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PREGNANCY IN THE BITCH – A PHYSIOLOGICAL CONDITION REQUIRING SPECIFIC CARE – REVIEW

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ABSTRACT

The physiology of canine pregnancy is characterised with specific features affecting the function of all organs and systems. The last third of pregnancy, when foetal development and growth are the most intensive, is particularly important. After the conception, the animals need not only extra care from their owners, but also veterinary medical monitoring of the bitch and foetuses for prevention or timely diagnosis of illnesses. The present review is focused on nutrition, antiparasitic treatment and vaccination of the pregnant bitch. Practical algorithms for prophylaxis and therapy are proposed. A special emphasis is placed on the role of these procedures on pregnancy course and maintaining, dam health and the vitality of neonates.

Key words: canine pregnancy, nutrition, prophylactic treatments.

Introduction

The physiology of canine pregnancy is characterised with specific features affecting the function of all organs and systems. Its last third when foetal development and growth are the most intensive, is the period carrying the highest risk of pathological deviations. Some of associated predisposing factors are continuous imbalanced nutrition – deficiency or excess of some nutrients, the specific hormonal profile (high progesterone, relaxin), inadequate rearing conditions, disturbances in digestive tract absorption, worsening of co-morbidities, stress, superfetation, different infectious and parasitic agents.

Pregnant bitches need extra care and attention. Apart the regular physical examinations, some of necessary measures are focused on prevention of metabolic disturbances, treatment against parasites and infections control.

Feeding during pregnancy

The mode of nutrition should be modified even before the onset of estrus (Kelley, 2002). The adequate meeting of energy demands of the body results in optimum body condition along with good muscle tone and low body fat percentage. This is achieved through adequate locomotor activity and balanced nutrition. The purpose is improved conception rates and physiological pregnancy ensured by the metabolism and the properly functioning endocrine system (Moser, 1992; Greer, 2014). Every correction in the feeding regimen should be gradually introduced. Thus, the risk from digestive troubles is significantly reduced (Girginov & Kallfeltz, 2008).

Dogs breeds predisposed to dystocia (bulldogs), terriers (Scotch, Boston, Yorkshire terriers) and miniature breeds are sensitive to feeding during the pregnancy. Both overnutrition and undernutrition exert negative effects on fertilisation and number of foetuses (Scantlebury et al., 2001; Kelley 2002). Poor body condition could entail metabolic disturbances during the pregnancy (gestational ketosis), impaired endocrine equilibrium, impaired placentation, uterine protein synthesis, increased neonatal death rates, eclampsia and insufficient milk production after the parturition (Kel-

ley, 2002; Wright-Rodgers et al., 2005; Johnson, 2008). The optimum weight by the end of pregnancy should not exceed the weight before mating by more than 15-25%, and postpartum: by 5-10% (Greco 2008). Apart the dietary regimen, this depends also on individual features of the dog, the number of foetuses, age of the bitch, locomotor activity etc. According to Münnich (2016), the body weight of the dam by the end of the pregnancy should be up to 36% higher.

The percentage of the nutrients in the ration should be as follows: proteins 27–34%, fat 18–20% with proper balance between omega-3 and omega-6 polyunsaturated fatty acids, carbohydrates 20–30%, 1% calcium and 0.8% phosphorus. Diets containing more than 40% carbohydrates on the account of proteins and fats are not suitable for pregnant animals (Kirk, 2001, Johnson, 2008). The energy demands of the bitch, respectively the amount of ingested food increase from 1.3 to 1.5 times until the end of gestation (Münnich, 2016). During the first 5-6 weeks, food intake increase is not necessary, although the appetite of the bitch is usually stimulated (Greco 2008). This could mislead owners and make them believe that the animal needs more food. Some animals experience reduced appetite, even vomiting between the 3rd and the 5th weeks after mating, that resolve spontaneously and do not require any treatment. The amount of food increases after the 35–40th day. As the uterus occupies a considerable part within the abdominal cavity, the extra amount of food should be offered in 2 or 3 smaller portions (Mosier, 1977; Schroeder and Smith, 1995; Heimendahl and Cariou, 2009; Kustritz, 2009). As the parturition approaches, some bitches could again exhibit inappetance during the last 2 weeks of pregnancy. Due to the intensive growth of the foetuses however, this is not associated with weight reduction (Johnson, 2008). Undernutrition, low energy content and poor absorption of food lead to impaired fetal growth manifested with hypotrophy of neonates. Their glycogen reserves are depleted. The undernutrition accompanied with high litter size is the main cause for occurrence of gestational ketosis. Small breeds are especially at risk (Meyer and Zentek, 2013). According to latest reports, the nutrition of pregnant bitches influences the fetal expression of genes, thus programming the type of metabolism during the postnatal life (Münnich, 2016).

A ration consisting of middle class to premium dry dog food with high energy content, easy digestible and containing all necessary minerals and vitamins is recommended. Home-made food is also good, although the needed ratios among high-quality proteins, carbohydrates, fat, calcium and phosphorus could be hardly achieved (Wright-Rodgers et al., 2005; Johnson, 2008).

Dietary protein and fat

During the pregnancy, dietary protein needs increase by up to 70% over maintenance levels (6.3 g protein per 100 kcal) (Kirk, 2001; Cline, 2012). Protein deficiency could result in disturbed placental function, hypotrophy of neonates, impaired fat metabolism and higher neonatal death rates (Ontko and Phillips, 1958; Greco, 2008).

Fat and omega-3/omega-6 unsaturated fatty acids are essential for meeting energy needs during pregnancy. Omega-3 fatty acids (recommended daily dose of 1000 mg per 20 kg body weight of the dam) are of utmost importance for the development of fetal nervous system as well as for immune system stimulation and retinal function (Bauer et al., 2004; Wright-Rodgers et al., 2005). The deficiency of essential fatty acids is associated with premature birth, emaciation of the dam, low weight of neonates at birth (Greco, 2008; Cline, 2012).

Pregnant bitches do not need vitamin and mineral supplements when their food is well-balanced and energetically and nutritionally complete. The excess of fat-soluble vitamins (A or D) and some macrominerals and trace elements (calcium, phosphorus, zinc, selenium, iron etc.) impairs the

absorption of other vitamins or minerals. The issuing metabolic disturbances are harmful for neonates (Johnson, 2008; Kustritz, 2009). Iron is important for erythropoiesis and a valuable aid for control of anaemia. The best source of iron are meat products. Vitamin C is essential for iron absorption in the digestive tract. It helps the production of collagen in tissues and immune system strengthening (Kealy et al., 2002). A controlled study with Boston terriers (Elwood and Colquhoun, 1997) demonstrated that puppies whose mothers were supplemented with folic acid (vitamin B9) during the pregnancy exhibited less frequently cleft palate. The recommended folic acid dose was 400 mcg for large, 200 mcg for medium-size and 50 mcg for small breeds.

Calcium is most needed after the 35th day of gestation. It is involved mainly in the development of fetal bones and teeth. Pregnant animals satisfy their needs with the usual diet (900 mg/kg food). If dietary Ca concentrations are low, it is supplied from maternal bones resorption. The supplementation of the bitch with calcium and vitamin D after mating is not only useless, but even harmful (Heimendahl and Cariou 2009). Under optimum feeding and rearing conditions and normal litter size, the increased demands for calcium are met by enhanced intestinal absorption, reduced excretion, restriction of dam's needs and utilisation of body calcium reserves. During pregnancy, the blood serum calcium concentrations of the bitch are sufficiently high. The increased intake of this macromineral (overdose) could inhibit the function of parathyroid glands. The low parathormone levels interfere with calcium utilisation and ultimately, could end up with a collapse at the time of whelping and start of lactation, where the needs from calcium are the greatest (Schoenmakers et al., 2000; Feldman and Nelson, 2004). Unnecessary supplementation with high doses of calcium during late pregnancy could induce deviations and pathological states as dystocia, eclampsia, soft tissue calcification, gastric dilation/volvulus in newborn puppies (Schoenmakers et al. 2000).

Treatment against endo- and ectoparasites

Ecto- and endoparasites are responsible for inadequate utilisation of nutrients from neonates, could induced digestive disorders, loss of electrolytes and anaemia, ocular or neurological diseases. Their control is of upmost importance (Payne-Johnson, 2000; Greer, 2014).

Most manufacturers rely on own research studies to demonstrate that the application of their produce in pregnant and lactating bitches is not associated to any risks. Dehelminthisation should be performed immediately before the breeding period and should not be repeated within 4 weeks in order to avoid matching with the first third of pregnancy. After wards, preventive treatments are started by the end of the second or last thirds of pregnancy. The application of antiparasitic drugs is especially efficient after the 43rd day of pregnancy, because this is the period of activation and development of larval stages to adult forms, in relation to specific maternal hormonal levels (increase in oestrogens) (Payne-Johnson, 2000).

Preparations considered safe for application to pregnant bitches contain the following active substances: Fenbendazole, Ivermectin, Pyrantel, Praziquantel, Selemectin, Milbemycinoxum. The European Scientific Counsel Companion Animal Parasites (ESCCAP, 2010; ESCCAP, 2011), and The Center for Disease Control and Companion Animal Parasite Council recommend different approaches to parasites' control in animals, including pregnant bitches. Various schedules are suggested to reduce efficiently transplacental and transmammary transmission of Toxocara canis, Ancylostoma caninum, Neospora caninum, Toxoplasma gondii etc. There are Protocols that can be used to reduce parasite transmission from mother to puppy. Most of them are off-label uses. The following schedules could be given as examples:

Variant 1) application of fenbendazole at 50 mg/kg once daily from the 40th day of gestation onwards to the 14th day postpartum during breastfeeding (approximately 37 consecutive days) (Greer, 2014). The sheets of commercial preparations containing fenbendazole (ESCCAP, 2011) recommend lower doses – from the 40th day of gestation to the 2nd day postpartum, single oral daily dose of 25 mg/kg, total for about 25 days.

Variant 2) application of ivermectin once weekly at 200 mcg/kg since the 5th week of gestation to the 3rd week postpartum. It was shown that this schedule reduced round worms and Ancylostoma populations in newborn puppies up to 98–100%. Against Ancylostoma caninum in particular, two treatments with ivermectin at 500 mcg/kg could be performed; the first 4 to 9 days before whelping and the second – 10 days apart (Greer, 2014). Ivermectin is prohibited for dogs carrying the MDR–1 gene (Australian shepherds, Border collies, Old English Sheepdogs, Shelties, German Shepherds, Bobtails, American White Shepherds).

Variant 3) application of selamectin 6 mg/kg locally to pregnant bitches 6 and 2 weeks before whelping, followed by treatments 14 and 42 days after whelping (Greer, 2014).

The control of fleas is successful with preparations containing fipronil, as the active substance does not enter the systemic circulation and thus is safe for pregnant animals (Greer, 2014).

Vaccinations

The safety of vaccination at the time of pregnancy and lactation is certified by own studies of bioproducts' manufacturers. Nevertheless, the best choice is to avoid any vaccinations. In case that it is compelling, vaccination should preferably be done during the second trimester of pregnancy. For buildup of durable immunity, vaccinations should be avoided 2 weeks before and after mating, as well as 14 days before the whelping is anticipated (Münnich, 2016).

The vaccine against canine herpes virus (CHV) – Eurican Herpes 205 (Münnich, 2016). The infection with CHV in adults is mild, with insignificant upper airways clinical signs (ocular and nasal discharge, cough) and could be easily mistaken for kennel cough. Herpes virus is able to pass through the placental barrier and could induce abortion (complete or partial), resorption or giving birth to dead fetuses, increased neonate death rates during the first weeks of life (Smith, 1997; Ström et al., 2012). The treatment is expensive and rarely successful, so preventive vaccination is the best option. Immunity is not durable therefore bitches carrying CHV are vaccinated during each pregnancy. Vaccination is done twice: once during the estrus or 7–10 days after tentative breeding date. Revaccination is done 1–2 weeks before the whelping date (Carmichael, 2004; Davidson, 2014; Münnich, 2016). Thus, the maternal immune system is stimulated to produce high antibody titres against CHV, which are transmitted to puppies through the colostrum (Carmichael 2004).

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