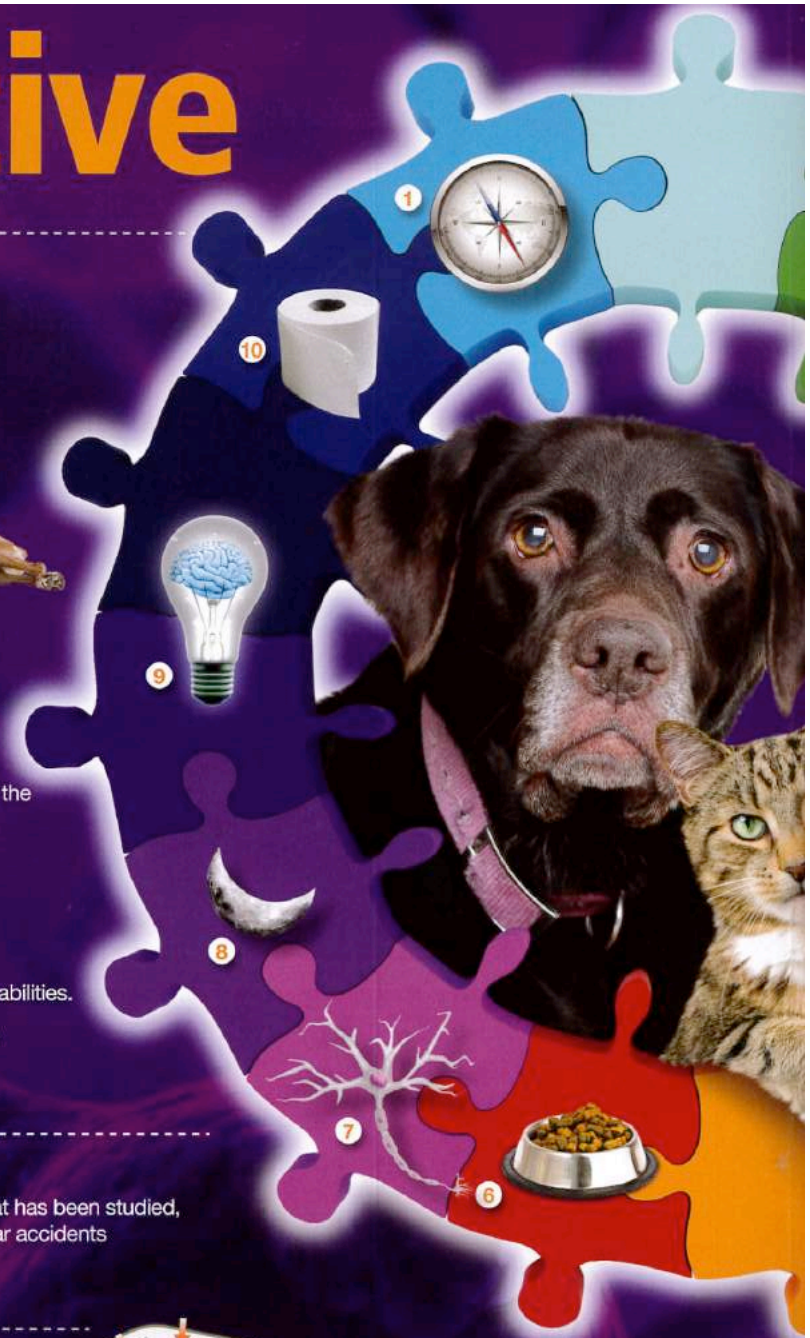
Cognitive

1 Clinical signs of CDS

The cognitive dysfunction syndrome (CDS) is a term used to refer to the behavioral changes of senior pets described by their owners. It affects **one in three animals** aged more than 11–12 years.

The diagnosis is based exclusively on the signs described by the owner once other medical causes have been ruled out.

1. Confusion and disorientation.
2. Altered relationships.
3. Modified activity patterns.
4. Irritability.
5. Anxiety.
6. Modified appetite.
7. Lack of response to stimuli.
8. Nocturnal activity.
9. Memory loss and loss of learning abilities.
10. Defecating/urinating inside the house.

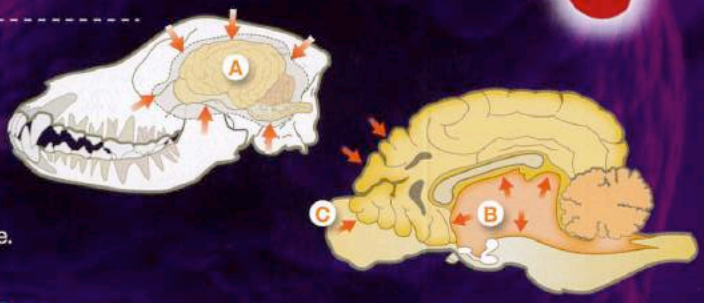


2 Aging as a risk factor

Aging is currently the only risk factor associated with CDS that has been studied, although the contribution of traumatic injuries or microvascular accidents at a central level has not been ruled out.

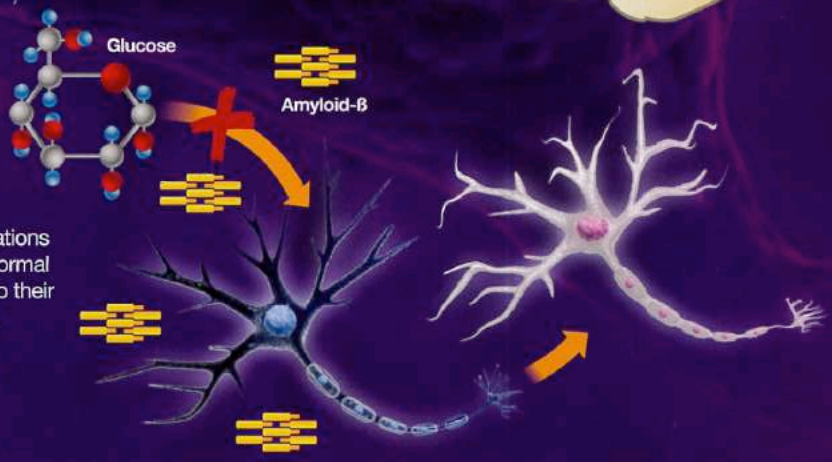
3 Gross and microscopic signs

Gross signs



- **A** Loss of brain volume.
- **B** Enlargement of the ventricles and perivascular space.
- **C** Lesions with atrophy of the brain cortex.

Histologic signs

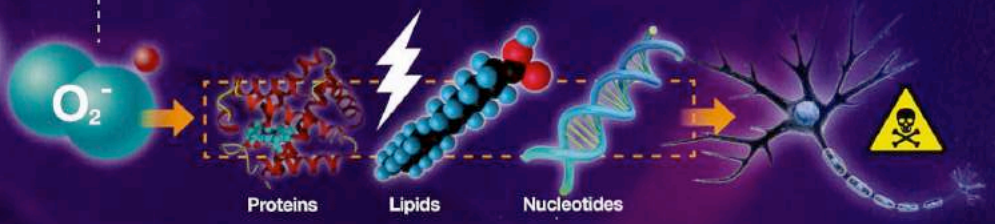


Accumulation of amyloid-ß on the brain's vascular wall (similar to what occurs in Alzheimer's disease). Amyloid-ß deposits in different regions of the cortex cause modifications in the blood-brain barrier, interfering with the normal transport of nutrients to neurons, which leads to their degeneration: glucose metabolism in the brain is reduced.

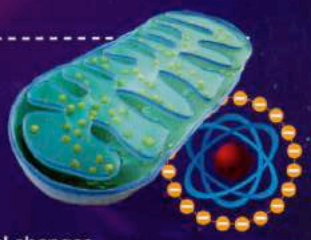
dysfunction syndrome

4 Oxidative damage

- ✔ Aging causes the deterioration of the mechanisms responsible for the production, control and detoxification of the by-products of aerobic metabolism, named reactive oxygen species (ROS).
- ✔ The main by-product is superoxide anion (O_2^-), which is controlled by superoxide-dismutase.
- ✔ ROS cause oxidative damage to proteins, lipids and nucleotides, which, at central level, produces lesions and death of the neurons.



5 Fighting ROS through diet



Dietary management of CDS involves the use of antioxidants and mitochondrial cofactors, which will increase the function of aged mitochondriae. The objective is to reduce the production or increase the capacity to eliminate ROS in order to delay the progression of age-related pathological changes.

According to a study, vitamin E, vitamin C, selenium, α-lipoic acid, L-carnitine and fruit/vegetables (for 1 % in dry matter, they provide 5 % of bioflavonoids) in diets for dogs with CDS, in combination with stimulation programs, improved these animals' behavior and prevented histopathological changes but did not reverse the effects of the disease.

6 Lesion distribution depends on the age

It is worth highlighting that lesions appear in different areas at different ages. In Beagle dogs (medium-size breed), alterations can already be seen in the prefrontal cortex at 8–9 years old, while amyloid-ß starts depositing in the parietal and entorhinal regions when animals are more than10 years old. This will condition the appropriate time to start dietary modifications if we want to prevent this disease.