

## UNIT-1 NERVE FIBERS

A axon or nerve fibre is a long, slender projection of a nerve cell or neuron, in vertebrates, that typically conducts electrical impulses known as action potentials away from nerve cell body

### CLASSIFICATION OF NERVE FIBERS

The classification of nerve fibers depends upon

- Structure
- Distribution
- Origin
- Function
- Secretion of neurotransmitter
- Diameter and conduction of impulse

#### Depending upon structure

- Myelinated nerve fibers
- Non-myelinated nerve fibers

#### Depending upon distribution

- Somatic nerve fibers
- Visceral or autonomic nerve fibers

#### Depending upon origin

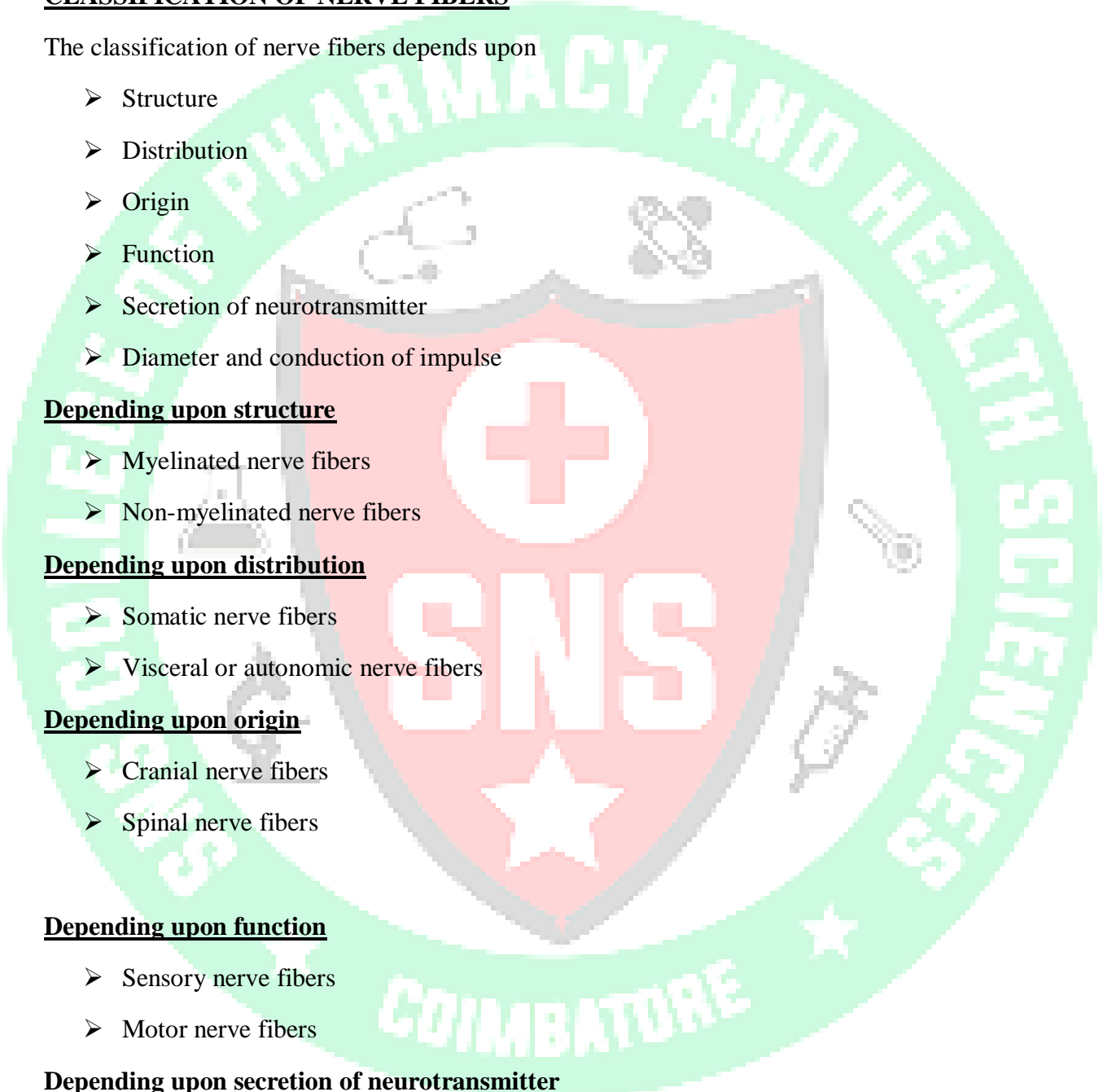
- Cranial nerve fibers
- Spinal nerve fibers

#### Depending upon function

- Sensory nerve fibers
- Motor nerve fibers

#### Depending upon secretion of neurotransmitter

- Adrenergic nerve fibers
- Cholinergic nerve fibers



**Depending upon diameter and conduction of impulse (Erlanger-Gasser classification)**

Type	Diameter( $\mu$ )	Velocity of conduction (meter/second)
A alpha	12 to 24	70 to 120
A beta	6 to 12	30 to 70
A gamma	5 to 6	15 to 30
A delta	2 to 5	12 to 15
B	1 to 2	3 to 10
C	< 1.5	0.5 to 2

**PROPERTIES OF NERVE FIBERS**

**Excitability**

Excitability is defined as the **physiochemical change** that occurs in a tissue when stimulus is applied.

When a nerve fiber is stimulated, based on the strength of stimulus, two types of response develop:

1. Action potential or nerve impulse

Action potential develops in a nerve fiber when it is stimulated by a stimulus with adequate strength. Adequate strength of stimulus, necessary for producing the action potential in a nerve fiber is known as **threshold** or **minimal stimulus**. Action potential is propagated.

2. Electrotonic potential or local potential

When the stimulus with **subliminal strength** is applied, only electrotonic potential develops and the action potential does not develop. Electrotonic potential is nonpropagated.

**Conductivity**

Conductivity is the ability of nerve fibers to transmit the impulse from the area of stimulation to the other areas.

Action potential is transmitted through the nerve fiber as nerve impulse. Normally in the body, the action potential is transmitted through the nerve fiber in only one direction.

However, in experimental conditions when, the nerve is stimulated, the action potential travels through the nerve fiber in either direction.

### **Refractory period**

Refractory period is the period at which the nerve does not give any response to a stimulus.

### **TYPES OF REFRACTORY PERIOD**

#### **1. Absolute Refractory Period**

Absolute refractory period is the period during which the nerve does not show any response at all, whatever may be the strength of stimulus.

#### **2. Relative Refractory Period**

It is the period, during which the nerve fiber shows response, if the strength of stimulus is increased to maximum.

Absolute refractory period corresponds to the period from the time when firing level is reached till the time when one third of repolarization is completed. Relative refractory period extends through rest of the repolarization period.

### **Summation**

When one subliminal stimulus is applied, it does not produce any response in the nerve fiber because, the subliminal stimulus is very weak.

However, if two or more subliminal stimuli are applied within a short interval of about 0.5 millisecond, the response is produced.

It is because the subliminal stimuli are summed up together to become strong enough to produce the response.

This phenomenon is known as summation.

### **Adaptation**

While stimulating a nerve fiber continuously, the excitability of the nerve fiber is greater in the beginning.

Later the response decreases slowly and finally the nerve fiber does not show any response at all. This phenomenon is known as adaptation or **accommodation**.

### **Cause for Adaptation**

When a nerve fiber is stimulated continuously, depolarization occurs continuously. Continuous depolarization inactivates the sodium pump and increases the efflux of potassium ions.

### **Infatigability**

Nerve fiber cannot be fatigued, even if it is stimulated continuously for a long time. The reason is that nerve fiber can conduct only one action potential at a time.

At that time, it is completely refractory and does not conduct another action potential.

### **All-or-none law**

All-or-none law states that when a nerve is stimulated by a stimulus it gives maximum response or does not give response at all.

