

# **SYNAPTIC TRANSMISSION**

**By**

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# Learning outlines

1. Definition
2. Types of Synapse
3. Electrical synapse
4. Chemical synapse
5. Neuromuscular transmission
6. Myasthenia gravis

A Synapse is the site at which the impulse is transmitted from one cell to the next.

# Two types of synapse

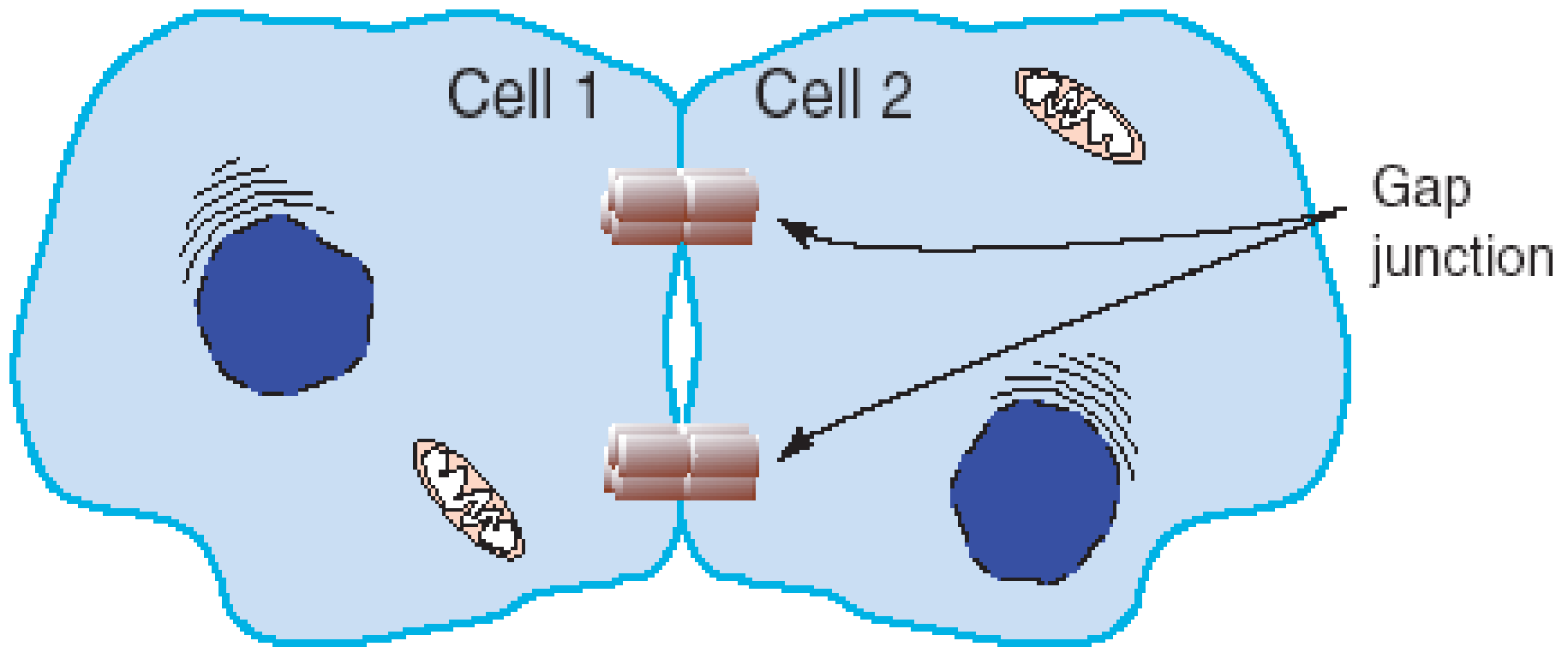
1. Electrical
2. Chemical

- ✓ Both types of synapses relay information, but do so by very different mechanisms.
- ✓ Much more is known about chemical than about electrical synapses.

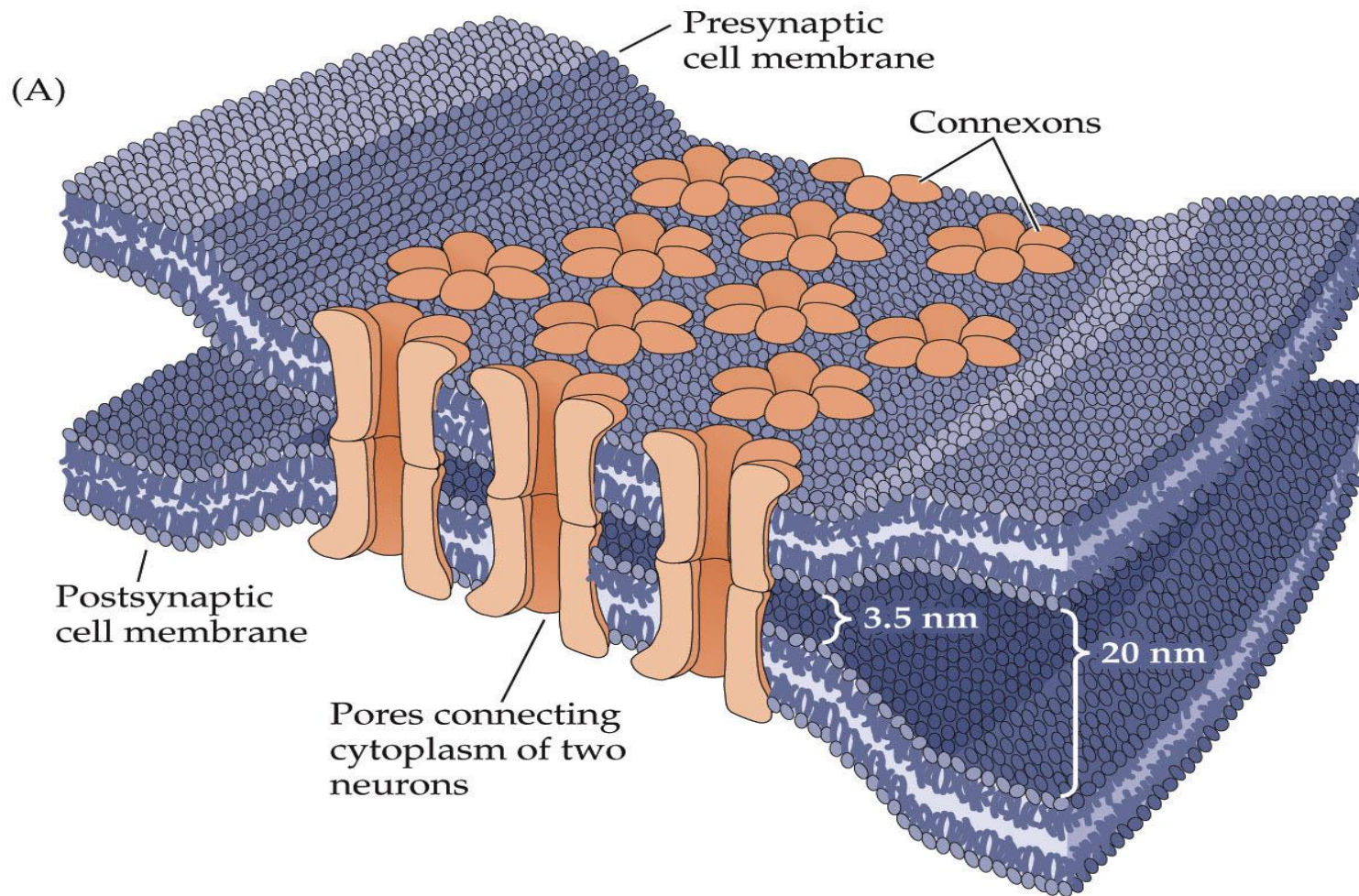
# Electrical synapse

- ✓ Bidirectional transfer of information, but can be unidirectional.
- ✓ *Pre* and *postsynaptic* cell membranes are in close apposition to each other, separated by *gap junctions*.
- ✓ Ions can flow through these gap junctions, providing low-resistance pathway for ion flow between cells without leakage to the extracellular space.
- ✓ Instantaneous, fast transfer from one cell to the next (< 0.3 msec), unlike the delay seen with chemical synapses.

# Electrical synapses

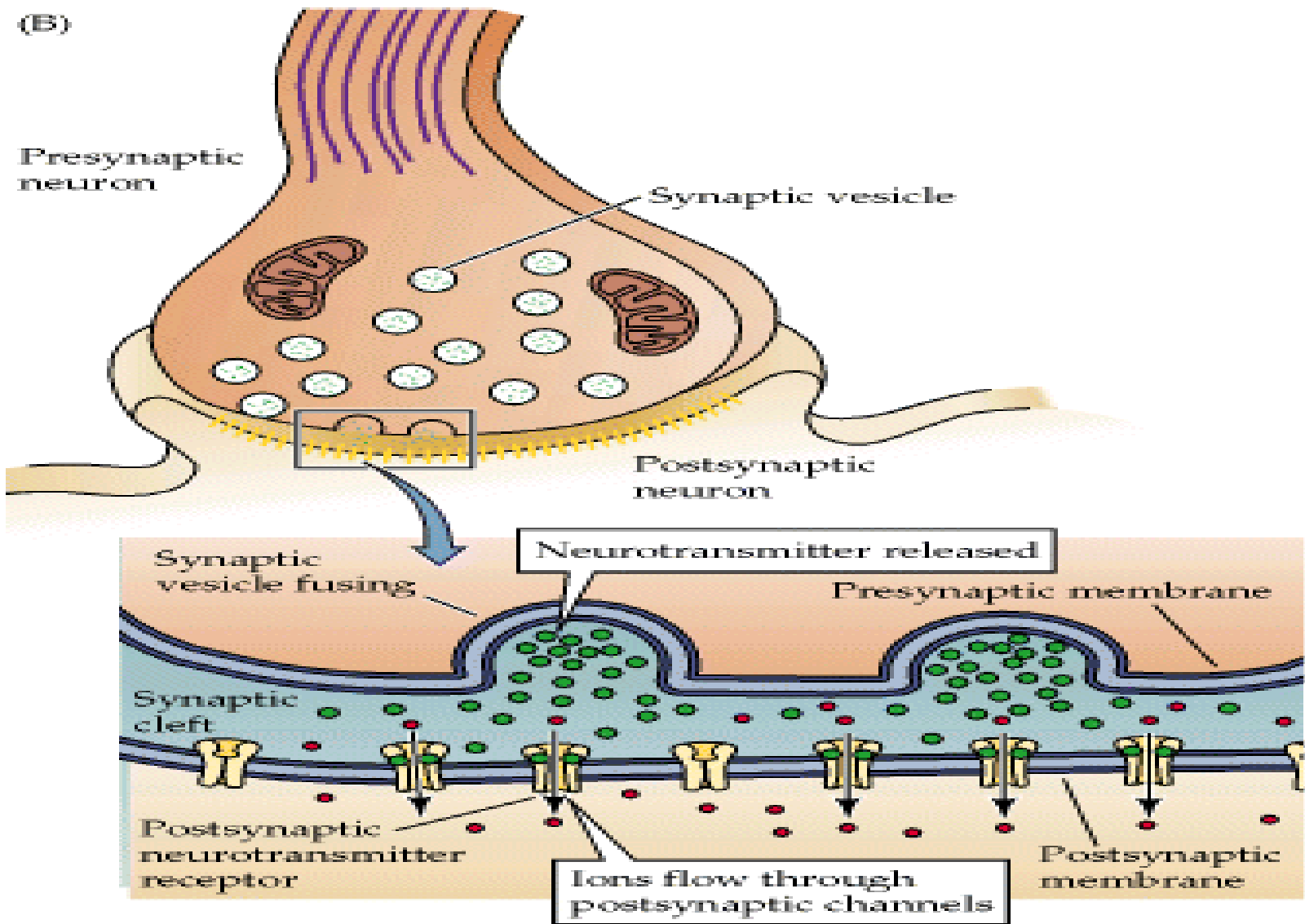


# Gap Junctions



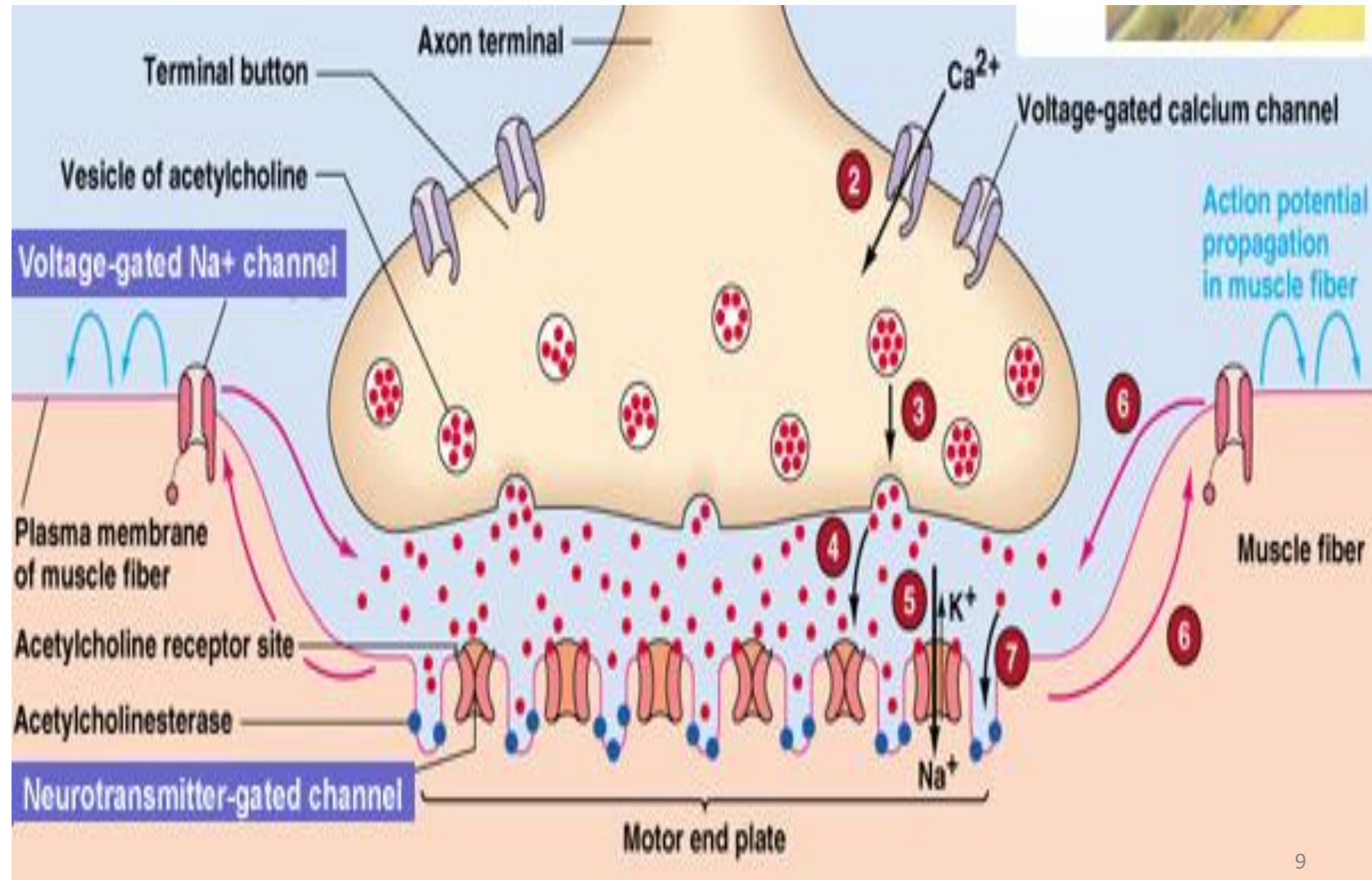
# Chemical Synapse

(B)





# Neuromuscular transmission



# Clinical correlate – Myasthenia Gravis

- ✓ **Overview:** Chronic autoimmune neuromuscular disease and a long term disease
- ✓ **Occurrence:** Any ethnic group and in both genders common in women under the age of 40 years and in men under the age of 60 years. Newborn can have neonatal MG if the mother has the disease and symptoms disappear 3 months after birth. MG is not inherited or contagious.
- ✓ **Signs and symptoms:** Muscles that control swallowing, facial expression and eye are most commonly affected. Blurred or double vision, weakness in arms and legs, unable to hold a steady gaze, changes in facial expression, difficult breathing if it affects breathing muscles.
- ✓ **Causes:** Unknown
- ✓ **Role of the Thymus gland.** Thymus gland tumour (Thymoma)
- ✓ **Diagnosis:** Medical history, Physical examination of the muscle and eye, blood test showing presence of acetylcholine receptor antibodies, CT or MRI scan, nerve conduction study,
- ✓ **Treatment:** Avoid stress, medications: prednisone, Azathioprine, Cyclosporin, mycophenolate, Mofetil, Tracrolimus all suppress the immune system, plasma replacement, Thymectomy (Neostigmine, Physostigmine, Pyridostigmine - Cholinesterase inhibitors).
- ✓ **Prognosis:** With proper treatment, signs and symptoms could reduce, does not affect life expectancy, Women with MG can have children



From  
Principles of  
Neural science,  
3rd edition, by  
E. Kandel, J.  
Schwartz and  
T. Jessel.

Thank you