

## Prolotherapy for Pain

Got prolotherapy? In the future, you may. Prolotherapy entails injecting proliferative agents near ligaments and tendons to promote articular stability. Convincing research evidence appearing in peer-reviewed human journals may help prolotherapy enter the mainstream, increasing the number of non-surgical options for joint pain and dysfunction. Although a limited number of veterinarians currently practice the technique, courses are popping up to meet growing demand.

Prolotherapy research investigating ligament proliferation in rabbits has demonstrated changes in biochemical, histologic, and tensile properties of ligaments injected with sclerosing agents. Rigorous, controlled, clinical trials on veterinary patients receiving prolotherapy do not exist. However, human studies show that prolotherapy reduces pain, swelling, and improves range of motion in patients with osteoarthritis. Other promising conditions examined include low back pain, neck pain, cervical headaches, and thoracic pain.

Ligaments loosen with age, trauma, and chronic biomechanical strains. When joint structures move excessively, they strain associated neural elements, irritating them and activating nociceptors, ultimately causing pain and compromised joint mechanics. Prolotherapists strengthen lax joint structures (ligaments, joint capsules, and tendons) by injecting irritating, sclerosing, or proliferative substances directly to these sites. Prolotherapy “cocktails” generally fall into one of three categories: irritants, osmotics, and chemotactic agents. Irritants and chemotactic agents cause local inflammation, then fibrosis and joint tightening. Hyperosmotic dextrose (d-glucose) fosters release of growth factors in cells such as tenocytes and fibroblasts, which help grow and repair structural tissue. As research on human mesangial (glomerular) cells indicates, elevation of extracellular glucose to as little as 0.5% raises growth factor levels and promotes fibrosis. In kidneys of diabetic patients, this causes detrimental conditions such as progressive glomerular sclerosis. However, the same fibrogenic reaction to elevated extracellular glucose concentrations can help restore joint integrity in hypermobile arthrodial structures, including spinal facets. Some practitioners are even using autologous blood injections as prolotherapy agents, since blood contains endogenous growth factors and can lead to fibrosis and/or tissue repair.

Expertise in isolating lax structures and avoiding neural or vascular tissue requires in-depth anatomical knowledge of the injected site, palpatory feedback providing certainty that the needle is in the right location, and experience gained through apprenticeship with a qualified instructor. One of the rare instructors in veterinary prolotherapy, Dr. Roger L. DeHaan from North Carolina, says that over a twelve year period, he has “had an exciting 85%-95% response from good to excellent”. Dr. DeHaan’s “Prolo Cocktail” contains 25% of each of the following substances: 50% dextrose, 2% lidocaine or procaine (without epinephrine),

vitamin B12 (1000mcg/ml), and Biosode (“a homeopathic with growth and Krebs cycle energy factors”).

A 2005 review article in *The Spine Journal* concluded that while results from clinical research indicate that prolotherapy may effectively reduce spinal pain, these studies demonstrate that wide variation exists in injection and treatment protocols, precluding definite conclusions. They suggest that future research should closely examine those solutions and protocols most commonly employed, in order to determine which patients, if any, can truly benefit from the treatment.

What, then, is the right injection regimen for veterinary patients, in terms of solution contents, volume, and frequency? Only more research can provide definitive guidance. Ten percent solutions of dextrose, injected into human osteoarthritic knees provides, significant improvement in lateral patellofemoral cartilage thickness, generating questions about whether intraarticular dextrose injection modulates chondrogenesis. Ten percent dextrose also improves anterior cruciate ligament (ACL) laxity, as shown in a 2000 randomized, prospective, double-blind, placebo-controlled study in *Alternative Therapies*, though the authors claim that, in their experience, twenty-five percent dextrose offers superior benefits.

How risky is prolotherapy? According to a 2004 review article in the *American Journal of Physical Medicine & Rehabilitation*, the most common adverse reaction was pain at the injection site. Anecdotal reports indicate that some patients have suffered ruptured ligaments. However, severe reactions include paralysis (after inadvertent subarachnoid injection of sclerosing solution), and death. The handful of reports documenting catastrophic reactions mostly occurred in the early 1960's, following the treatment's popularity for low back pain that burgeoned in the 1950s. In retrospect, these cases likely resulted when inexperienced physicians dabbled with excessively irritating and untested solutions.

Other questions remain. For example, in comparison to prolotherapy, what is the effect of dry needling, which involves introducing either a hypodermic or acupuncture needle into the site? What are the relative contributions from each of the chemicals concomitantly contained in a “cocktail” (e.g., local anesthetics, corticosteroids, saline, or hypotonic solutions)? It is possible that back pain emanating from zygapophyseal joint nociceptors could respond to neurolysis or local anesthetic blockade of nociceptive fibers innervating the joint, rather than, or in addition to, joint stabilization. Further, dry needling performed during electromyography can improve cervical myofascial pain, as a sort of trigger point therapy. Studies currently underway comparing prolotherapy to trigger point treatments may answer lingering questions over whether the process of needling, or the sclerosing substance itself, impart the more beneficial effects.

What adjunctive treatments should, or should not, accompany prolotherapy? Should injected patients be instructed to eschew manipulative therapy, at least for the six to eight weeks required for the new tissue to mature? When is it appropriate to re-institute pain medications such as non-steroidal anti-inflammatory medication, so as not to interfere with the proliferative process? Once again, future research answering questions such as these will help determine which patients, if any, will most likely derive benefit from prolotherapy.