# Causes of death and life expectancy in carnivorous pets (I)

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**SUMMARY**

The authors studied causes of death for 1,044 dogs and cats. The main causes of mortality are natural death (17.90 %, N = 187), poisoning (3.80 %, N = 40), road accidents (5.20 %, N = 54), euthanasia (7.60 %, N = 79), infectious diseases (8.10 %, N = 84), cancer (24.70 %, N = 258) and chronic organ diseases (28.60 %, N = 299). Animals dying a natural death had 15 years' life expectancy. Poisoning, road accidents and infectious diseases (17 %, N = 178) are associated with a mean life expectancy of 5 years. Euthanasia by cessation of therapy, cancer and chronic organ diseases now constitute most of the mortality causes (57,20 %, N = 597) and are associated with a mean life expectancy of 12 years. Likewise, the survival rates are respectively, 83 % up to 5 years, 75 % up to 8 years, 50 % up to 11 years and 20 % up to 15 years. Thus, campaigns against straying of carnivorous pets and early vaccination programs have contributed to an extensive reduction in early mortality. Concurrently, and as with human beings, geriatric medicine, late-life support and euthanasia constitute new concerns for ethics and preventive medicine.

**KEY-WORDS : epidemiology - life expectancy - mortality - pediatrics - geriatrics - carnivorous pets.**

**RÉSUMÉ**

**Les causes de mortalité et les espérances de vie chez les carnivores domestiques (I). Par A. LACHERETZ, D. MOREAU et P. CATHELAIN.**

Les auteurs étudient les causes de mortalité de 1044 chiens et chats. En dehors des morts naturelles (17,90 %, N = 187), les principales causes de mortalité sont liées à des empoisonnements (3,80 %, N = 40), à des accidents de la circulation (5,20 %, N = 54), à des euthanasies (7,60 %, N = 79), à des maladies infectieuses (8,10 %, N = 84), à des cancers (24,70 %, N = 258) et à des affections chroniques d'organe (28,60 %, N = 299). Les animaux qui sont décédés d'une mort naturelle avaient une espérance de vie moyenne de 15 ans. Les empoisonnements, les accidents de la circulation et les maladies infectieuses (17 %, N = 178) associent ensemble une espérance de vie moyenne de 5 ans. Les euthanasies pour renoncement thérapeutique, les cancers et les affections chroniques d'organe (57,20 %, N = 597) associent quant à elles une espérance de vie moyenne de 12 ans. Parallèlement, les taux de survie sont respectivement, de 83 % à 5 ans, de 75 % à 8 ans, de 50 % à 11 ans et de 20 % à 15 ans. Le contrôle de la divagation des animaux et la généralisation, dès le premier âge, des programmes de vaccinations permettent ainsi une réduction considérable des décès prématurés. Comme chez l'homme, les consultations de gériatrie, l'accompagnement de fin de vie et le recours à l'euthanasie, constituent en contrepartie de nouvelles préoccupations de médecine préventive et d'éthique.

**MOTS-CLÉS : épidémiologie - espérance de vie - mortalité - pédiatrie - gériatrie - carnivores domestiques.**

## 1. Introduction

The emergence of bovine spongiform encephalopathy has lead to new concern about the handling of pets' cadavers, favoring systematic incineration. This new behavior has facilitated retrieval of data on animals' identity and cause of death.

The present study involved 1,044 dogs and cats. It sought to assess the present epidemiology of causes of death in carnivorous pets in France, and determine the associated life expectancies.

## 2. Materials and methods

### A) ANIMALS

The corpses of the 1,044 animals studied (785 dogs (75 %) and 259 cats (25 %)), had been sent to the incineration center of Beauvoir in Cambrésie (France) during the year 1999. They came from 15 veterinary clinics working exclusively with this center and which had agreed to provide information on habitat and cause of death for each animal, in addition to the usual data (species, breed, sex, and age).

### B) STATISTICAL ANALYSIS

The data were analyzed with 5 % risk by chi-square test or by comparison of means ± semi-interquartile range. Life expectancies correspond to weighted means of death ages observed in each population and sub-population under study.

## 3. Results

### A) CAUSES OF DEATH

The different causes of death observed can be classified into 4 main categories (Table I). In order of increasing frequency, these were :

- Convenience euthanasia : 7.60 % of cases (N = 79/1,044). This was mostly motivated by the animal's aggressiveness (60.80 %, N = 48/79) or cessation of therapy (20.30 %, N = 16/79).
- Accidental death : 10.80 % of cases (N = 113/1,044) mainly caused by road accidents (47.80 %, N = 54/113) or poisoning (35.40 %, N = 40/113).
- Natural death : 17.90 % of cases (N = 187/1,044).
- Death due to disease : 63.70 % of cases (N = 665/1,044), including 45 % related to a chronic organ disease (N = 299/665), 38.80 % to cancer (N = 258/665) and 12.60 % to an infectious disease (N = 84/665).

### B) DISEASE-RELATED MORTALITY

**a) Chronic organ disease**

Chronic organ diseases affected 299 animals. They included renal failure (30.10 %, N = 90/299), locomotor organ diseases such as paralysis or osteoarthritis (24 %, N = 72/299), cardiac diseases (17.40 %, N = 52/299), cerebral failure (10.70 %, N = 32/299), metritis (9 %, N = 27/299) and diabetes (8.7 % ; N = 26/299).

**b) Cancer**

Cancer process location was reported in 157 cases out of 258 (60.85 %). Mammary tumors were the most frequent (42.04 %, N = 66/157). Other locations included hepatic (15.92 %, N = 25/157), lymphoid (13.37 %, N = 21/157), osseous (10.82 %, N = 17/157), cerebral (10.19 %, N = 16/157) or pulmonary location (7.64 %, N = 12/157).

**c) Infectious diseases**

Infectious diseases were the cause of death in 25 dogs. In this species, they were mainly parvovirosis (40 %, N = 10/25) and distemper (32 %, N = 8/25).

Among cats, 59 deaths were consecutive to infectious diseases. Retroviroses were the main causes (72.90 %, N = 43/59). Infectious peritonitis was the second most frequent identified infectious disease (15.30 %, N = 9/59).

| Causes of death | Number | % (total) | % (group) | L.E. |
|---|---|---|---|---|
| Euthanasia | 79 | 07.60% | 100% | 08.10 ±0.95 |
| Aggressiveness | 48 | 04.60% | 60.80% | 06.60 ±0.95 |
| Cessation of therapy | 16 | 01.55% | 20.20% | 11.40 ±1.95 |
| Other | 15 | 01.45% | 19% | ND |
| Accidental deaths | 113 | 10.80% | 100% | 04.61 ±0.80 |
| Road accidents | 54 | 05.20% | 47.80% | 03.60 ±1.10 |
| Poisoning | 40 | 03.80% | 35.40% | 05.50 ±1.30 |
| Other | 19 | 01.80% | 16.80% | ND |
| Natural deaths | 187 | 17.90% | 100% | 14.90 ±0.40 |
| Deaths related to disease | 665 | 63.70% | 100% | 11.10 ±0.30 |
| Chronic organ disease | 299 | 28.60% | 45% | 11.80 ±0.45 |
| Cancer | 258 | 24.70% | 38.80% | 12.10 ±0.45 |
| Infectious disease | 84 | 08.10% | 12.60 % | 05.30 ±0.95 |
| Other | 24 | 02.30% | 03.60% | ND |
| Total | 1,044 | 100% | 100% | 10.85 ±0,35 |

TABLE I. — Frequencies of causes of death, and associated life expectancies (L.E.). (ND = non-determined).

| Habitat Type | Euthanasia Deaths | Accident Deaths | Natural Deaths | Disease Deaths | Total |
|---|---|---|---|---|---|
| Rural | 36 (08%) | 056 (12.5%) | 059 (13%) | 298 (66.5%) | 449 (100%) |
| Urban | 43 (07.2%) | 057 (09.6%) | 128 (21.5%) | 367 (61.7%) | 595 (100%) |
| Total | 79 (7.6%) | 113 (10.8%) | 187 (17.9%) | 665 (63.7%) | 1,044 (100%) |

TABLE II. — Frequencies of causes of death in relation to habitat (number of cases (percentage).

### C) HABITAT INFLUENCE

449 cadavers came from rural habitats (43 %) and 595 from urban habitats (57 %) (Table II). Habitat did not affect the mortality rates linked to euthanasia, accidents or diseases. On the other hand, natural deaths were significantly more frequent in urban (21.5 %, N = 128/595) than in rural habitats (13.10 %, N = 59/449).

### D) SEX INFLUENCE

Males (53.8 %, N = 562/1044) were significantly more numerous than females (46.2 %, N = 482/1044) (Table III). Leaving aside metritis (N = 27) and mammary tumor (N = 66), there were no significant sex differences for renal failure, cerebral disease, or cancer. However, mortality rates were significantly higher in males for locomotor system diseases (osteoarthritis/paralysis), cardiac pathologies and infectious diseases.

### E) AGE INFLUENCE

Among the 187 animals that died from natural causes, life expectancy (L.E.) was 15 years (L.E. = 14.90 years), as against 10 years (L.E. = 9.95 years) for all the other animals taken together (N = 857). Analysis of table I shows :

- pathologies associated with early mortality included road accidents (L.E. = 3.60 years), infectious diseases (L.E. = 5.30 years), poisoning (L.E. = 5.50 years) and euthanasia for aggressiveness (L.E. = 6.60 years) ;

- pathologies associated with late mortality included euthanasia by cessation of therapy (L.E. = 11.40 years), chronic organ diseases (L.E. = 11.80 years) and cancer (L.E.. = 12.10 years).

## 4. Discussion

### A) GENERAL CHARACTERISTICS OF THE POPULATION UNDER STUDY

Independently of the species, global analysis of the 1,044 reports shows :

- geographical distribution predominantly urban (57 %) as compared to rural habitat (43 %) ;

- significantly greater representation of the male (53.8 %) than of the female sex (46.2 %) ;

- survival rates of respectively 83 % up to 5 years (82.66 %, N = 863/1,044), 75 % up to 8 years (74.25 %, N = 775/1,044), 50 % up to 11 years (57.75 %, N = 603/1,044) and 20 % up to 15 years (19.1 %, N = 199/1,044).

These general data are in close agreement with those of a FACCO/SOFRES survey made in 1998 for France as a whole [7]. This allows the present population under study to be deemed representative.

### B) LIFE EXPECTANCY AND LONGEVITY

The life expectancy of animals whose death occurred naturally was 15 years (14.9 years). This figure is in agreement with the average longevity generally described for carnivorous pets [13] :

Among dogs, longevity appears to be more particularly related to animal size than to breed, varying from 10 years for medium size dogs to 20 years for small dogs.

Among cats, longevity is more closely related to the way of life : 10 years for cats living outdoors, and up to 20 years for cats living indoors.

Thus, the present results can be validated, taking as reference an average longevity of 15 years [6].

| Cause of death | Males | Females | Total | L.E. |
|---|---|---|---|---|
| Renal failure | 46 | 44 | 90 | 12.40 ±0.90 |
| Arthritis / paralysis | 48 | 24 | 72 | 12.80 ±0.75 |
| Cardiac pathology | 34 | 18 | 52 | 12.10 ±0.75 |
| Cerebral pathology | 17 | 15 | 32 | 11.10 ±1.70 |
| Diabetes | 14 | 12 | 26 | 11.40 ±1.30 |
| Metritis | 00 | 27 | 27 | 11.30 ±1.80 |
| Sub - total | 159 | 140 | 299 | 11.80 ± 0.45 |
| Mammary cancer | 00 | 66 | 66 | 13.50 ±0.65 |
| Hepatic cancer | 12 | 13 | 25 | 10.60 ±1.60 |
| Lymphoid cancer | 08 | 13 | 21 | 10.90 ±2.10 |
| Osseous cancer | 08 | 09 | 17 | 13.90 ±1.60 |
| Cerebral cancer | 07 | 09 | 16 | 11.30 ±2.40 |
| Pulmonary cancer | 08 | 04 | 12 | 11.40 ±1.80 |
| Cancer / others | 58 | 43 | 101 | ND |
| Sub - total | 101 | 157 | 258 | 12.10 ±0.50 |
| Infectious diseases | 55 | 29 | 84 | 05.30 ±0.95 |
| Other | 16 | 8 | 24 | ND |
| Total | 331 | 334 | 665 | 11.10 ±0.30 |

TABLE III. — Frequencies of causes of death in relation to sex, and associated life expectancies (L.E.).

| Age group in years | Infectious diseases, accidents, poisoning | Euthanasia for aggressiveness | Chronic diseases Cancers Cessation euthanasia | Natural deaths |
|---|---|---|---|---|
| [ 0 – 3 [ | **082 (46.07)** | **012 (25.00)** | 030 (05.02) | 000 (00.00) |
| [ 3 – 5 [ | 029 (16.29) | 003 (06.25) | 010 (01.68) | 000 (00.00) |
| [ 5 – 8 [ | 028 (15.73) | **015 (31.25)** | 040 (06.70) | 000 (00.00) |
| [ 08 – 11 [ | 019 (10.67) | **014 (29.16)** | **123 (20.60)** | 011 (05.88) |
| [ 11 – 15 [ | 015 (08.43) | 004 (08.34) | **290 (48.58)** | **089 (47.59)** |
| [ 15 – 20 [ | 005 (02.81) | 000 (00.00) | **097 (16.25)** | **084 (44.92)** |
| ≥ 20 years | 000 (00.00) | 000 (00.00) | 007 (01.17) | 003 (01.61) |
| Total | 178 (100) | 048 (100) | 597 (100) | 187 (100) |
| Mean L.E. | 4.81 years | 6.63 years | 11.96 years | 14.92 years |

TABLE IV. — Age-specific causes of death (number of cases (percentage)) and mean life expectancy (L.E.).

### C) LIFE EXPECTANCY AND PATHOLOGY

Among animals which died from an identified disease, whatever its nature, life expectancy was 10 years (9.95 years). It corresponds to the age as of which animals are usually no longer covered by insurance [2], and to a 5 year reduction in life span. This overall 5 year reduction actually covers two very different phenomena (Table I) :

- a period from 0 to 6 years, during which pathologies involving an external cause predominate, including : road accidents (L.E. = 3.6 years), infectious diseases (L.E. = 5.3 years) and poisoning (L.E. = 5.5 years) [1,10] ;

- a period from 10 to 15 years of age, during which chronic organ diseases (L.E. = 11.8 years) and cancer (L.E. = 12.10 years) predominate, to which can be added euthanasia by cessation of therapy (L.E. = 11.4 years) [4,11].

Animals' aggressiveness is a major cause of convenience euthanasia (60.8 %). This problem is mostly encountered between 1 and 3 years and between 5 and 10 years of age (Table IV) ; i.e., respectively during the animal's socialization period or during the period of character assertion [4].

### D) PATHOLOGY EVOLUTION

Alongside this foreseeable age-linked disease distribution, a quantitative shift in causes of death from traditionally pediatric to truly geriatric pathologies can also be observed [3]. (Table IV).

Thus, infectious diseases, road accidents and poisoning add up to 178 cases out of 1,044 (17 %) with a mean life expectancy of 5 years (4.81 years), whereas chronic organ diseases, cancer and euthanasia by cessation of therapy add up to 597 cases out of 1,044 (57.20 %) with a mean life expectancy of 12 years (11.96 years). This can be underlined by recalling that the survival rate is 75 % (74.25 %, N = 775/1,044) at 8 years, an age that corresponds to carnivorous pets' mid-life and to the beginning of age-linked mortality (Table IV).

## 5. Conclusion

Incineration centers give now decent solutions to the handling of pets' cadavers. They have also the advantage of recovering data, and this turns them into actual health observation posts [2]. In this way, they enable assessment of the efficacy of health systems and controls.

Campaigns against straying of carnivores, the spread of preventive medical consultations, and early vaccination programs [9] have contributed to a significant recession in the main causes of infantile mortality, be it poisoning, road accidents, or infectious diseases.

Most of dogs and cats now show life expectancies that almost reach their physiological limit. Life expectancy can nonetheless be shortened by 3 years, due to chronic organ disease or cancer. Prevention or attenuation of these consequences of aging require early detection, as of the age of 8 years, when animals enter the second half of their life [5, 8, 12, 14]. A comparative study of causes of death observed for dogs and cats will contribute to setting orientations (part II in publication).

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