**Results**

General observations: The euthymic rats that underwent nerve repair with human acellular allograft performed poorly in physical measures and histomorphometric analysis compared to other groups. Although human acellular nerve allograft is a promising replacement, rodent nerve sections showed nerve fascicles that were well-developed with mature, well-formed endoneurial microstructure. Euthymic experimental limbs uniformly demonstrated smaller nerve fascicles, many of which were malformed and hemorrhagic.

Gross specimens from athymic nerve sections showed nerve fascicles that were well-developed with mature epineurium. Euthymic experimental limbs uniformly demonstrated smaller nerve fascicles, many of which were malformed and hemorrhagic.

Axon count of athymics was 1593 ± 741 and 667 ± 384 for euthymics. Control limbs of athymic rats generally demonstrated patchy regeneration of small, poorly myelinated axons. Nerves from contralateral control limbs of both athymic and euthymic rats demonstrated similar histology on light microscopy.

**Materials and methods**

Fifteen athymic nude and 15 Sprague-Dawley rats underwent unilateral excision and repair of a 10mm tibial nerve segment using 10mm of human acellular nerve graft. At 3 months, the rats underwent testing. The gastrocnemius and distal tendon were dissected away from surrounding tissue and attached to a clamp while exposing the proximal neurovascular pedicle. Tetanic contractions were stimulated using a bipolar electrode applied to the proximal tibial nerve (5V, 1.5sec, 70Hz) and implanted nerve graft and contralateral control nerves were excised and histologic specimens prepared from the middle of the grafts. The specimens were stained with toluidine blue to allow for axon counting, measurements, and myelin quantification. Bilateral gastrocnemius muscles were harvested and weighed, and the rats were euthanized.

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**Conclusions**

The immunocompromised state of the athymic rat seemed to support more successful nerve regeneration through processed acellular human nerve tissue implanted as nerve xenograft when compared to similar tissue implanted into euthymic or immunocompetent rats. Gross inspection of the human nerve following implantation into euthymic rats demonstrated central necrosis consistent with immune rejection not seen either grossly or histologically with the athymic rats. Additionally, axon counts, axon caliber, and reinnervated muscle weights all indicated superior axon regeneration in the athymic rats.

Our study confirms the previous notion that xenograft rejection is a hindrance to using human xenograft in a rodent model. The capability to directly test commercially available human acellular nerve grafts in a relatively easy-to-use rodent model would advance our understanding of these nerve grafts and help optimize their use in humans. The use of an athymic nude rat model appears to be a promising tool that warrants further investigation.