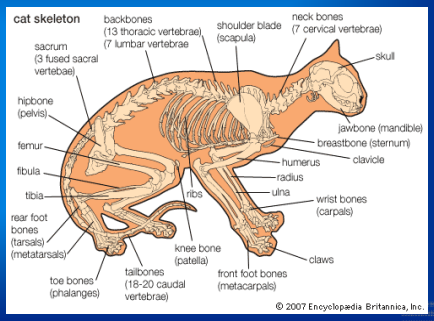
Joint Disease and Arthritis in Dogs and Cats

Steve McBride, DVM
Cascade Hospital for Animals

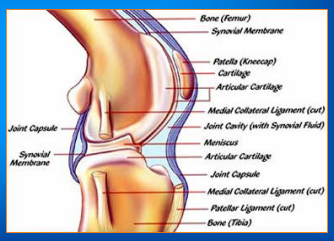
Lecture Outline

- Joint terminology—what do you call that joint?
- Joint anatomy and physiology—how they are supposed to work
- Osteoarthrosis (degenerative joint disease or arthritis)—what happens to a good joint gone bad
- Managing osteoarthrosis—we can't cure it, but we can control it

Anatomy



Joint Anatomy



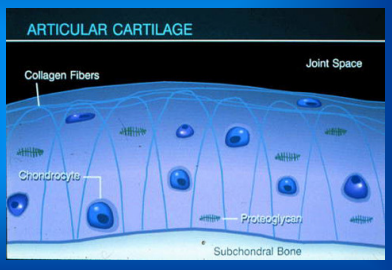
Articular Cartilage

- Three basic components:
  - Water (approximately 80% in healthy cartilage)
  - Matrix
  - Chondrocytes
- Absent:
  - Nerves
  - Blood vessels
  - Lymphatics

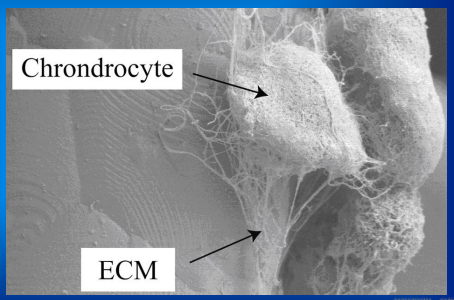
Articular Cartilage

- Chondrocytes—cells within cartilage that are responsible for making and remodeling the cartilage matrix; the "living" part of cartilage. These cells are fairly quiescent in healthy cartilage.
- Collagen fibers—provide structure to cartilage and contribute to its strength and tensile strength
- Proteoglycans—large biomolecules trapped by the collagen fibers that play a role in the water content of the cartilage matrix, which affects compressibility of cartilage

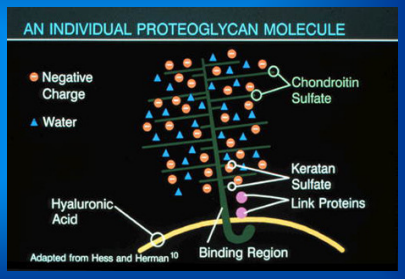
Components of Articular Cartilage



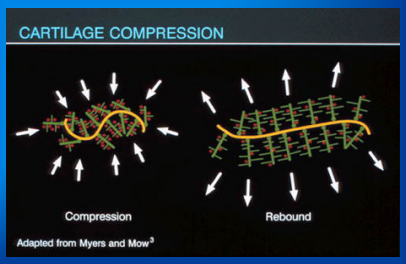
Chondrocytes



Proteoglycans



Proteoglycans and Cartilage Compressibility



Healthy Cartilage

- Homeostasis
  - Balance of cartilage degradation and synthesis
  - The chondrocytes are able to keep up with ongoing wear and tear in the joint
- Function
  - Shock absorption
  - Smooth surface with slippery joint fluid = lubricated joint for easy motion

Causes of joint damage

- Congenital (generalized or localized conformational defects of the limbs)
  - Achondroplasia (Dachshund, Basset Hound)
  - Bowleggedness
  - Straight hocks
- Developmental
  - Osteocondrosis dessicans (OCD)
  - Abnormal development of joints (hip dysplasia, congenital elbow luxations)

Causes of joint disease (con't)

- Failure of ossification centers to fuse (ununited anconeal process)
- Premature epiphyseal (growth plate) closure resulting in asynchronous growth of bones (radius curvus)
- Miscellaneous conditions (patellar luxation)

- Acquired
  - Damage to articular surfaces
    - Post-traumatic (fractures of articular surfaces, unusual shoulder stress in sled-pulling huskies)
    - Inflammatory joint disease (rheumatoid arthritis, Lyme)

Causes of joint disease (con't)

- Damage to supporting structures of joints (tendons, ligaments, menisci)
- Aseptic necrosis (Legg-Calve-Perthes disease of femoral head)
- Neuropathies (abnormal range of motion resulting from abnormal pain and loss of proprioception)

- Primary degenerative joint disease (degeneration of cartilage in elderly individuals occurring for no known reason other than the wear and tear that comes with aging)

Most common joint diseases

- Osteochondrosis dessicans (OCD)
  - Elbow dysplasia
  - Shoulder OCD
- Cruciate ligament disease (ruptured cranial cruciate ligament)
- Hip dysplasia
- Patellar luxation

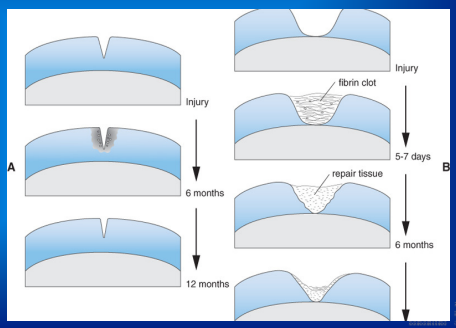
Osteoarthritis

- Fibrillation (cracking) occurs in the surface of the articular cartilage, exposing the underlying chondrocytes and matrix.
- Some of these chondrocytes degenerate; others become active, reproducing and secreting substances that attempt to heal the cartilage defect.
- The matrix loses some of its elasticity, leaving the cartilage more prone to additional insults

Osteoarthritis

- Small traumas are healed, BUT
- Larger traumas, or repeated traumas continue to expose more underlying cartilage.
- Chondrocyte function alters to produce cells that act more like cells in growth plates
- Matrix continues to degenerate
- Underlying bone can become exposed → PAIN

Cartilage damage



Osteoarthritis

- The new "hyperactive" chondrocytes may cause calcification in the joint.
- The inflammatory process causes the joint capsule to thicken and osteophytes (bone spurs) to form.
- Pain, joint thickening and joint swelling limit range of motion.
- Inactivity (from pain) and limited range of motion lead to muscle atrophy.

Normal hips

Canine hip dysplasia

Osteoarthritis, clinical signs

- Change in gait/signs of stiffness
- Reluctance to perform usual activities/play/inappropriate eliminations
- Difficulty getting up or lying down
- Reduced range of motion
- Intermittent lameness
- Pain and/or joint laxity
- Muscle atrophy
- Joint capsule thickening or distension

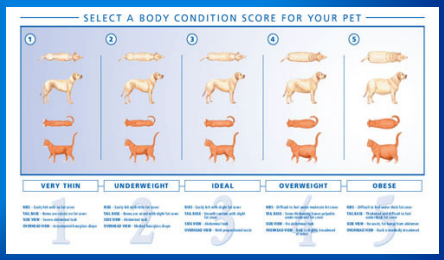
Osteoarthritis, treatment

- Arthritis is MANAGED, not CURED
- Multimodal approach is best
  - No single therapy works 100%
  - By using multiple therapies, the side effects of any single therapy can be reduced.

Osteoarthritis, treatment

- Lifestyle management
  - Weight control
  - Exercise
- Nutritional supplements/nutraceuticals
- Physical therapy/laser therapy/acupuncture
- Pharmaceuticals
- Surgery
- Stem cell therapy

Body Condition Score



Obesity

- Extra weight increases stress on damaged joints
- Fat tissue increases inflammation in the body
- Ideal body condition score for arthritic patients: 2.5 / 5
- Weight management complicated
  - Exercise intolerance
  - Older patients may be more "set in their way" and therefore, difficult to change diet
  - Drug-induced appetite changes

Obesity, management

- General principle: decrease caloric intake below expenditures.
- Dogs: low calorie, high fiber diet (w/d, r/d)
- Cats:
  - Low calorie, high fiber (w/d, r/d)
  - High protein (canned may be better) (m/d)
- Exercise: regular, low impact
  - Appropriate pain control may be needed
  - Avoid weekend warrior syndrome

NO!

NO!

Exercise, benefits

- Weight control
- Muscle mass maintenance
- Improved joint function—range of motion
- Maintain cartilage health by improving joint fluid circulation

Nutritional supplements

- Omega-3 fatty acids
- Glucosamine
- Chondroitin sulfate

Omega-3 fatty acids

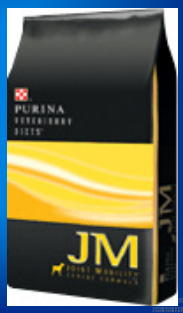
- Found in fatty fish
- Eicosapentaenoic acid (EPA) competes with arachidonic acid in the inflammatory mediator pathway, reducing inflammation
- Expect to see results in one month, with peak at 3-4 months
- How to supplement:
  - Foods specifically supplemented with omega-3 fatty acids
  - Supplements: veterinary or human formulations

Hill's j/d (canine)

- Rich in EPA
- Controlled calorie content and added L-carnitine help maintain a healthy weight
- Lower protein may be suited to renal disease patients

Purina JM

- High EPA content
- Moderate fat content
- High levels of antioxidant vitamins E and C
- High protein:calorie ratio
- Natural source of glucosamine



Glyco Flex ®

- Vetri-science product—independently tested by National Animal Supplement Council
- Glucosamine, chondroitin sulfate supplement

Physical therapy

- Goal is to increase joint movement, range of motion, muscle stimulation
- Muscle massage
- Passive range of motion exercises
- Sit-stand exercises
- Stair climbing
- Walking over obstacles (ladder)
- Swimming

Companion Therapy Laser

- Laser energy penetrates tissues to stimulate healing of tissues.
- Effective for both acute injuries and chronic conditions

Pharmaceuticals

- Non-steroidal anti-inflammatory (NSAIDs) medications
  - Reduce inflammation
  - Rimadyl, Deramaxx, Previcox, Metacam, (aspirin?)
- Analgesics (pain medications)
  - Tramadol, Gabapentin, Buprenex
- Corticosteroids
- Adequan—injectible polysulfated glycosaminoglycan

Adequan ®

- Binds to matrix components
- Protects against further degradation
- Stimulates chondrocytes and synoviocytes to improve cartilage and joint fluid environment

Surgery

- Stabilize unstable joints (cruciate disease, luxating patella)
- Remove source of pain (femoral head and neck excision arthroplasty—FHO)

Surgery

- Remove cartilage or bone fragments floating in joint
- Artificial joints (hips, elbows)

Stem cell therapy

Vet-Stem
Regenerative Veterinary Medicine

- Cutting-edge technology
- Patient's own fat cells are used to harvest stem cells
- Stem cells are grown in cell culture, then injected into diseased joints to stimulate healing

Joint Disease and Arthritis

Questions?