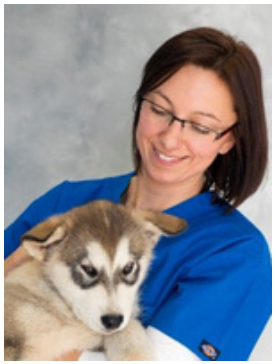

ARTIFICIAL FEEDING IN DOGS DURING THE NEONATAL PERIOD

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Introduction

In bitches, lactation occurs right after whelping or few days before. In the first day post-partum, the volume of colostrum ejected is low and it increases gradually, with the final mature milk yield adapted to the number of puppies within a litter. However, in some cases lactation onset is retarded or it does not appear at all (i.e. stress, C-section, other pathology) or the volume of milk produced is low (i.e. very large litter). In such cases, feeding with milk replacer is recommended in order to cover the nutritional requirements of puppies.

The choice of milk replacer

One would imagine the optimal milk replacer to be as similar in its composition to the canine milk as possible. Therefore, to choose milk replacer, it is necessary to know the composition of canine milk (see abstract entitled "Importance, composition and quality of canine colostrum" [1]). Not only the level of immunoglobulin changes during lactation, but also that of macronutrients and the total energy content, from colostrum rich in IgG and energy to milk rich in IgA and sugar. Therefore, optimally colostrum replacer should be administered to puppies during the first few days of life (until 3-4 days) and only afterwards the milk replacer.

Colostrum replacer

Commercial milk replacers contain only micro and macronutrients, vitamins and some supplements (i.e. DHA). No immune compounds are present, although colostrum is rich in many immunologically active elements, such as immunoglobulins, lactoferrin, cytokines, immune cells and others. Facing the absence of a canine colostrum, canine serum or plasma could be used in order to boost puppies' immunity at birth. None of the studies using serum supplementation administrated to puppies before the intestinal barrier closure demonstrated an increase in IgG comparable with that after the maternal colostrum ingestion. However, authors have evaluated effect of canine plasma supplementation on puppies from birth until weaning showing some benefits on health [2]. Indeed, puppies receiving 1.5ml/100g body weight of plasma from adult dogs since birth until weaning have greater growth rate, more rich and more diverse intestinal microbiota and lower morbidity during the neonatal period than puppies from the control group. Similar beneficial effect on puppies' health were demonstrated after administration of hyperimmune egg powder containing antibodies against *E.coli* and canine parvovirus.

Milk replacer

Many milk replacers are available on the market with large variability in their composition. In a recent work, authors demonstrated 3-fold difference in gross energy among the tested milk replacers [3]. Moreover, the energy content was comparable with that of the bitch only in 3 out of 15 tested milks.

Choosing a milk replacer, each product containing starch is to be directly excluded, as the secretion of amylase by both pancreas and intestinal villi is very limited in puppies before eight weeks of age. Thus, administration of such a milk replacer may lead to diarrhea. Bovine and caprine milk are to be avoided due to lower fat and higher sugar (lactose) contain, leading in puppies not only to retarded growth but also to digestive troubles. Higher lactose level in the bovine milk increases its osmolality causing slower stomach emptying (and thus vomiting) and water absorption into the digestive tube (and thus diarrhea).

Methods of artificial feeding

There are two methods of artificial feeding in puppies: bottle feeding or via a feeding tube.

Although bottle feeding is time-consuming, it is much closer to the natural feeding than the feeding tube technique. Suckling occurring during bottle feeding is not only relaxing for the newborn, but also it allows progressive secretion of the digestive enzymes. However, the suckling reflex is necessary for the bottle feeding. The risk of aspiration pneumonia exists using this technique and to avoid it, puppy should be hold

in the prone position and the size of the teat and its opening should be adapted to the size of the puppy.

If the suckling reflex is absent, the only possible feeding technique is the feeding tube. The length and diameter of the tube should be adapted to the size of the puppy (usually 6-8 Fr). Also, the flexibility of the tube is an important criterion, with a risk of mucous membrane irritation in case of too rigid tube or of wrapping of the tip in case of too soft tube. Milk should be administrated slowly to avoid bloating and colic (during about 1-2 minutes).

Feeding frequency

The administrated volume as well as the feeding frequency should be adapted to puppy age and energy requirements (Table 1). During the first days of life often feeding with small volume is recommended, which increases gradually with puppy's age. Administration of the maximal stomach volume should be avoided at the very early stage of life (5ml/100g body weight at birth).

Weight gain and body temperature should be monitored daily in all hand reared puppies (see abstract entitled "Monitoring of newborn dogs - who is at risk of death?"). Quality of feces should be also controlled: yellowish feces in healthy newborns. Green or white color may indicate low digestibility of the milk replacer and a change of the milk brand should be considered.

Table 1. Feeding frequency and energy requirements in puppies depending on age.

Age	Energetic requirements /kg body weight	Feeding frequency
1st week	291 kcal	8 meals/day
2nd week	251 kcal	5 meals/day
3rd week	228 kcal	4 meals/day
4th week	185 kcal	4 meals/day

References

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