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## Volumetric evaluation of the stomach capacity in stillbirths dogs

### Avaliação volumétrica da capacidade estomacal em cães natimortos

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### ABSTRACT

Neonatology remains a challenge for veterinarians due to the scarcity of information (including morphological data) on canine neonates. Misinformation on the topic is one of the causes of the high rate of fetal and neonatal mortality. The aim of this study was to evaluate the volumetric capacity of the stomach in stillbirths dogs. A total of 39 stillbirths were examined. The animals were classified into three groups according to their weight (I small size, II medium size and III large size). The stomach was removed from the abdominal cavity and the volumetric capacity of the stomach was measured by administering milk with a syringe until it was completely filled. In group I, the average weight of stillborns was 136.22±39.04 g; in group II 243.24±32.6 g and in group III 333±17.4 g. The mean volumetric capacity of the stomachs of animals in group I was 3.52±1.79 ml; from group II 6.6±2.88 ml and from group III 7±1.91 ml. It was observed that the volumetric capacity of the stomachs of newborn dogs increases with the size of the animal. This information makes it possible to provide adequate nutrition to patients unable to ingest maternal milk.

**Keywords:** Anatomic Mensuration; Canine; Feeding; Morphometry;

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## RESUMO

A neonatologia continua sendo um desafio para os veterinários devido à escassez de informações (incluindo dados morfológicos) em neonatos caninos. A desinformação sobre o tema é uma das causas da alta taxa de mortalidade fetal e neonatal. O objetivo deste estudo foi avaliar a capacidade volumétrica de natimortos caninos. Foram examinados 39 natimortos. Os animais foram classificados em três grupos de acordo com seu peso (I porte pequeno, II porte médio e III porte grande). O estômago foi retirado da cavidade abdominal e a capacidade volumétrica do estômago foi medida por meio de administração de leite com uma seringa até preenchimento total. No grupo I a média de peso dos natimortos foi de  $136.22 \pm 39,04$  g; no grupo II  $243.24 \pm 32,6$  g e no grupo III  $333 \pm 17,4$  g. A média da capacidade volumétrica dos estômagos dos animais do grupo I foi de  $3.52 \pm 1,79$  ml; do grupo II  $6.6 \pm 2,88$  ml e do grupo III  $7 \pm 1,91$  ml. Observou-se que a capacidade volumétrica dos estômagos de cães recém-nascidos aumenta com o porte do animal. Essas informações possibilitam o fornecimento de alimentação adequada a pacientes impossibilitados de ingerir o leite materno.

**Palavras-chave:** Canino; Estômago; Mensuração anatômica; Morfometria;

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## INTRODUCTION

Canine neonatology studies the newborn, the phase in which pups adapt to the extrauterine environment. The evaluation of newborns and the therapeutic approach adopted represent significant challenges to veterinarians. Prenatal care for pregnant dogs is directly related to the birth of healthy pups. However, the lack of knowledge in this area is quite evident, particularly in Brazil (Domingos et al., 2008).

Knowledge of the peculiarities inherent in this critical period of physiological adaptation of the newborn is essential for the decline in high rates of fetal and neonatal mortality. In addition to the advances in reproductive biotechnology, veterinary neonatology represents an area of rapid development (Lourenço; Machado 2013).

Neonatal mortality in dogs is high, and nutritional factors are one of the most important factors involved in mortality (Mila et al., 2015). The economic value of purebred pups as well as the increased emotional involvement of owners with their pets in the parturition process has resulted in increased interest in improving pup survival (Veronesi et al., 2009).

If the neonate does not gain weight because of either difficulty in breastfeeding or decrease in the mother's milk in the first two weeks of life, artificial feeding is recommended (Barreto 2003, Domingos et al., 2008).

Neonatal nutrition involves important factors such as colostrum ingestion in the first hours of life, enabling the acquisition of antibodies for immunological protection until administration of vaccines. If colostrum is not ingested, regardless of the cause, the

pups become dependent on humans for maternal care; therefore, a substitute for maternal milk should be assigned while considering the amount of calories and expiration date of commercial compositions. When providing homemade meals, one must always be attentive to the quality and quantity of water to be administered and the stomach capacity of the puppy (Barreto, 2003).

Basic morphological studies such as evaluation of the volumetric capacity of the stomach of neonates are necessary to support the correct management of the volume of food that must be provided to the canine neonate and, in this way, to avoid hyper or hyponutrition. There are few studies on morphometry in canine neonates. In dogs, there is a study on the body morphometry of stillborn neonates but with a smaller study population (Silva et al., 2015).

In view of the scarcity of morphological information on canine neonates, the objective of this study was to evaluate volumetric capacity of the stomach of stillbirths dogs to establish an average stomach capacity for artificial feeding.

## **MATERIALS AND METHODS**

The procedures performed during the experiment were approved by the Ethics Committee on Animal Experimentation at the institution where it took place (protocol 272/16).

Thirty-nine stillborn canine pups were examined. These stillbirths dogs were born from bitches who were treated at a veterinary teaching hospital.

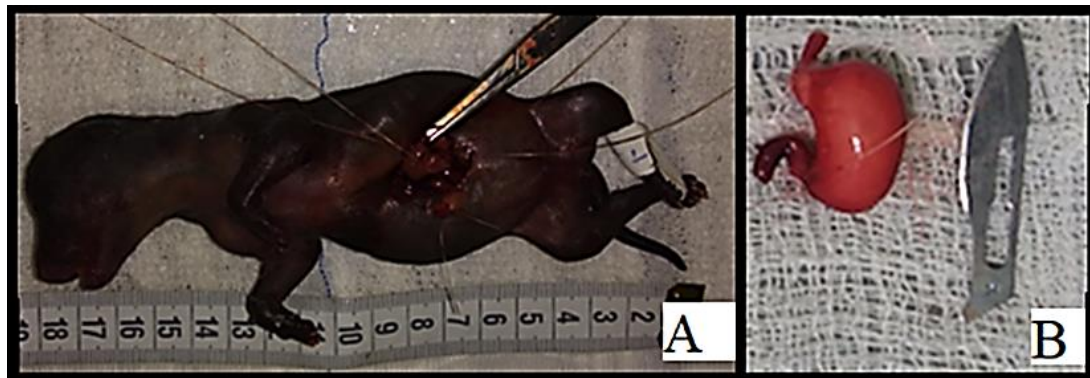
All stillbirths were weighed on a precision digital scale (Mars/AY220) to obtain the body mass. The pups were classified into three groups: Group I, small-sized dogs (0–199g); Group II, medium-sized dogs (weight ranging from 200 to 299g); and Group III, large dogs (over 300g) (Barreto, 2003).

After classification of the stillbirths, the abdominal cavity was opened, starting with an incision using a number 24 scalpel blade through the linea alba to expose the abdominal viscera (Figure 1A). The stomach was identified and excised. Outside the abdominal cavity, the stomach was ligated with cotton thread at both ends (cardia and pyloric sphincter regions) (Silva et al., 2015). The volumetric capacity of the stomach was evaluated by filling it with milk after ligation. For this purpose, a graduated syringe coupled to a needle (25×0.7) filled with natural milk was used. Milk was the liquid of choice because it best mimicked the process of administering the product to the neonate.

The stomach was filled via the cardia sphincter with milk until full repletion (Figure 1B), as measured by the turgidity of the organ under light digital pressure. The data were recorded in a table containing the volumetric capacities of the neonates (Silva et al., 2015).

The data obtained were tabulated in Excel 2011. A descriptive analysis of the study variables was performed to determine means and standard deviations.

**Figura 1** – Canine stillbirth obtained from a bitch with dystocic delivery treated in a Teaching Veterinary Hospital. A: Exposed abdominal viscera; B: Stillborn stomach filled with milk to measure volumetric capacity.



Source: The authors.

## RESULTS AND DISCUSSION

Regarding the sex of the neonates, 50.72% were female (20/39) and 49.28% were male (19/39). These data reflect that the birth of males and females is balanced in canine species (Vassalo et al., 2015).

In Group I pups (n=25), the general mean body mass and standard deviation were  $136.22 \pm 39.04$  g. The animals in group II (n=10) had a general mean and standard deviation of  $243.24 \pm 32.6$  g. In Group III pups (n=04), the average body mass with standard deviation was  $333 \pm 17.4$  g. (Table 1). Weight is one of the most important characteristics of very young animals (Domingos et al., 2008; Gropetti et al., 2015) and must be carefully recorded at birth. This conduct allows the identification of patients at risk, allowing adequate measures to be taken to increase the chances of survival of the

animals (Domingos et al., 2008). Low birth weight is accompanied by immature physiological processes that can lead to adaptive deficiency after birth (Lawler, 2008; Tonnessen et al., 2012), often associated with inadequate production or release of pulmonary surfactant (Lawler, 2008) which may predispose to neonatal mortality (Lawler, 2008; Tonnessen et al., 2012). Therefore, low birth weight should be considered as a prognostic factor for survival within the first 24 hours of birth, and special assistance should be given to low birth weight neonates to reduce perinatal mortality (Dodamani et al., 2017). However, the literature on the weight of newborn dogs is poor, especially in Brazil. In this way, the weight of the newborns in the study was carefully recorded, serving as a basis for professionals working in the field of neonatology. The data of the birth weight of the pups are similar to those observed in the literature that recorded the birth weight of canine pups in Brazil (Martin et al. 2005, Silva et al. 2015).

Table 1: Mean  $\pm$  standard deviation of weight and stomach volumetric capacity of small size (Group I), medium size (Group II) and large size (Group III) canine neonates (n=39)

<b>GROUP I (UP TO 199g)</b>		
	n	stillborn
Weight (g)	25	136.22 $\pm$ 39,04
Volumetric capacity (ml)	25	3.52 $\pm$ 1.79
<b>GROUP II (200–399g)</b>		
	n	stillborn
Weight (g)	10	243.24 $\pm$ 32.6
Volumetric capacity (ml)	10	6.6 $\pm$ 2.88
<b>GROUP III (ABOVE 300g)</b>		
	n	Stillborn
Weight (g)	04	333 $\pm$ 17.4
Volumetric capacity (ml)	04	7 $\pm$ 1.91

Regardless of the cause (including disappearance or rejection by the mother, agalactia, mastitis, numerous litters, lack of weight gain, or orphaned neonate), maternal care, nutrition, and providing an adequate environment is dependent on humans (Pascoal et al. 2007, Domingos et al. 2008). As puppies lose weight quickly, any difficulty in breastfeeding can lead to death (Barreto 2003). Therefore, if the puppy is unable to feed properly, it should receive a substitute diet similar to the canine milk; however, care must be taken with the amount of food provided, since excessive feeding can cause a risk of

overloading stomach capacity, abdominal discomfort, aspiration, and diarrhea in infants (Lawler 2008, Vannuchi; Abreu, 2017).

Morphological studies such as evaluation of the volumetric capacity of the stomach of neonates are necessary to support the correct management of the volume of food that must be provided to the animal and, thus, avoid hyper or hypofeeding (Silva et al. 2015). Considering these aspects, the stomach capacities of 39 stillbirths were measured. Separated into groups according to weight, stillbirths in groups I (up to 199g), II (199–399g), and III (above 399g) had a stomach capacity of  $3.52\pm 1.79$ ml,  $6.6\pm 2.88$ ml, and  $7\pm 1.91$ ml (Table 1), respectively. Therefore, the results showed that animal size was positively associated with the volumetric capacity, as reported in a previous study (Silva et al., 2015).

## CONCLUSION

The volumetric capacity of the stomachs of newborn dogs increases with animal size. This information makes it possible for the veterinarians to assess the supply of adequate food required by canine neonates who are unable to breastfeed (among other reasons).

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