

Module 4 – SCI Biology Part I: How an SCI Causes Loss of Function

How Neurons Transmit Signals

Neurons transmit information to each other through a combination of chemical and electrical signals. Here is how it works.

Neurons sit close to each other but not touching, leaving a small space between the axon terminal of one neuron and the dendrite of another. This space is called the synapse.

One neuron sends chemical messengers called neurotransmitters into the synapse, and the neurotransmitters bind to receptors on the surface of the next neuron's dendrites.

Dozens of different neurotransmitters have been identified, and more are being discovered all the time. Each different type of neurotransmitter has its own chemical structure, which determines what signal the neurotransmitter sends. To generate a signal, a specific neurotransmitter must bind to a specific receptor on the surface of the dendrites, like a key fitting into a lock.

Scientists estimate that a single neuron can receive signals from 10,000 other neurons at the dendrites and transmit signals to 10,000 other neurons at the axon terminal. To accomplish even simple tasks, billions of neurons work together, signaling in a circuit, which forms a coordinated neural network.

Neural networks begin to form before we are born. They become highly developed in the first five years of life as we learn to stand, walk, talk, control our bladder and bowels, and so on. These neural networks are a form of memory, learning from practice and repetition until they can perform numerous complex actions effortlessly.

One area of SCI research, which we will look at in the Neuroplasticity Module, is investigating how to retrain neural networks to restore function.