet. My eyes popped open when I noticed Dr. Johnson's birthdate. My goodness, she was – at least to this member of the Woodstock generation – a mere baby! Lest any readers jump to hasty conclusion, let me assure you that the young veterinarian proved to be a consummate professional. Answering all my questions with precise clarity, she impressed me with her patience and instant recall of data and procedures.

We actually conducted the interview while Dr. Johnson was driving her car, which caused me no small amount of anxiety. What if she had an accident while concentrating on our conversation? I finally decided that this type of multi-tasking-driving and discussing animal medical issues – seems to be a prerequisite for being a large animal veterinarian.

Pretty soon, my attention was intensely focused on the interview, and I managed to push the concern over Dr. Johnson's safety out of my mind. As a breeder, I am always curious about the source of a scientist's interest in alpacas. Dr. Johnson had routinely encountered camelids in veterinary school. During the summer of 2003, a considerable number of llamas and alpacas were admitted to veterinary hospitals suffering from the West Nile virus. Dr. Johnson's interest was piqued considerably when post mortem examinations revealed ulcers in

alarming numbers in those animals that succumbed to the virus. Dr. Johnson became intensely curious about the prevalence of ulcers in camelids and even more curious about the choice of treatment. At times, she witnessed much debate between the patients' human caretakers. "People were guessing at the correct dosage of GastroGard and basically prescribing and administering random amounts. I didn't feel comfortable with managing animal health care in such a manner," Dr. Johnson remembered. "I thought to myself, 'We don't even know if this drug works on alpacas. I thought it would be an important avenue to explore since ulcers are such a problem in alpacas.'" When ARF offered the opportunity to take Dr. Smith's research to the next level, she didn't hesitate to tackle the task. As the Principal Investigator, Dr. Johnson's main objective was "to determine if a dose of 4 mg/Kg of orally administered omeprazole will significantly raise gastric pH and, if so, for how long." Achieving positive results with such a dosage would indicate that GastroGard is the correct choice in healing camelid ulcers.

Eight intact alpaca males between the ages of two and three years old were donated to the University of Minnesota for this project. All were carefully examined and declared healthy prior to any research procedures. "We surgically implanted a cannula leading to the third compartment of the stomach. That's where ulcers are typically found in alpacas," Dr. Johnson explained. "How much of the drug did you give each animal?" I inquired. "Not so fast," Dr. Johnson responded. "First, we spent ten days taking baseline pH levels from each animal. They ranged from 1.6-3.5. The implanted cannula has a portal – a little window, so to speak – through which stomach fluid is withdrawn with a pipette. The pH level is then measured with a pH meter." The cannula has a cap which is removed during this procedure. At all other times, it seals the opening. The eight alpacas were administered oral omeprazole in the form of GastroGard, a paste used successfully to treat ulcers in horses. "We used the horse dosage, which is 4mg/Kg," Dr. Johnson emphasized. "This dose has been shown to effectively raise gastric pH in adult horses and foals within one hour of administration. Also, a small paper from the Middle East suggested that this dose may work in old world camelids." The GastroGard paste used by Dr. Johnson and her team was donated by Merial, the drug's manufacturer. The company's generous donation was unfortunately not rewarded with positive results. Not a single one of the twenty-two samples taken from each alpaca over a week's time showed the raised pH level alpaca breeders had hoped for. We learn in the *The Merck Veterinary Manual (2005)* that gastric ulcers in horses result from increased exposure to hydrochloric acid due to "periods of not eating or nursing, intensive exercise, or delayed gastric emptying."

Does this apply to alpacas? The research abstract I read prior to this interview mentioned that "it is also theorized that an anorexic animal is at a greater risk for developing TCU (third compartment ulcers) as the third compartment is denied the buffering effect of ingesta". "Did you address this theory in your study?" I asked Dr. Johnson. "Yes, we did. We fasted the animals for 24 hours at one point to see if GastroGard would raise pH under those circumstances. It did not."

"What about blood tests?" I inquired, remembering Dr. Smith's statement that Omeprazole is a proton-pump inhibitor and has to be absorbed into the bloodstream to work.

"Blood tests were definitely part of our research", Dr. Johnson confirmed. "We took blood samples through a catheter inserted in the jugular vein." She hesitated slightly and then stated firmly, "I know that breeders will not be happy to hear this, but the oral form of omeprazole at this dose does not appear to work in alpacas. It appears to be futile and a potential waste of money to administer the drug in paste form." Dr. Johnson's research mirrored the findings of the earlier study performed by Dr. Smith on a group of llamas. To put it quite bluntly: alpacas are not horses, and what works for a species with a simple stomach does not always work for animals which are often referred to as "modified" ruminants (true ruminants have four stomach compartments while camelids only have three).

I asked Dr. Johnson the same question I had previously posed to Dr. Smith, "What options do alpaca breeders have after hearing this disappointing news?" Not surprisingly, her answer was virtually identical to that of her colleague at North Carolina State University.

"If an owner is concerned about ulcers, which we believe come from stress, an important management step would be to examine the environment of the animal and eliminate any possible causes of stress," she

responded. Smart breeders know that understanding and respecting the rich emotional and social life of the alpaca is the key to eliminating fear and anxiety from their existence.

“What if it’s too late and the alpaca already has an ulcer?” I inquired, “The only advice I can give at the present time is to use a product that will coat the stomach and allow it to heal,” Dr. Johnson suggested. A product called sucralfate has been proven to work very well clinically. This study’s research abstract included the information that other anti-ulcer medications used in veterinary medicine, such as ranitidine and cimetidine, are also “ineffective in altering gastric pH in camelids.” Dr. Johnson advised, “I want to caution breeders against arbitrarily increasing the dose of GastroGard in hopes that it will work if the animals are just given more. Dr. Smith’s research suggests that it won’t and we don’t know the high end of the safe dose in alpacas. Omeprazole does have some fairly significant side effects when animals are given too much.”

Dr. Johnson was anxious to give credit to fellow scientists who worked with her on this project. She urged me to please mention Dr. Micah Bishop, Dr. Florian Jenner, and Dr. Susan McClanahan. “There is no way I would have been able to conduct this study without their help,” Dr. Johnson emphasized. “Since none of us work in a vacuum, it’s fitting that they receive kudos for their contributions.”

Our conversation drifted to “alpaca talk” in general. Meantime, the increase in traffic background noise could no longer be ignored. If I had to worry about Dr. Johnson’s safety much longer, I’d have to administer a dose of omeprazole to myself. I also wondered how her husband Tim, who works in law enforcement, would feel about his wife “teaching while driving” and my complicity in this matter.

Nevertheless, Dr. Johnson still shared with me that she owns a dog and three cats while boarding two horses at a nearby farm. “I love working and playing with my animals,” she told me and added, “I also love to read just about anything.”

The accomplishments of Jennifer Lynn Johnson DVM, who is a very, very young twenty-eight years old as this article goes to press, are quite awe inspiring. Let’s hope the alpaca community continues to benefit from her interest in camelids for many years to come.

Equally inspiring are the accomplishments of those who, through their tireless efforts, have made this research possible. Alpaca breeders increasingly recognize the important work done by the ARF/MAF organizations. Their funded studies are not “Ivory Tower” projects with little benefit accrued to the everyday lives of breeders and their animals. To the contrary, research like that performed by Dr. Johnson and her colleagues has practical applications to alpaca husbandry protocols and farm management. Camelid breeders will be wise to share the results of the ARF/MAF research projects with their veterinarian and collaborate on how to *prevent* ulcers in our beloved alpacas and llamas.