

The Fading Puppy Syndrome by Richard S. Marcus

Most breeders have had the experience of losing one or more puppies without a readily identifiable cause. This perplexing and heart-breaking problem can lead to a sense of guilt, failure and even incompetence. It can also cause concern over the "breedability" of the dog or bitch involved in the breeding. Many causes of neonatal mortality can be explained by such causes as crushing by the mother, infection, congenital anomalies, premature birth and parasites to name a few. Blunden found surveys of mortality in neonates ranging from 20-30% throughout the world. Johnson found that of puppies born alive, 28% died within the first week of life and another 10% died within the second week. In a study of 518 puppies by Blunden, 8.3% were stillborn while 32% died within the first three weeks of life. Of those that died, 45% died due to causes that were readily identifiable. The other 55% (which amounted to 83 puppies) died of unknown causes. After careful autopsy, these deaths were attributed to the fading puppy syndrome. The syndrome can be described as a complex of disorders that strike puppies that were apparently normal at birth. The syndrome usually presents as a triad of hypothermia, dehydration and hypoglycemia. Puppies are affected shortly after birth and usually will die within 4 - 5 days of first showing symptoms. In this article, I hope to review the symptoms, causes, treatment and prevention in such a way as to help the breeder dramatically reduce its incidence in their puppy population. I urge breeders to work in concert with their veterinarians who are skilled in the early recognition and treatment of some of the processes described below.

Symptoms include lethargy and a weak sucking response in the first two days. This progresses to restlessness, crying, lying on one's side with limb paddling and, occasionally shivering. Holst points out that if crying persists for fifteen minutes or longer, a cause should be sought. A healthy pup who is hungry will cry itself to sleep in less than fifteen minutes whereas one who cries for a longer period of time is in trouble. One of the first things a breeder can check for is hypothermia. Hypothermia is a cooling of the core body temperature below normal. Normal body temperature for the first two weeks of life is from 94-97 degrees F. Hypothermia's causes can be due to something as simple as separation from the mother to the complexity of an overwhelming infection. A core temperature in the range of 78-85 degrees F will cause severe metabolic depression accompanied by cessation of digestive activity. Holst advised against giving food to a puppy whose rectal temperature is below 94 degrees F because of digestive inactivity. She also cautions against rapid warming. Rapid warming will cause the skin and extremities to warm, but the heart and lungs, due to metabolic depression, will not be able to supply the oxygen needed to keep up with the greater metabolic demands of the warm extremities. The puppy should be warmed slowly in an environment with a relative humidity of approximately 60% to prevent dehydration. An ideal means of accomplishing this is by simply holding the puppy next to your own body until a normal temperature is reached, then transfer the puppy onto a heating pad or into an incubator. Lewis, et. al, recommends that warming take place over a period of three hours. He has observed that mothers usually reject hypothermic pups but readily accept them back after rewarming. It is at this point that the puppy can be safely hydrated and evaluated for other problems.

The problem of dehydration must be addressed. This is usually accompanied, at this point in the syndrome, by hypoglycemia (low blood sugar). Both of these problems can be dealt with by feeding the puppy a solution of sugar water (four teaspoons of sugar per 4 ounces of water). The solution should be warmed to approximately 95 degrees F so as not to offset the efforts achieved by

rewarming the puppy. This is then fed at the rate of two cc's every 30 minutes per eight ounces of puppy body weight. This can easily be measured and administered by mouth using a disposable plastic syringe with the needle removed.

Infectious causes of fading puppy syndrome include peritonitis, septicemia, herpes virus, canine brucellosis, toxoplasmosis, infectious canine hepatitis, *Clostridium perfringens* and toxins from bacterial infections. Poor prenatal nutritional status in the bitch can also lead to a litter plagued with this syndrome. Peritonitis is a bacterial infection of the abdominal cavity that usually comes from contamination of the umbilical cord due to poor birthing technique. Symptoms include crying, bloating and an abdomen that is somewhat rigid and tender to palpation. Septicemia is an infection that spreads through the blood stream and is also bacterial in origin. It is often caused by Strep or Staph which are bacteria that are usually found on the skin. Therefore it is postulated that the source of this infection is usually from poor sterile technique in docking tails, clipping dew claws, or cutting the umbilical cord. *E. Coli* is another common pathogen, but this is usually found residing in the gut and may be indicative of a congenital anomaly of the gut or urinary tract. Symptoms can be similar to those of peritonitis except careful inspection of the puppy will usually reveal an area of local infection such as at the site of a newly clipped dew claw, umbilicus or tail. Herpes is contracted during whelping and is known to be a cause of abortion, stillborn or low-birth weight pups. It generally affects pups during the first three weeks of life because of their low body temperatures. Once body temperatures go above 100 degrees F, it usually ceases to be a problem. Symptoms according to Holst include soft, odorless, yellow-green stool, depression, anorexia, uneasiness and continuous painful crying. Once herpes related crying has begun, viability is seriously compromised. Survivors at this stage usually have significant renal or hepatic impairment.

There are two modes of treatment available. The first is to raise the environmental temperature to 100 degrees F for a minimum of three hours, then reduce it to 95 degrees F for the next 21 hours. Since the virus replicates at temperatures between 95 and 96 degrees F, this should interfere with the virus's survival.

One must remember that maintaining the puppy at these temperatures will increase its fluid and nutritional needs. The second form of treatment which is that used for humans is with a drug called acyclovir, which is available in both an IV and oral form. (At the time of writing this article, I was unable to find literature pertaining to its use in the canine.)

Clostridium perfringens Type A has been recovered with some frequency from the genital tract of both bitches and stud dogs with a history of neonatal loss according to Blunden. The organism can then be cultured from fecal samples of puppies as soon as 24 hours after birth. The organism effects the gut much as a stomach virus effects us. Canine Brucellosis is caused by the *Brucella canis* bacterium and is transmitted by vaginal and mammary secretions in an infected bitch and via semen in the dog. Recovery may take in excess of two years. Screening is relatively simple.

Hyaline membrane disease is a disease that affects the lungs of premature infants due to immature lungs that don't have sufficient quantities of surfactant, a substance that helps the alveoli (the smallest air sacs) remain open. Surprisingly, research by Blunden, et. al., has not shown this to be a component of the fading puppy complex.

Methods of prevention are obviously what any breeder should turn their attention towards. The breeding pair should be tested for the above mentioned infectious organisms prior to breeding. The utmost of care should be used and sterile techniques employed for tail docking, dew-claw clipping and the securing of the umbilical cord. Fisher feels that perigestational malnourishment of

the bitch contributes significantly to the mortality of neonatal puppies. He observes that the clinical signs of malnutrition include an "out of condition" appearance often unnoticed until just after birth, uncontrollable diarrhea during lactation, the fading puppy syndrome, lactation problems and anemia.

Lewis, et. al., recommends that the bitch be examined, checked for parasites, vaccinated if necessary and weighed. It has been found that markedly under or overweight bitches tend toward dystocia, premature birth and the inability to make adequate amounts of colostrum or milk. The hematocrit (percentage of red blood cells in the plasma) should be greater than 37%; the hemoglobin (the oxygen carrying component of red blood cells) should be greater than 10 g/dl. The total serum protein should be greater than 5 g/dl. A growth/lactation diet should be fed during pregnancy. This consists of a diet containing greater than 29% protein, at least 17% fat and less than 5% fiber. Calcium should be between 1 - 1.85%, phosphorus between 0.8 - 1.6 % and sodium 0.3 - 0.7. The ratio of calcium to phosphorus should be greater in the direction of calcium. Over supplementation of calcium and vitamin D can lead to soft-tissue calcification and physical anomalies in the puppies. It does not help prevent eclampsia. Carbohydrate free diets (such as meat only diets) causes hypoglycemia (low blood sugar) late in the gestational period. One should look for a 15-25% increase in the bitches body weight by the time of whelping due to the rapid increase in fetal size during the last 3-4 weeks of gestation. This may represent as much as a six pound weight gain in the Corgi. The increased size of the uterus may encroach on the filling capacity of the stomach and subsequently multiple feedings may be necessary in the latter period of gestation in order to allow the bitch to have an adequate nutritional intake.

During lactation, the bitches nutritional demands markedly increase. Assuming that the bitch was at optimal weight at the time of whelping. Lewis recommends increasing the amount of food by 1 1/2 that of maintenance for the first week of lactation, by 2 times for the second week and by a factor of three for the third week through weaning. Of course this varies with litter size. If the bitch is in her optimal nutritional state, this should assure adequate amounts of colostrum for all of her puppies.

In conclusion, mysterious neonatal mortality in puppies is hopefully now less mysterious. A concerted effort should be made to identify a puppy in trouble early on. If that puppy is hypothermic, slow rewarming should be instituted immediately then rehydration after a core temperature of 95 degrees F is reached. Next, a careful veterinary examination should be done to rule out an infectious or congenital cause. More importantly, screening of the breeding pair for Brucellosis and Clostridium perfringens should be performed in the name of prophylaxis. Lastly and perhaps most important is assuring the optimal nutritional status of the bitch.

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