PURINA PROCLUB

Golden Retriever Update

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Early Diagnosis of Masticatory Muscle Myositis Is Needed for Treatment Success

Imagine what it would be like if your Golden Retriever could not open his mouth to eat and drink. That is often what happens with an autoimmune disorder called masticatory muscle myositis (MMM) that affects the jaw muscles, causing pain and dysfunction.

Swollen, painful masticatory (chewing) muscles and an inability to open the mouth (trismus) are clinical signs of the disorder. "These dogs are not able to pick up a ball or eat without experiencing severe pain," says Brian E. Greenfield, D.V.M., who practices at Animal Clinic Northview in North Ridgeville, Ohio. "In the early stages of the disease, the muscles that are used for eating and chewing appear swollen. As the disease progresses, these muscles begin to atrophy, or waste away. Sometimes the eyes appear sunken, or, less commonly, they seem to protrude."

Although MMM can occur in any breed, it occurs more commonly in large breeds, such as Golden Retrievers, Doberman Pinschers, German Shepherd Dogs, and Labrador Retrievers. Young Cavalier King Charles Spaniels may be severely affected and are believed to be genetically predisposed to developing MMM. Although the disorder does not occur on a widespread basis in Golden Retrievers, anecdotal data suggest that the incidence may be increasing. Thus, whenever a Golden is suddenly unable to open his mouth, experts recommend immediate veterinary care to determine the cause.

The condition occurs in males and females, with an average age of onset of 3 years, though puppies as young as 4 months have been affected. Fortunately, if MMM is diagnosed early, dogs can be treated to increase the likelihood of a full recovery. Research of this disease at the University of California-San Diego led to the development of a blood test in 2004 that detects the presence of 2M antibodies and accurately identifies affected dogs.

Pathologist Diane Shelton, D.V.M., Ph.D., DACVIM, and her team at the Comparative Neuromuscular Laboratory identified type 2M fibers in the masticatory muscle group and showed that antibodies against type 2M fibers are involved in the pathogenesis of MMM. They found that type 2M muscle fibers are not present in any other muscle group and antibodies against this fiber type are not involved in any other muscle disease.[1]

"Masticatory muscle myositis is an inflammatory myopathy," Shelton explains. "It is a unique myopathy, or muscle disease, in which dogs commonly have jaw pain and inability to open the jaw. The autoimmune process in this disease involves circulating antibodies that specifically target the masticatory muscles. We still don't know what causes the autoantibodies to form or why they are directed specifically against the type 2M fibers."

One theory is that antibodies or T-cells generated in response to an infectious agent subsequently cross-react with self-antigens. Antibodies directed against these bacterial antigens potentially could cross-react with the 2M fibers. In humans, autoantibodies directed at *Streptococcus pyogenes* have been shown to attack cardiac and skeletal muscle. Pericarditis and rheumatoid arthritis are examples of diseases in which autoantibodies are directed at specific myofibers.[1]

Rhonda Hovan, research facilitator for the GRCA and a member of the club's Health & Genetics Committee, says, "The genetic components of autoimmune diseases are very complex. Although a great deal of research has been done to identify the causes of human autoimmune diseases, much less research has been done in dogs. Still, the same overall principles of autoimmune disease apply to dogs. Genes play a role in increasing susceptibility to autoimmune diseases, but environmental triggers initiate the onset of clinical signs.

"In dogs that are predisposed to autoimmune reactions, suspected triggers include viral and bacterial exposures, possibly vaccinations, hormones, stress, allergens, medications, and environmental toxins. Most of the time, it is impossible to know with certainty what triggers the onset of an autoimmune disease."

Shelton agrees that MMM is not purely a genetic disease. "Hormonal, environmental and other unknown factors come into play," she says. The genes responsible for a dog's susceptibility to autoimmune diseases are part of the major histocompatibility complex.

"Goldens seem susceptible to many autoimmune muscle diseases, including not only MMM but also polymyositis, extraocular myositis and myasthenia gravis," says Shelton. "Perhaps the most common autoimmune disease in Goldens and many other breeds is autoimmune thyroiditis, the underlying cause of most canine hypothyroidism."

The 2M Antibody Blood Test

Masticatory muscle myositis is an autoimmune disorder in which antibodies attack the 2M fibers in the masticatory (chewing) muscle group. A blood test was developed in 2004 by researchers at the University of California-San Diego to confirm the circulating antibodies that attack 2M fibers. The test is available to veterinarians through the Comparative Neuromuscular Laboratory at the University of California at San Diego. For information, visit *http://medicine.ucsd.edu/vet_neuromuscular*.

Determining an Accurate Diagnosis

Bill Page of Wildwood, Mo., recalls experiencing MMM with his first Golden Retriever many years ago. "'Buddy' was diagnosed when he was about 8 years old," Page says. "It began as soreness when he chewed, so we thought perhaps he had a bad tooth. The veterinarian examined him and diagnosed MMM."

The veterinarian started Buddy right away on prednisone and referred Page to a specialist, who performed a muscle biopsy that confirmed the diagnosis. (Note: This was before the 2M antibody blood test was available.) The prednisone was effective. One year later, the signs of MMM recurred, and Buddy again began prednisone therapy, which effectively managed the condition.

"The quick diagnosis by our veterinarian in the beginning made all the difference in Buddy's outcome," Page says.

An accurate diagnosis is important in treating dogs with MMM. Early detection and aggressive immunosuppressive

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Masticatory Muscle Myositis

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therapy can help reduce myofiber loss and muscle fibrosis, which can lead to irreversible jaw dysfunction and severe muscle atrophy.

Complete physical and neurological examinations are necessary to determine that the clinical signs are restricted to the jaw muscles. The most definitive confirmation of MMM is the 2M antibody test, which detects the antibodies that attack and destroy the 2M muscle fibers. A blood chemistry profile determines the creatine kinase (CK) level, which may be mildly elevated during the acute phase but becomes normal as the disease progresses. Although a blood test may produce a normal CK level, it does not rule out acute MMM.

"Clinical signs compatible with MMM and positive results from a 2M antibody test confirm the diagnosis," says Shelton. "False negatives are possible if a dog has been given immunosuppressive dosages of corticosteroids for seven to 10 days before testing or is in the end stage of the disease with severe loss of myofibers and fibrosis."

Recognizing Signs of MMM

Owners who recognize these signs of masticatory muscle myositis (MMM) in their dogs should promptly seek veterinary care. The sooner a dog is properly diagnosed and begins treatment, the greater the chance of recovery.

- Inability to open the jaw (trismus)
- Jaw pain
- Swelling or atrophy of the jaw muscles
- Difficulty eating and drinking
- Reluctance to play with toys
- Sunken or protruding eyes

A veterinarian also may use radiographs to evaluate the temporomandibular (TM) joint and advanced imaging techniques to help diagnose MMM. A muscle biopsy is useful to demonstrate the inflammation and determine the severity of muscle fiber loss and the degree of fibrosis, which may help to predict a dog's long-term prognosis and chance for successful therapy.

Dogs in the acute phase of MMM have swollen, painful jaw muscles and trismus, or the inability to open the jaw. Clinical signs vary in severity and rate of onset. Ocular signs occur in 44 percent of dogs and, if severe, can result in stretching of the optic nerve and subsequent blindness.[1] The condition often progresses to the chronic phase, involving muscle atrophy with or without trismus. In some cases, only progressive atrophy of the masticatory muscles is found and an acute phase may not be identified.

"Unfortunately, many owners do not recognize a problem until the chronic phase," Shelton says. "Dogs generally show no other neurological or physical abnormalities, which may help veterinarians differentiate this disease from other causes of trismus."

Masticatory muscle myositis is not the only cause of a dog's inability to open the jaw. In MMM, the inability to open the jaw under anesthesia is a typical finding. However, this also can occur following trauma to the TM joint or chronic arthritic changes in the TM joints that could restrict movement. Infrequent causes of restricted jaw mobility include tetanus, muscular dystrophy or other muscle diseases, and even a foreign body in the mouth. In these cases, the 2M antibody test is negative.

Treatment & Breeding Recommendations

As with Page's Golden Retriever Buddy, an accurate diagnosis and prompt treatment are vital to help a dog regain the ability to open his mouth without pain. Corticosteroids, particularly prednisone, are the cornerstone of therapy, Shelton says. During the acute phase, corticosteroids help to achieve aggressive immunosuppression.

"Immunosuppressive dosages of prednisone should be continued until a dog has maximum jaw function and his CK levels are normal," says Shelton. "At that time, the dosage can be tapered to the lowest every-other-day dosage that prevents clinical signs. Once the lowest alternate dosage is reached that keeps the dog free of clinical signs, the alternate-day therapy should be continued for at least four to six months. In most cases, this low alternate-day dosage should not result in significant side effects. Many dogs require a maintenance dosage throughout their lifetime, though others can eventually discontinue therapy."

Side effects from prednisone include polyuria, or excessive urination; polydipsia, or excessive thirst; and polyphagia, or excessive appetite. Other immunosuppressive drugs, such as azathioprine, can be prescribed if a dog cannot tolerate prednisone.

Dogs that do not receive proper treatment are likely to progress to the chronic phase. "A common problem is dogs receiving an inadequate dosage of corticosteroids for too short of time," Shelton says. "MMM generally responds initially to therapy, but relapses occur quickly if treatment is discontinued prematurely."

"If the disease is diagnosed early and a dog is treated appropriately, the prognosis is good for dogs with MMM," Greenfield says. "In these cases, dogs can usually regain normal jaw mobility and function. If the disease has progressed for a longer period without treatment, the amount of scar tissue formation in the muscles can cause permanent problems."

The prognosis for an individual dog is determined by the degree of fibrosis and how well the dog responds to corticosteroid treatment. Dogs that receive aggressive treatment during the acute phase generally have a good outcome. Because corticosteroids can cause muscle atrophy, progressive atrophy may not necessarily indicate a worsening disease state.

Dogs that relapse may be harder to treat during the subsequent course of treatment, Shelton says. Those that are treated in the chronic phase of the disease have a more uncertain prognosis though they can do well if they do not experience persistent jaw dysfunction.

"It is important that owners realize that though jaw function should improve if treated in the chronic phase, there may be residual fibrosis and muscle atrophy that could be irreversible," explains Shelton.

Regarding breeding recommendations, the Golden Retriever Club of America does not consider MMM to be a high-priority disease to target for reduction. "This is due to the genetic and environmental complexities, the low incidence of the disease, the overall good outcome with appropriate therapy, and importantly, the concern for maintaining as much genetic diversity in the breed as possible," Hovan says.

"Instead, we suggest that breeders include MMM along with other autoimmune diseases, such as hypothyroidism, myasthenia gravis and immune-mediated hemolytic anemia, as one factor when they evaluate the overall pros and cons of each dog for breeding," she says.

"A dog with a parent, littermate or offspring that has any autoimmune disease is at slightly increased risk of also having an autoimmune disease — but not necessarily the same disease," Hovan says. "More important, the majority of dogs with an affected first-degree relative may never be affected themselves."

A recommended breeding strategy if a dog has a close relative with an autoimmune disease is to select a mate that does not have a first-degree relative with an autoimmune disease and to keep the coefficient of inbreeding low. "This helps to reduce the likelihood of both parents having the same MHC genes, which is important because diversity within MHC generally reduces the risk of autoimmune diseases," Hovan explains.

The good news is that breeders can use these breeding principles to help reduce the risk of autoimmune diseases in their puppies without unnecessarily reducing genetic diversity in the breed. Fortunately, with proper diagnosis and treatment, Golden Retrievers that develop MMM can live happy, normal lives. ■

[1] Melmed C, Shelton GD, Bergman R, Barton C. Masticatory Muscle Myositis: Pathogenesis, Diagnosis and Treatment. *Compendium*. 2004:590-605.

Purina appreciates the support of the Golden Retriever Club of America and particularly Rhonda Hovan, the GRCA research facilitator, in helping to identify topics for the *Purina Pro Club Golden Retriever Update* newsletter.

'Sky' Inches Ahead of 'Matisse' in *Pro Plan* Champions Cup Award Standings

A Wire Fox Terrier and a Portuguese Water Dog have been vying for the top spot in the *Pro Plan* Champions Cup Award standings all year long. After flip-flopping in the point totals, GCH AfterAll Painting The Sky ("Sky"), a Wire Fox Terrier, was in the lead through Nov. 30 with 368 points. GCH Claircreek Impression De Matisse ("Matisse"), a Portuguese Water Dog, was in second place with 298 points.

"Sky," a Wire Fox Terrier, is handled by professional handler Gabriel Rangel of Rialto, Calif.

The No. 1 dog in the country, Sky, a 5-year-old female, was bred by A.J. Pertuit Jr. of Central, S.C., and Betty Seaton of Scandia, Minn. Sky is co-owned by Victor Malzoni Jr. of São Paulo, Brazil, and Torie Steele of Malibu, Calif., with Mary and Scott Olund of San Rafael, Calif., and Diane Ryan of Laguna Niguel, Calif.

Matisse, a 2-year-old male, has had a whirlwind career, says owner Milan Lint of New York, who co-owns the current No. 2 dog in the country with Peggy Helming of Flemington, N.J., and breeder Donna Gottdenker of Arthur, Ontario, Canada. The winningest Portuguese Water Dog of all time, Matisse has garnered 94 Bests in Show, 20 Reserve Bests in Show and 140 Working Group Firsts in 2013.

The *Pro Plan* Champions Cup award program is based on points tabulated from Bests in Show and Group placements at more than 200 Purina-sponsored all-breed dog shows in 2013. The winner will receive a $10,000 cash prize, an original oil painting by artist Linda Draper and a keepsake trophy.

The Portuguese Water Dog "Matisse" is handled by professional handler Michael Scott of Chesapeake City, Md.

Cash prizes also will be awarded to the top-placing dogs as follows:

- Second place, $5.000
- Third place, $2,500
- Fourth place, $1,250

To view the point standings and a list of qualifying dog shows, please visit the *Purina Pro Club* website at *purinaproclub.com*.

New *Purina Pro Plan SPORT* Bars Help Fuel Active Dogs

Coming in January 2014, the *Purina Pro Plan SPORT* performance nutrition line is introducing two nutritional supplement bars to help optimize performance nutrition before and after exercise. The *SPORT PRiME* Bar is a pre-exercise protein-rich supplement designed to keep muscles strong during exercise, and the *SPORT ReFUEL* Bar is a post-exercise supplement that helps replenish muscle energy stores and promotes muscle rebuilding. The *PRiME* and *ReFUEL* Bars are available exclusively at pet specialty and farm supply stores. To learn more, visit *proplan.com* or

call 800-PRO-PLAN (800-776-7526) from 7 a.m. to 7 p.m. Central Time Monday through Friday to talk with a pet nutrition consultant.

Purina Pro Club Website Gets a New Look & Is Easier to Navigate

Purina Pro Club recently launched a newly designed contemporary website (*purinaproclub.com*) that is easy to navigate and can be viewed on all types of Internet devices, including personal or desktop computers, tablets and smartphones. A rich Resource Library contains articles on health, genetics, conditioning, and nutrition, as well as archives of past issues of *Today's Breeder* and the *Purina Pro Club Updates*. The highly searchable website includes *Pro Club* membership tools, videos and new features on getting started in breeding, conformation and sporting. A Featured Member section allows members to submit their own photos and stories. The *Pro Club* content is shareable on Facebook, Twitter, Google+ and Pinterest.

Purina-Sponsored Dog Shows*
January to March 2014

Event	Date	Location
Kennel Club of Palm Springs	Jan. 2-5	Indio, CA
Land O' Lakes Cluster	Jan. 3-5	St. Paul, MN
Florida Gulf Coast Cluster	Jan. 9-19	Brooksville, FL
Orange Empire	Jan. 24-27	San Bernardino, CA
Cherokee Rose Cluster	Jan. 30-Feb. 2	Atlanta, GA
Westminster Kennel Club	Feb. 10-11	New York, NY
International Kennel Club of Chicago	Feb. 20-23	Chicago, IL
Fiesta Cluster	Feb. 28-March 3	Scottsdale, AZ
Belle City Cluster	March 1-2	Purina Event Center, Gray Summit, MO
Heart of America Cluster	March 13-16	Kansas City, MO
Tar Heel Cluster	March 19-23	Raleigh, NC
Fort Worth Cluster	March 21-23	Fort Worth, TX
Salt City Cluster	March 27-30	Syracuse, NY

* This table lists some, but not all, upcoming Purina-sponsored dog shows.

Owner Credits Golden Retriever's Success to *Pro Plan* SELECT Grain Free Formula

Purina Pro Plan SELECT Grain Free Formula is the secret to success for GCH Shadowlands Paws for Applause at Tristar, says co-owner Julie Matney of Rocklane Kennels in Kettle Falls, Wash. The 5-year-old bitch, called "Sydney," captured Best of Breed for the second consecutive year in October at the Golden Retriever Club of America National Specialty in Wichita Falls, Texas.

"Sydney" is shown with judge Virginia Lyne, left, and handler Megan Honari.

After her dog struggled with allergies that caused skin and ear problems, Matney discovered the alternative sources of carbohydrates in the *Pro Plan* SELECT Grain Free Formula helped to reduce the dog's sensitivities. Matney, a professional groomer, was so impressed with the food that she now recommends it to others based on her own success.

A picky eater, Sydney had turned up her nose at other grain-free foods, but when Matney started feeding *Pro Plan* SELECT Grain Free in June, the dog readily ate it, she says. Sydney's co-owner Sharmin Dominke also feeds *Pro Plan* SELECT Grain Free when the dog is with her in Redmond, Wash.

Instead of traditional carbohydrate sources, such as grains or soy, *Pro Plan* SELECT Grain Free Formula contains cassava root flour, which comes from the tuberous root of the tropical cassava plant. Cassava root flour and pea starch provide the fuel dogs need for energy in this super-premium formula.

Made with chicken as the No. 1 ingredient, the Grain Free Formula has an optimal blend of ingredients to provide 26 percent protein. Along with being rich in antioxidants to help promote a healthy immune system, the Grain Free Formula contains omega-6 fatty acids and zinc to help nourish skin and promote a healthy coat.

Purina Pro Plan SELECT Grain Free is also available in wet formulas: Adult Chicken & Carrots Entrée Classic, Adult Turkey & Sweet Potato Entrée Classic, and Adult Beef & Peas Entrée Classic.

Purina Pro Plan is sold exclusively at pet specialty and farm supply stores. For more information, visit *proplan.com* or to talk with a pet nutrition consultant, call 800-PRO-PLAN (800-776-7526) from 7 a.m. to 7 p.m. Central Time Monday through Friday.

Want to Reach the Editor?

Have comments about the *Purina Pro Club Update*? Send them to us at: *Purina Pro Club Update*, c/o Editor, Nestlé Purina PetCare, 2T Checkerboard Square, St. Louis, MO 63164 or via email at *today'sbreeder@purina.com.*

Purina-Sponsored Sporting Events*
January to March 2014

Event	Date	Location
Grand American Nite Hunt and Bench Show	Jan 2-4	Orangeburg, SC
National Shooting Dog Championship	Jan. 10	Union Springs, AL
Midwest Beagle Gundog Federation All-Age Runoff	Jan. 10-12	Jackson, OH
National Bird Hunters Association Mid-South Regional Championship	Jan. 10-12	Oneonta, AL
Florida All-Age Championship	Jan. 12	Lake City, FL
United Kennel Club Winter Classic (Coonhound)	Jan 24-25	Batesville, MS
National Bird Hunters Association Free-for-All Championship	Feb. 7-9	Mayflower, AR
Southeastern Treeing Walker Days	Feb. 20-22	Salisbury, NC
Deep South Beagle Gundog Federation All Age Runoff	Feb. 28-March 1	Pontotoc, MS
U.S. Open Brittany Championship	March 4-8	Ardmore, OK
National Bird Hunters Association National Open Championship	March 11-16	Patrick, SC

* This table lists some, but not all, upcoming Purina-sponsored sporting events.

PURINA Pro Club Golden Retriever Update

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