CLAIMS

1. A method of culturing cells, comprising:

(a) providing ventral spinal neuron progenitor cells and a dual channel microfluidic device comprising a first channel and a second channel;

(b) seeding the ventral spinal neuron progenitor cells within the first channel; and

(c) culturing the seeded cells such that the cultured cells express a marker of spinal motor neurons.

2. A method according to Claim 1, in which the marker is selected from a list consisting of SMI32, nuclear marker islet1 (ISL1), Beta 3 tubulin (TUBB3), NKX6.1, neurofilament marker microtubule-associated protein 2 (MAP2), and synaptic marker synaptophysin (SYNP).

3. A method according to Claim 1, in which the first channel comprises an open region.

4. A method according to Claim 1, in which the dual channel microfluidic device further comprises a first chamber, the first chamber fluidically coupled to the first channel.

5. A method according to Claim 1, in which the dual channel microfluidic device comprises a second chamber, the second chamber fluidically coupled to the second channel.

6. A method according to Claim 1, in which the ventral spinal neuron progenitor cells are seeded within at least a portion of the first channel are disposed within a gel or gel-precursor.

7. A method according to Claim 1, in which the ventral spinal neuron progenitor cells are seeded on top of a gel present within a portion of the first channel.

8. A method according to Claim 1, in which the ventral spinal neuron progenitor cells are derived from induced pluripotent stem-cells.

9. A method according to Claim 1, in which the ventral spinal neuron progenitor cells are derived from embryonic stem-cells.

10. A method according to Claim 1, further comprising seeding glial cells within the first channel.

11. A method according to Claim 13, in which glial cells comprise one or more cell types selected from the list comprising astrocytes, oligodendrocytes, ependymal cells, Schwann cells, microglia, and satellite cells.

12. A method according to Claim 1, in which the culturing comprises culture media.

13. A method according to Claim 1, in which the culturing comprises blood or at least one blood component.

14. A method according to Claim 8, in which the induced pluripotent stem cells, prior to step (a), are differentiated to neural ectoderm.

15. A method according to Claim 14, in which the neural ectoderm cells, prior to step (a), are exposed to retinoic acid and sonic hedgehog agonist to pattern said ventral spinal neural progenitor cells.

16. A method according to Claim 1, in which the ventral spinal neural progenitor cells were frozen, banked, and thawed before step (b).