INTERACTION:
THE NERVOUS AND ENDOCRINE SYSTEMS
• The interaction process
• The neuron
• Electric signals
• The central nervous system (CNS) (I)
• The central nervous system (CNS) (II)
• The peripheral nervous system
• The autonomic nervous system
• The endocrine system
• The nervous and endocrine systems
• Healthy habits. Diseases of the nervous and endocrine systems
THE INTERACTION PROCESS
Interaction: the nervous and endocrine systems

**Interaction** includes a series of processes whose objectives are:

- To adapt the body to changing conditions, in the internal as well as external environment.
- To connect and coordinate the different parts of our body so that they work together.

These objectives are carried out by two systems: **the nervous and endocrine systems**.
THE NEURON
Neurons are the most specialised cells in the body. Their capacity for reproduction is very limited. They are made up of a cell body, which is similar to all other cells, and has two kinds of long extensions: dendrites and axons or neurites.

**Cell body:** this contains the nucleus and other organelles, and is filled with cytoplasm.

**Axon:** this is a long extension that is made up of cytoplasm and carries nerve impulses from the cell body to another neuron or cell.

**Dendrites:** these are short, branched extensions of the cell body that receive nerve impulses from other neurons.
Interaction: the nervous and endocrine systems

ELECTRIC SIGNALS
Neurons have a unique ability: they generate and transmit **nerve impulses**. When a neuron is stimulated, some electrical changes originate in the membrane and these transmit the electric signal from the dendrites towards the axon.

Neurons are not isolated. They work with one another to establish connections called **synapses**.
Interaction: the nervous and endocrine systems

THE CENTRAL NERVOUS SYSTEM (CNS) (I)
It is made up of nerve centres, which are responsible for integrating information received, coordinating it and preparing a response.

The **spine**, a cord of nerve tissue that runs through the spinal canal.

The **brain**, the part of the nervous system that is inside the **skull**. It is divided into four sections: the spinal bulb, the brains stem, the cerebellum and the cerebrum.
Interaction: the nervous and endocrine systems

THE CENTRAL NERVOUS SYSTEM (CNS) (II)
Interaction: the nervous and endocrine systems

- left cerebral hemisphere
- hypothalamus
- pituitary gland
- spinal bulb
- brain stem
- skull
- cerebrum
- cerebellum
- spinal cord
- meninges
- sympathetic trunks
- ventral root
- dorsal root
- spinal nerve
- communicating branch
- sympathetic trunk ganglia
- ependyma
- dorsal horn (sensory nerves)
- ventral root
- white matter
- grey matter
- dorsal root
- dorsal horn (motor neurons)

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THE PERIPHERAL NERVOUS SYSTEM
Interaction: the nervous and endocrine systems

The peripheral nervous system connects all of the receptors and effectors in the body to the nerve centre. The peripheral nervous system is divided into:

- **The somatic nervous system**, which connects the sensory receptors of the sensory organs to the central nervous system and this to the skeletal muscle. It receives information from external stimuli. It also transmits signals for voluntary muscle contractions.

- **The autonomic nervous system** regulates and controls involuntary body functions. It is divided into two parts: the **sympathetic nervous system** and the **parasympathetic nervous system**.

**Diagram:**
- **abducens** (eye movement)
- **trigeminal** (facial sensations and jaw movement)
- **auditory** (hearing and balance)
- **vagus** (digestion, respiration and circulation)
- **hypoglossal** (tongue movement)
- **optic** (vision)
- **olfactory** (smell)
- **oculomotor** (eye movement)
- **trochlear** (eye movement)
- **facial** (taste and facial expression)
- **glossopharyngeal** (taste and sensations in the throat)
- **spinal accessory** (neck and dorsal muscles)
Interaction: the nervous and endocrine systems

THE AUTONOMIC NERVOUS SYSTEM
The parasympathetic nervous system provokes relaxation and the organs work more slowly and less intensely.
The sympathetic nervous system controls most of the body’s organs so that they work more effectively under stress.
Interaction: the nervous and endocrine systems

THE ENDOCRINE SYSTEM

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The endocrine system is made up of a coordinated group of glands called the **endocrine glands**. They are called endocrine (*endo* means internal) because they release **hormones** directly into the bloodstream.

**Pituitary gland**
- Posterior lobe: Antidiuretic (ADH)
- Oxytocin

**Anterior lobe**: Stimulating hormones
- Growth hormone

**Thyroid gland**: Thyrosine

**Parathyroid glands**: Parathyroid hormone

**Adrenal glands**: Adrenaline, Corticosteroids, Aldosterone

**Pancreas**: Insulin, Glucagon

**Testicles**: Androgens

**Ovaries**: Estrogens, Progesterone
NERVOUS AND ENDOCRINE SYSTEMS
### Interaction: the nervous and endocrine systems

<table>
<thead>
<tr>
<th></th>
<th>Nervous system</th>
<th>Endocrine system</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conductor(s)</strong></td>
<td>nerves</td>
<td>Circulatory system</td>
</tr>
<tr>
<td><strong>Response</strong></td>
<td>fast very specific short in time</td>
<td>slow not very specific prolonged</td>
</tr>
<tr>
<td><strong>Coordination</strong></td>
<td>actions that require an immediate response</td>
<td>actions that develop during a period of time</td>
</tr>
<tr>
<td><strong>How</strong></td>
<td>nerve impulses</td>
<td>hormones</td>
</tr>
</tbody>
</table>
HEALTHY HABITS. DISEASES OF THE NERVOUS AND ENDOCRINE SYSTEMS
To keep the nervous system healthy, we should follow these recommendations:

- Lead an orderly life.
- Do not consume any type of drugs.
- Perform intellectual and mental exercises regularly.
- Try to eat foods rich in vitamin $B_1$, $B_3$ and phosphorous.
- Avoid stress.

### Others/Itivem diseases

<table>
<thead>
<tr>
<th>Degenerativas</th>
<th>Mentales</th>
<th>Otras</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alzheimer</td>
<td>Schizophrenia</td>
<td>Infectious diseases</td>
</tr>
<tr>
<td>Parkinson’s disease</td>
<td>Neurosis</td>
<td>Epilepsy</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>Depression</td>
<td>Narcolepsy</td>
</tr>
<tr>
<td>ALS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Endocrine system diseases

- Diabetes
- Hypothyroidism
- Hyperthyroidism
- Dwarfism
- Giantism
- Addison's disease
- Cushing's syndrome