

The aging

1

Aging mechanisms

- ✓ Aging is a progressive process that includes physiological, metabolic, and behavioral changes, characterized by decreased functions.
- ✓ It is not a pathological process, but it affects the presentation of certain diseases, particularly cancer, chronic renal failure, and heart disease.
- ✓ The beginning of this stage of life takes place when the animals reach the halfway point of their life expectancy: between 5 and 7 years of age.



2

Life expectancy

The life expectancy of our domestic dogs and cats represents an exception in the animal kingdom. In the wild, senile animals, due to natural selection, represent a target for other predators, diseases and accidents. Pets enjoy old age accompanied with social well-being, in spite of diseases that are a natural part of the degenerative aging process.

Life expectancy varies with each species

There are records of dogs and cats dying at ages near 30 years old, but this is rare.

- ✓ Cats, on average, live longer: this could be due to a slower aging process. Their life expectancy is similar to small and medium dog breeds.
- ✓ In dogs, there are differences depending on body weight. The weight and the life expectancy are inversely correlated: small dogs live 45% longer than giant dogs.



Species and size	Beginning of old age (years)
Small dogs (<10 kg) and cats	11.5-12
Medium-sized dogs (10-25 kg)	10
Large dogs (25-45 kg)	9
Giant dogs (>45 kg)	7.5

The breed affects life expectancy

The life expectancy in some breeds is influenced by certain hereditary traits (for example: English Bulldog) or by certain orthopedic conditions caused by high growth rates. A large quantity of hereditary diseases have been reported in purebred dogs that could contribute to the reduction of their life expectancy.



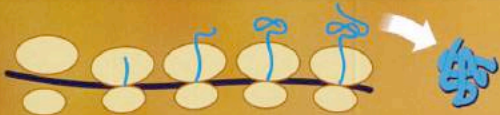
process

The mechanisms of aging include:

Deterioration of the DNA with instability of the genome

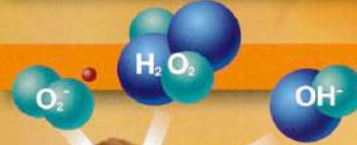
Changes in genetic expression

Shortening of telomeres



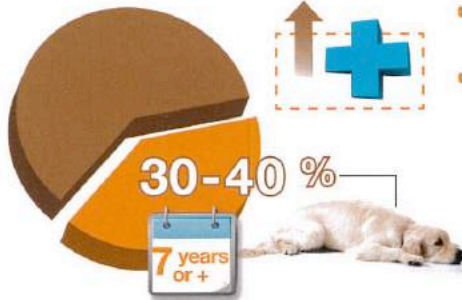
Non-enzymatic glycosylation of structural proteins

Oxidative stress



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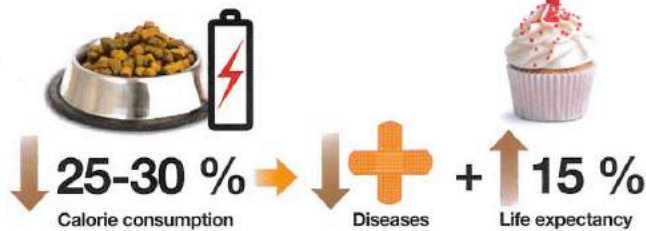
Dogs and cats live longer



- ✓ Currently, and as a result of the best health programs, the number of geriatric patients has increased.
- ✓ Approximately 30-40 % of pets are 7 years of age or older.

✓ Unlike other previous stages where the requirements of the group are considered, in this stage, great individual variations are seen in the animals' state of health. Each patient should be observed individually, evaluating the functional changes more than their chronological age, to establish the nutritional requirements in accordance with their particular status.

✓ The only scientifically proven nutritional factor that prolongs life expectancy and reduces the risk of other pathologies is the decrease in calorie consumption throughout the entire life of the pet.



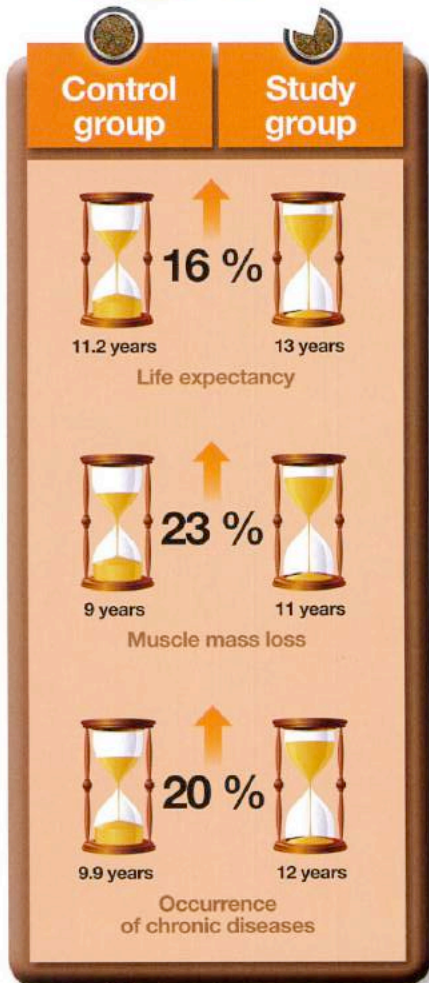
How does



Benefits of calorie restriction

Restricting the daily energy requirements by 25 % in dogs throughout their life offers greater well-being and life expectancy.

Although the intrinsic mechanisms of these processes are not clear, the different observations have revealed certain benefits, generally speaking:



1

Greater life expectancy

The half life is prolonged from 11.2 to 13 years, or, a 16 % increase. At the age by which all of the "control" dogs had died, nearly 40 % of the dogs with diet restriction were still alive.

2

Reduced loss of lean mass

In the control group, the loss of mean mass took place at 9 years of age. In the study animals, this period was nearly 23 % greater (11 years of age). This allows for an increase in the life expectancy (the loss of muscle mass is related with the changes that take place in the trajectory toward death).

3

Delay in the occurrence of chronic diseases

The age at which chronic diseases associated with aging occurred was approximately 20 % higher (12 compared to 9.9 years).

Theories on the effects of calorie restriction

In general, and in different species, the theories about the positive effects are as follows:

- ✓ One theory affirms that calorie restriction **reduces the rate of cellular division in many tissues**, which would partially explain its positive effects on cancer.
- ✓ Another theory is based on the fact that the **blood glucose level is reduced**, which in turn decreases the rate of accumulation of sugar in the proteins and its destructive effects.
- ✓ One interesting hypothesis postulates that it slows down aging given the fact that it **reduces the production of free radicals** due to a lower consumption of oxygen by the mitochondria.
- ✓ Recent research shows that calorie restriction leads to a **reduction in triiodothyronine (T₃)**, which is a hormone with an important role in the body's metabolic control.
- ✓ The latest studies defend the possible implication of the **PHA-4 gene** as key in the physiological effects of calorie restriction.



food restriction affect aging?



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Lower weight

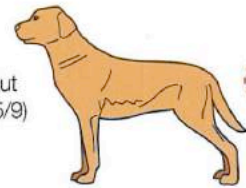
The total weight was 25 % lower.

 25 %

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Better body condition

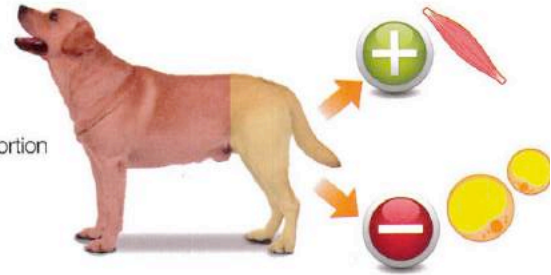
The body condition (based on Laflamme's scale of 9) was kept between 4-5/9 throughout the animals' lives, showing a slight increase (5/9) during the senile phase (10 to 14 years).



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More muscle mass

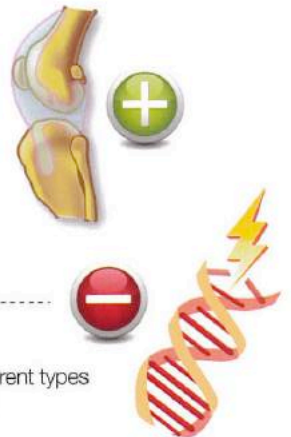
The body fat and lean tissue were lower; however, the proportion of muscle mass was higher.



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Better bone quality

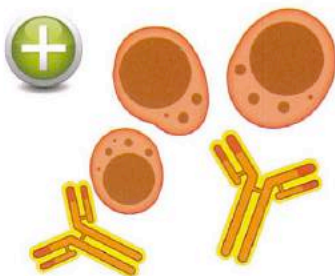
No changes were observed in the maturation, structure, or metabolism of the bone tissue. The density and mineral content of the bones were higher and remained constant between 6-12 years of age. After that age, a decrease in the two parameters occurred, but values higher than those in the control group were maintained.



8

Better immune response

The loss of the immunological response capacity due to aging, measured by the activity of the lymphocyte populations and the lymphoproliferative response to mitogens, was lower and more delayed over time.



9

Less damage to DNA

DNA damage was evaluated by the prevalence of the different types of oncological processes and by the rate of mutagenesis.

10

Lower glucose levels

In spite of the fact that baseline glucose levels increase with age, their levels were lower.

Better response to insulin

The sensitivity to insulin was higher. A correlation between insulin resistance and increased body fat has been shown.

