

2021 PSBR High School Essay Contest
Finalist

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Girls soccer has the highest number of ACL tears at the high school level. After playing soccer for 12 years, my teammates and I have experienced injury after injury. I've had countless close friends face life changing ACL injuries. These injuries are completely disheartening to an athlete, and many never return to play after facing a serious tear of the ACL. The reconstruction procedure can be intimidating, recovery is long, and a serious injury such as this causes much stress and is just as much a mental battle as it is physical. However, biomedical research and animal models have played a prominent role in developing new ways to make the process of surgery more efficient and recovery less challenging.

Many trials regarding the reconstruction of the anterior cruciate ligament, better known as the ACL, use large animal models such as dogs, goats, sheep, and pigs. These models provide the most similarities to human ACLs. There have previously been entire studies dedicated to finding the best animal model to use in ACL reconstruction experimentation. For example, *Frontiers in Veterinary Science* published a journal regarding this topic. In the study, specialists looked at characteristics of the human ACL including the way the ligament attaches to the tibia, the angle of the uppermost part of the tibia, and the width of that same part of the bone, which is known as the tibial plateau. These observations and measurements, as well as imaging of each model's ACL, were compared to each other and the study concluded that goats and pigs make promising models for research on human ACL surgeries. This journal, as well as similar comparisons and experiments, can be beneficial to future studies by giving scientists the most appropriate models to use when experimenting with different methods of reconstruction.

Amongst the most common treatments for ACL injury repairs are tendon grafts. Tendon grafts involve taking tissue from another area and using it to bridge the gap that the tear created. Typically, grafts are taken from the patellar tendon or the hamstring in order to repair a torn ACL. In a study conducted on sheep, thirty-eight models underwent ACL reconstruction in the right knee using a semitendinosus autograft. The semitendinosus is a muscle located in the thigh. Afterwards, data was collected during the sheep's recovery. The researchers made observations at 2, 6, 12, 24, and 56, weeks after the procedure. Because of the significant decrease of necrotic tissue, meaning tissue with dead cells, the conclusion was able to be made that patients who received this procedure should avoid strenuous activities for a minimum of 12 weeks after the surgery. This trial illustrates the importance of this type of testing in animal models and shows that information collected in studies can easily be applied to human procedures.

An advancement studied by *Annals of Joints* shows an alternative to the more typical treatments of ACL injuries. In a study conducted in November of 2017, scientists tested the use

of stem cells to repair such injuries. Because stem cells have the potential to develop into any type of cell, they are optimal for injuries such as tears so that they can regenerate the torn tissue. This study specifically mentions the use of bone mesenchymal stem cells and adipose-derived stem cells. Rabbit and rat models are tested by having mesenchymal stem cells injected into the injured ligament to observe the effectiveness of healing and analyzing the recovery. The journal concludes that this method of ACL repair is potentially exceedingly beneficial and prevents the negative effects of the means of ACL reconstruction. This procedure is already being applied in the medical field and is used on applicable patients, but professionals would not be so confident in its effectiveness without the application of animal studies.

As a final observation, it can be concluded that biomedical research involving animals is essential to improving many of the medical procedures that are used to correct injuries, as well as collecting more information about processes such as recovery and returning to play after activities. After seeing my close friends and teammates go through burdensome injuries, it is apparent there are ways to continue to better existing ACL reconstruction methods that are commonly used, as the process is evidently demanding and extensive. Additionally, research allows for the development of new solutions to the injury. Biomedical experimentation is the answer to many of the problems that are encountered often and affect the people we know and love the most.

Works Cited

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