Human Skeletal Muscle-Derived Cells:
## Applications in Tissue Engineering

Cook MyoSite offers single-donor primary human skeletal muscle cells (skMDC™) characterized by age, gender, race, and BMI with optimized media (MyoTonic™, CryoTonic™) to make cell culture growth, differentiation, and cryopreservation as reliable as possible in your lab. We offer cells from healthy donors and donors with a range of medical, neuromuscular, and other conditions.

Cook MyoSite skMDC are isolated and processed using only the highest quality materials, and as such are considered the highest quality muscle cells for use in research applications by scientists around the globe. See below for a few recent examples of researchers that have used skMDC to acheive noteworthy and reliable results in their laboratories.

A single vial of skMDC SK-1111 Human Skeletal Muscle-Derived Cells.

Researchers at Carnegie Mellon University in Pittsburgh used decellularized green-onion scaffolds as a substrate to grow aligned myotubes *in vitro*. Cook MyoSite skMDCs were grown in MyoTonic Growth Medium and seeded onto scaffolds from the white, bulbous portion of a green onion and formed a highly confluent, uniform monolayer of aligned muscle cells. This finding identifies a new, low-cost and easily-accessible way to engineer highly confluent monolayers of muscle cells for use in tissue engineering applications.
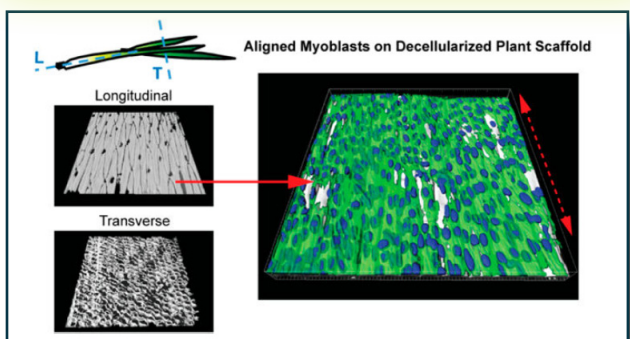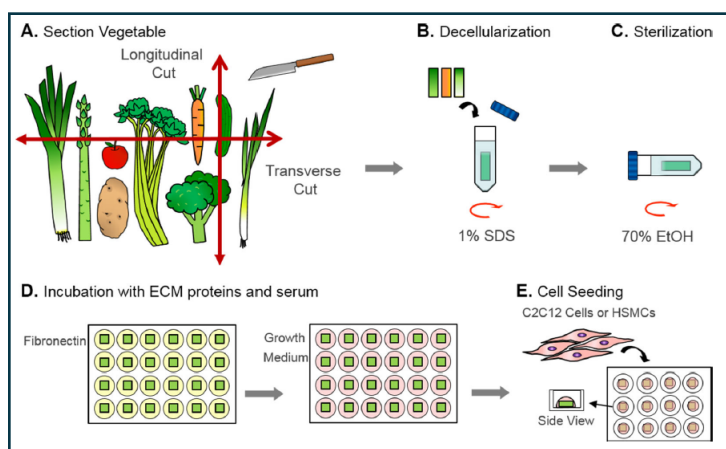
Cheng YW, Shiwarski DJ, Ball RL, Whitehead KA, Feinberg AW. Engineering Aligned Skeletal Muscle Tissue Using Decellularized Plant-Derived Scaffolds. ACS Biomater Sci Eng. 2020 May 11;6(5):3046-3054. doi: 10.1021/acsbiomaterials.0c00058.

"Here, we assessed the potential for a variety of decellularized plant scaffolds to promote mouse and human muscle cell alignment and differentiation. After decellularizing a range of fruits and vegetables, we identified the green-onion scaffold to have appropriate surface topography for generating highly confluent and aligned C2C12 and human skeletal muscle cells (HSMCs)."

Swiss researchers recently improved their bioprinting system to allow for on-demand printing of 3D skeletal muscle microphysiological systems (MPS). The models consist of Cook MyoSite skMDCs suspended in liquid Matrigel and displayed the ability to differentiate into "aligned, striated and uniformly 3D dispersed myofibers". Unlike 2D models, these models can be used to test the effects of potential drugs on core muscle functions like contractility or fatigue.
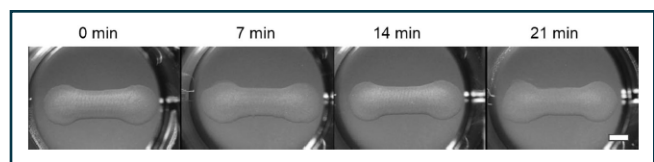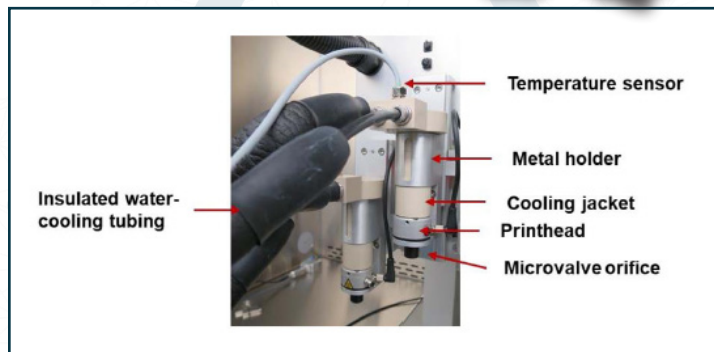
Macroscopic images of dumbbell-shaped Matrigel/cell models directly after printing at different time points of the printing process in 24-well plates on agarose substrates. Scale bar 2 mm.

Alave Reyes-Furrer, A., De Andrade, S., Bachmann, D. et al. Matrigel 3D bioprinting of contractile human skeletal muscle models recapitulating exercise and pharmacological responses. Commun Biol 4, 1183 (2021). https://doi.org/10.1038/s42003-021-02691-0

"...[We] adapted our recently described 24-well plate 3D bioprinting platform with a printhead cooling system to allow microvalve-based drop-on-demand printing of cell-laden Matrigel containing primary human muscle precursor cells. Mini skeletal muscle models develop within a week exhibiting contractile, striated myofibers aligned between two attachment posts. [...] In summary, these data demonstrate differentiation of 3D bioprinted Matrigel/skeletal muscle cell models into structural and functional myofibers with contractile properties."

A group of British researchers published a paper in 2023 detailing a new method for evaluating the therapeutic potency of muscle cell populations using live cell imaging. Using Cook MyoSite skMDCs, the researchers were able to correlate certain cell-shape characteristics with myogenicity. Their findings indicate a potentially useful method for evaluating the potency of autologous cell-based products before they are implanted into patients.

Desprez C, Danovi D, Knowles CH, Day RM. Cell shape characteristics of human skeletal muscle cells as a predictor of myogenic competency: A new paradigm towards precision cell therapy. J Tissue Eng. 2023 Mar 16;14:20417314221139794.

"Predicting the therapeutic potency of [skeletal muscle-derived cells (SMDC)] in vitro prior to implantation is key to developing successful therapeutics in regenerative medicine and reducing implementation costs. Here, we report on the development of a novel SMDC profiling tool to examine populations of cells in vitro derived from different donors. We developed an image-based pipeline to quantify morphological features and extracted cell shape descriptors. [...] The information extracted with our approach indicates live cell imaging can detect a range of cell phenotypes based on cell-shape alone and preserving cell integrity could be used to predict propensity to form myotubes in vitro and functional tissue in vivo."