Comparative medicine is a major focus area for funding agencies, regulatory bodies, and industry. Similarly, translational research using animal models is critical for ensuring safety and efficacy of novel diagnostic and therapeutic modalities. Certainly, orthopaedics in general, and the stifle or knee, specifically, are topics of great interest and importance on the comparative and translational medicine landscape. As such, it is important for us as veterinary surgeons to understand the similarities and differences among the human, equine and canine stifle with respect to anatomy, pathology, diagnosis, and treatment. Most importantly, sharing knowledge across species will allow each discipline to progress more efficiently in optimizing clinical strategies for managing patients most appropriately. This presentation will address the comparative anatomy, biomechanics, related pathology, and clinical approaches to diagnosis and treatment for disorders of the human knee, equine stifle, and canine stifle.

The anatomy of the canine stifle is closely matched to the human knee. Both macroscopic and microscopic anatomy are similar, apart from size. The canine stifle has communicating medial and lateral femorotibial compartments and a patellofemoral compartment, as does man. The cranial (anterior) and caudal (posterior) cruciate ligaments, menisci, meniscal ligaments, fat pad, and patellar ligaments match the human in form and function very closely. The only major gross anatomical differences are that the dog has an intra-articular long digital extensor tendon, which crosses the joint in the cranio-lateral compartment, and that the dog has lateral and medial fabella (sesamoids) in the heads of the gastrocnemius muscle, as well as a popliteal sesamoid. Biomechanically, there are differences with respect to amount of load transmission, relative joint congruency and laxity, range of motion, weight bearing angle, tibial slope, and tibial thrust. Histologically and biochemically, articular cartilage, subchondral bone, synovium, joint capsule, and menisci are very well conserved between these two species. Importantly, spontaneously occurring clinical problems in terms of anterior cruciate ligament deficiency, meniscal pathology, osteochondrosis, and trauma are comparable in all facets between man and dog. These similarities in conjunction with postoperative management capabilities are major advantages in using dogs for translational research.

The anatomy of the equine stifle is quite different from the human knee. The horse has three patellar ligaments and the joint has medial and lateral femorotibial compartments and a femoropatellar compartment, which are separated from each other by synovial membranes. The separation of compartments in conjunction with the very large intercondylar eminences (spines) of the tibia limit surgical access to the intra-articular structures via open and arthroscopic approaches. Cartilage defects, OCD, and meniscal tears are frequently diagnosed and treated in horses, while cranial cruciate ligament tears are rarely seen. The comparative advantages for using horses in translational research include the size of the joint, the thickness of the articular cartilage, and the biomechanical forces that the joint is subjected to, especially during athletic activities.