A bioreactor refers to any manufactured device or system that supports a biologically active environment. In one case, a bioreactor is a vessel in which a chemical process is carried out which involves organisms or biochemically active substances derived from such organisms.

Maggiore et al. developed tissue engineered nerve grafts (TENGs) featuring long, aligned axonal tracts from Dorsal root ganglion (DRG) neurons that are fabricated in custom bioreactors using the process of axon “stretch-growth”. They have shown that TENGs effectively serve as “living scaffolds” to promote regeneration across segmental nerve defects by exploiting the newfound mechanism of axon-facilitated axon regeneration, or “AFAR”, by simultaneously providing haptic and neurotrophic support. To extend this work, the current study investigated the efficacy of living versus non-living regenerative scaffolds in preserving host sensory and motor neuronal health following nerve repair. Rats were assigned across five groups: naïve, or repair using autograft, nerve guidance tube (NGT) with collagen, NGT + non-aligned DRG populations in collagen, or TENGs. We found that TENG repairs yielded equivalent regenerative capacity as autograft repairs based on preserved health of host spinal cord motor neurons and acute Axon regeneration, whereas NGT repairs or DRG neurons within an NGT exhibited reduced motor neuron preservation and diminished regenerative capacity. These acute regenerative benefits ultimately resulted in enhanced levels of functional recovery in animals receiving TENGs, at levels matching those attained by autografts. The findings indicate that TENGs may preserve host spinal cord motor neuron health and regenerative capacity without sacrificing an otherwise uninjured nerve (as in the case of the autograft), and therefore represent a promising alternative strategy for neurosurgical repair following Peripheral nerve injury (PNI) [1].

1)
Maggiore JC, Burrell JC, Browne KD, Katiyar KS, Laimo FA, Ali ZS, Kaplan HM, Rosen JM, Cullen DK. Tissue Engineered Axon-Based “Living Scaffolds” Promote Survival of Spinal Cord Motor Neurons Following Peripheral Nerve Repair. J Tissue Eng Regen Med. 2020 Oct 13. doi: 10.1002/term.3145. Epub ahead of print. PMID: 33049797.