

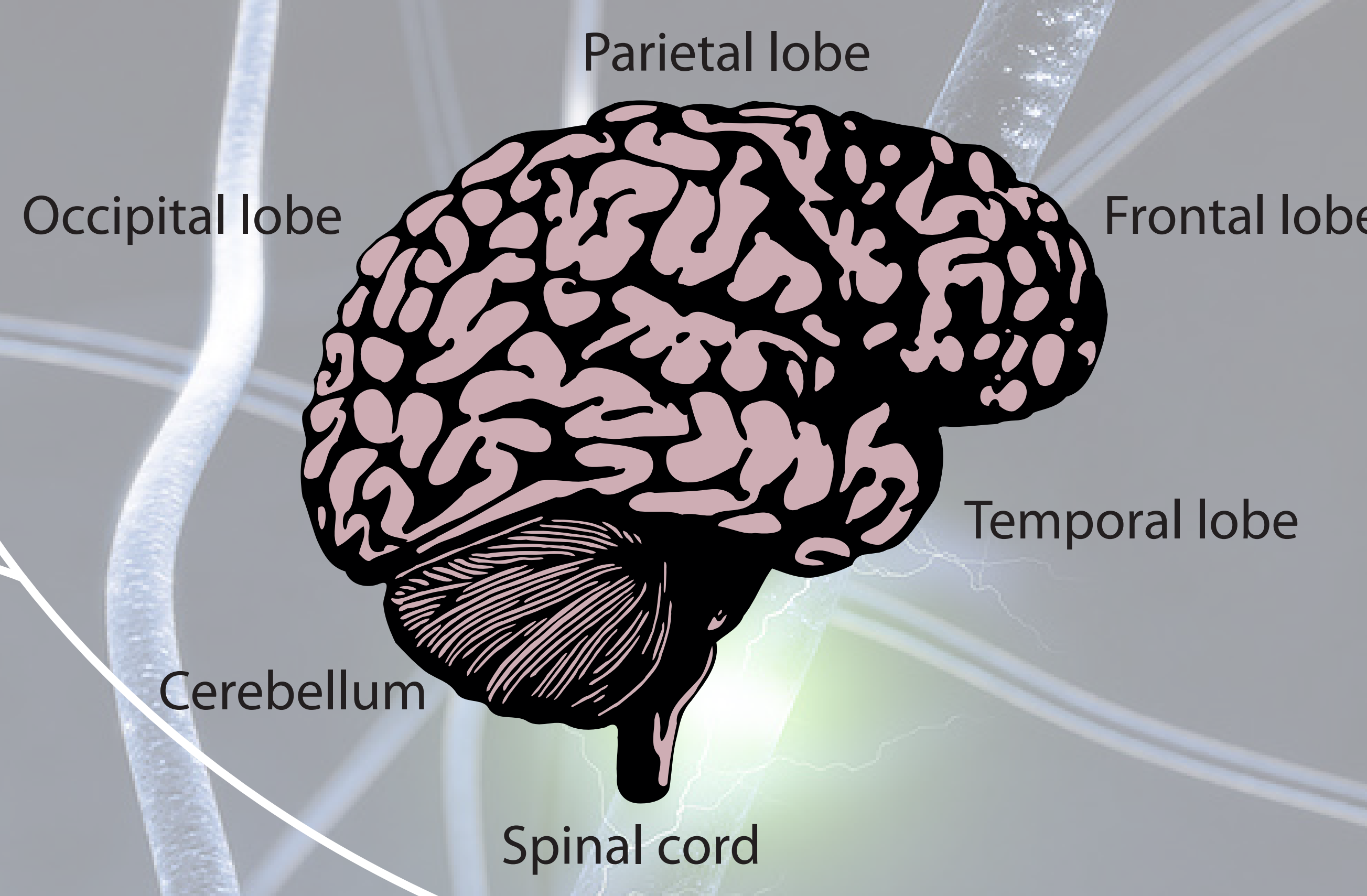


Neurochemistry of Toxins

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The Central Nervous System (CNS) is composed of the **brain** and **spinal cord**; it coordinates thoughts, memory and other complex processes, such as the body's reaction to stimuli. A **synapse** is the gap between two nerve cells (neurons) through which chemical signalling molecules (neurotransmitters) pass to ensure communication between nerve endings. There are several types of neurotransmitters; excitatory such as glutamate (in the brain) and acetylcholine (in the muscle and in the brain) or inhibitory, such as gamma-aminobutyric acid (GABA; present in the brain). There are three types of neurons: motor-, sensory- and inter-neurons. **Sensory neurons** are present in eyes, nose, skin and ears; they relay information about the environment to the CNS. **Motor neurons** send information to the muscles and glands; controlling movement and reaction. **Interneurons** are cells that connect other neurons.

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Ammonia

Induces swelling of astrocytes (cells that protect neurons) which slows brain function.

$LD_{50} = 3.5 \times 10^7$ ng/kg

Tetanus Toxin

Disables inhibitory neurons (those sending an "off" signal) resulting in excessive muscle contraction.

$LD_{50} = 2$ ng/kg

Ethanol

Reduces the stability of membranes, which can prevent neurotransmitters release and binding, disabling communication between neurons.

$LD_{50} = 8.3 \times 10^9$ ng/kg

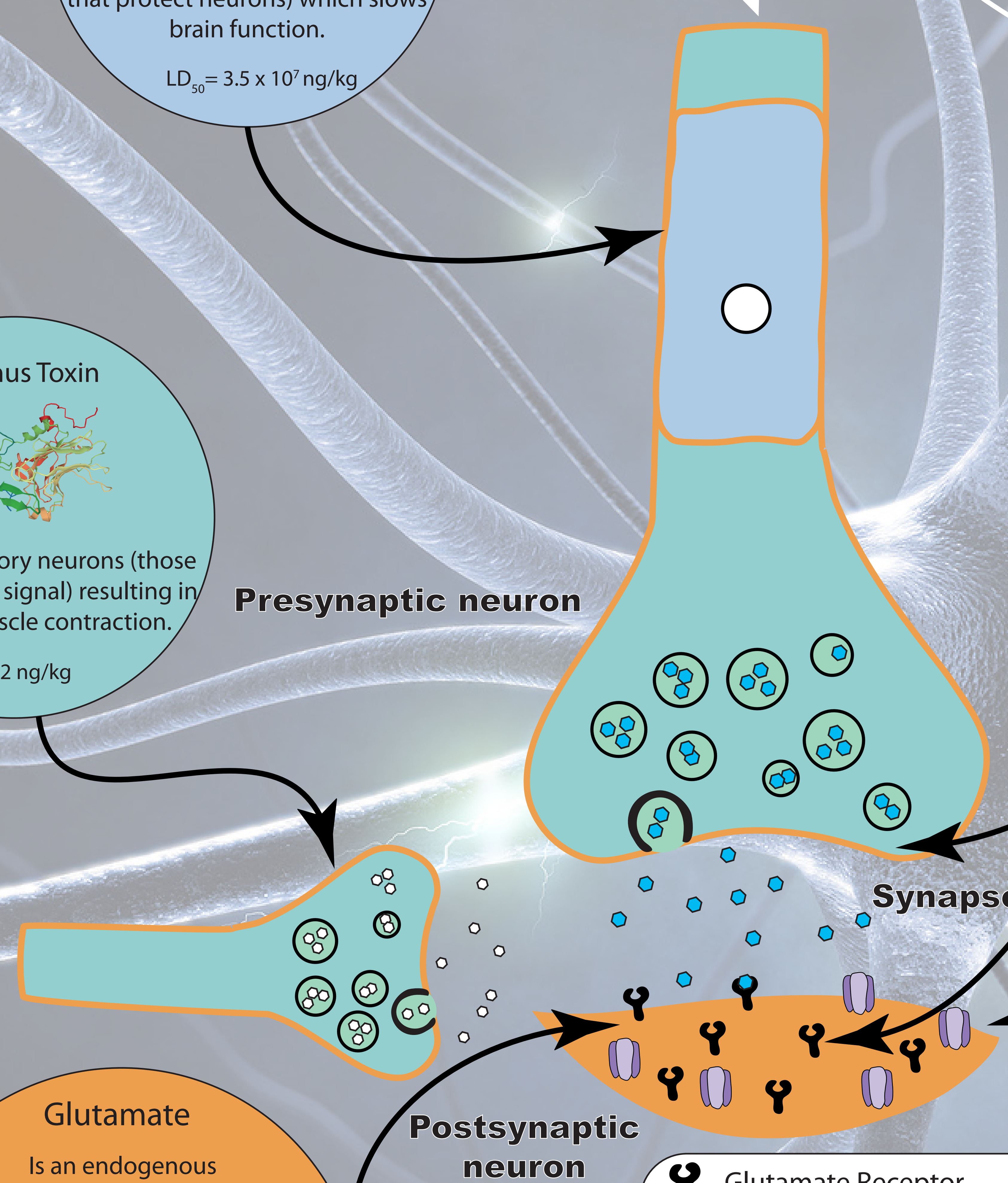
Caramboxin

Overstimulates glutamate receptors, effectively producing a state similar to that of an excessive level of glutamate.

Arsenic
in the form of soluble As^{3+}

Long term inhibition of neuron growth; short term increase of intra-cellular Ca^{2+} levels; this in turn can induce cell death.

$LD_{50} = 2 \times 10^7$ ng/kg



Glutamate

Is an endogenous neurotransmitter, responsible for the transmission of an excitatory signal to the postsynaptic neuron.

When present in excess, glutamate induces a calcium flux into the neuron; this can lead to swelling and necrosis.

$LD_{50} = 1.7 \times 10^4$ ng/kg

- Glutamate Receptor
- Calcium (Ca^{2+}) Channel
- Glutamate (Neurotransmitter)
- GABA (Inhibitory Neurotransmitter)
- Astrocyte (Protective cell)
- Point of initiation of toxin effect
- Cellular membrane