

For Veterinarians only



Health Management of Neonatal Puppies

Dear Vets,

The neonatal period is the most vulnerable stage of canine life, characterized by the physiological immaturity of thermo-regulatory, immune, gastrointestinal, renal and metabolic systems. Their complete dependence on maternal care and environmental support makes them highly vulnerable to a variety of health challenges, many of which can rapidly progress to life-threatening conditions if not recognized and managed promptly.

Despite significant advancements, neonatal mortality continues to be a major concern in canine breeding and clinical practice. Conditions such as hypothermia, hypoglycemia, dehydration, inadequate colostrum intake, infectious diseases and congenital abnormalities remain important contributors to neonatal losses. However, many of these challenges are preventable through diligent monitoring, early intervention, proper environmental management and adequate nutritional support.

In this issue, we highlight the key physiological characteristics of neonatal puppies, common causes of morbidity and mortality, and practical approaches to improve neonatal survival and wellbeing. Special emphasis has been placed on the importance of early neonatal assessment, maintenance of optimal environmental conditions, disease prevention, and ensuring appropriate nutritional care during this critical developmental window.

Your feedback is invaluable to us. We invite you to share your suggestions and comments by scanning the below QR code. You may also reach us at petpod@intaspharma.com for any queries or feedback.

Editorial Team

Dr. Batul Ranasiya
Dr. Harshraj Joddha
Dr. Jaydip Parmar
Dr. Rahul Patel
Dr. Venkata Krishna N.



Neonatal period in puppies extends from birth to 2-3 weeks of age and is recognized as the most critical phase of postnatal development. During this period, puppies are physiologically immature (altricial) and entirely dependent on maternal care for thermoregulation, nutrition, hydration and immune protection. The transition from intrauterine environment to extrauterine life requires rapid adaptation of respiratory, cardiovascular, gastrointestinal and thermoregulatory systems. Immediately after birth, a systematic assessment of neonatal viability should be performed. Consequently, even minor disturbances during this stage can significantly affect survival and long-term health.

Neonatal Physiology

Neonatal period is characterized by rapid physiological adaptation and growth. During this time, puppies are completely dependent on maternal care for nutrition, warmth, and elimination because their thermoregulatory, neurological, immune and gastrointestinal systems are still immature.

At birth, puppies possess:

- Immature thermoregulatory mechanism
- Limited energy reserves
- Incomplete immune competence
- Reduced renal concentrating ability
- Underdeveloped gastrointestinal and hepatic functions

Because of these limitations, even minor disturbances in temperature, hydration or nutrition can rapidly result in clinical deterioration. The normal physiological parameters are summarized as below.

Table 1: Normal physiological parameters

Parameter	Week 1	Week 2	Week 4
Temperature, rectal	96-98°F	96-99°F	100°F
Ambient temperature	85-90°F	80-85°F	75-80°F
Contact surface	90-95°F	85-90°F	-
Heart rate and blood pressure	96-98°F	96-99°F	100°F
Respiratory rate	15-35/min	15-35/min	15-25/min
Mucous membranes / CRT	Pink to hyperemic if recently nursed	Pink / One second	Pink / One second
Urine color	Very pale yellow, <1.020	Very pale yellow, <1.020	Pale yellow
Weight	May lose up to 10% in first 3 days after birth. Birth weight: Tiny 100-200 g; Large 400-500 g; Giant 700 g	Gain 5-10% daily; may double birth weight by day 10. Expected gain: 2-4 g/day/kg anticipated adult weight	Calculate expected gain of 2-4 g/day/kg anticipated adult weight
Activity	Sleeps and eats ~90% of time; twitches while sleeping; movement is a crawl; nurses and snuggles with littermates	Sleeps and eats ~90% of time; twitches while sleeping; begins supporting on forelegs; nurses aggressively; limited interaction	Begins to stand and walk by day 21; starts playing with littermates and toys when eyes open; can sit; more sturdy
Body tone and Reflexes	Flexor dominance for first 4 days, then extensor. Righting, rooting, weak withdrawal reflexes present.	Extensor dominance, righting, rooting, crossed extensor reflexes. Withdrawal reflex developing.	Approaching normal adult reflexes. Suckling reflex and crossed extensor reflex disappear.
Vision and Hearing	No vision but blink, response to bright light. Limited hearing.	None to limited vision and hearing. Menace present but initially slow. Limited hearing. Waxy discharge.	Blurry vision; pupillary light reflex present within 24 hours of eyelid opening; responds to visual and auditory stimuli.



Neonatal Vulnerabilities and Challenges

During neonatal phase, puppies are physiologically immature and entirely dependent on their dam and environment for survival. Their thermoregulatory mechanisms are poorly developed, making them highly susceptible to hypothermia. Similarly, limited glycogen reserves and an immature metabolic system predispose them to hypoglycemia, particularly when nursing is inadequate. Immune system is also underdeveloped, relying heavily on passive immunity and failure to receive adequate colostrum can significantly increase the risk of infectious diseases and mortality.

In addition to physiological vulnerability, neonatal puppies face several management and environmental challenges. Inadequate maternal care, insufficient milk production, overcrowding, poor hygiene, and inappropriate environmental temperatures can adversely affect growth and survival. Since neonates possess limited energy reserves and an immature stress response system, even minor health disturbances can rapidly become life-threatening. Neonatal infections, septicemia, congenital abnormalities, birth trauma, dehydration, and fading puppy syndrome are among the leading causes of morbidity and mortality during this stage.



Causes of Neonatal Morbidity and Mortality

The average neonatal mortality rate in puppies is 15-20%, but can vary from 5-40% depending on the breed and the sanitary conditions in breeding kennel or cattery. Morbidity rates are even higher, affecting approximately 34% of litters. Most neonatal deaths occur during the first week and are commonly associated with birth asphyxia, hypothermia, hypoglycemia, dehydration, inadequate colostrum intake and poor environmental conditions. In majority of cases, neonatal puppies present hypothermia (rectal temperature < 93.2 °F), hypoglycaemia [glucose < 2.22 mmol/L (40 mg/dL)] and dehydration, frequently occur together and constitute a life-threatening condition, the **Neonatal Triad**. This syndrome can rapidly compromise neonatal health and if untreated, may result in significant morbidity or death.

Apart from this, neonatal morbidity and mortality in puppies can also arise from infectious and non-infectious causes. Infectious causes such as bacteria, virus and parasite. Common bacterial pathogens include *Escherichia coli*, *Brucella canis*, *Bordetella bronchiseptica*, *Leptospira spp.* and *Salmonella spp.*, which may lead to severe conditions such as septicemia. Viral pathogens include Canine Adenovirus type 1 (CAV-1), Canine Coronavirus (CCoV), Canine Herpesvirus (CHV-1), Canine Parvovirus type 2 (CPV-2) and Canine Distemper Virus (CDV). Parasitic infections associated with neonatal illness include *Neospora caninum*, *Leishmania infantum*, *Toxoplasma gondii*, *Toxocara spp.*, *Giardia spp.*, *Cryptosporidium spp.*, *Coccidia* and *Ancylostoma spp.* Non-infectious causes include congenital abnormalities, hypoxia, hypothermia, hypoglycemia, toxic milk syndrome, and trauma. Due to the immature immune system and limited physiological reserves of neonatal puppies, both infectious agents and environmental or metabolic disturbances can rapidly lead to serious illness or death.

Bacterial Septicemia is a major cause of neonatal mortality implicated in approximately 40-65% of neonatal deaths. The organisms most frequently isolated from affected puppies include *Escherichia coli*, *Streptococcus spp.* and *Staphylococcus spp.* Neonatal puppies possess an immature immune system and underdeveloped mucosal defense mechanisms, making them highly susceptible to systemic bacterial infections. Conditions such as hypothermia and hypoglycemia can further impair mucosal barrier function, promoting bacterial translocation from gastrointestinal tract into bloodstream and resulting in septicemia, a condition associated with high mortality. Clinical signs of neonatal septicemia are often non-specific and may include lethargy, fading, anorexia, decreased suckling reflex, diarrhea, vomiting, hypothermia and failure to gain weight. Neonatal bacterial peritonitis accompanied by septicemia can cause rapid clinical deterioration and death if not recognized and treated promptly.

Several factors have been associated with an increased risk of septicemia in neonatal puppies, including:

- Maternal endometritis or other reproductive tract infections
- Prolonged labor or unrecognized dystocia
- Feeding of milk replacer formulas instead of maternal milk
- Administration of antibiotics, which may alter normal gastrointestinal flora
- Environmental or handling stress
- Low birth weight
- Chilling and body temperature below 35.5°C

Early recognition and prompt correction of hypothermia, hypoglycemia, dehydration, hypoxia and infectious diseases are essential for improving survival rates in neonatal puppies.

Table 2: Common causes of morbidity and mortality

Category		Very pale yellow, <1.020
Infectious	Bacterial	<i>Brucella canis</i> , <i>Bordetella bronchiseptica</i> , <i>Leptospira</i> spp., <i>Salmonella</i> spp.
	Viral	Canine Adenovirus Type 1 (CAV-1), Canine Coronavirus (CCoV), Canine Herpesvirus (CHV-1), Canine Parvovirus type 2 (CPV-2), Canine Distemper Virus (CDV)
	Parasitic	<i>Neospora caninum</i> , <i>Leishmania infantum</i> , <i>Toxoplasma gondii</i> , <i>Toxocara</i> spp., <i>Giardia</i> spp., <i>Cryptosporidium</i> spp., <i>Coccidia</i> , <i>Ancylostoma</i> spp.
Non-infectious	Congenital and Metabolic Disorders	Congenital defects, Hypoxia, Hypothermia, Hypoglycemia
	Maternal and Environmental	Toxic milk syndrome, Trauma



Neonatal Care and Management

Effective neonatal management comprises three fundamental pillars: **effective resuscitation at birth, optimal environmental management, adequate nutritional support and disease management**. Together, these interventions ensure a smooth adaptation to extrauterine life, promote healthy development, and significantly improve survival rates during this crucial stage.

Effective Resuscitation at birth

Neonatal resuscitation aims to establish effective breathing, adequate oxygenation, circulation, thermoregulation and nursing behavior immediately after birth. Initial assessment should follow below steps:

Resuscitation steps (ABC Approach):

A) Airway

- Remove fetal membranes from face.
- Clear oral and nasal secretions using a bulb syringe or gentle suction.
- Avoid excessive swinging of puppies, as it may cause cerebral injury.

B) Breathing

- Dry puppy vigorously with a warm towel to stimulate respiration.
- Provide tactile stimulation by rubbing the thorax.
- If apnea or gasping persists, administer positive-pressure ventilation using a small face mask and oxygen supplementation.
- Early ventilation is the most important lifesaving intervention.

C) Circulation

- Assess heart rate.
- Heart rate >120 bpm generally indicates adequate perfusion.
- If heart rate remains extremely low or absent despite ventilation, initiate chest compressions and advanced resuscitation measures.

Optimal Environmental Management

Environmental control is fundamental, as newborn puppies possess immature thermoregulatory mechanisms, limited energy reserves, and a high susceptibility to hypothermia, dehydration, and infectious diseases. During the first few weeks of life, puppies are unable to effectively regulate their body temperature and therefore depend entirely on the external environment and maternal care for warmth. The whelping area should be maintained at an appropriate ambient temperature, with warm, dry, and clean bedding, while avoiding drafts and sudden temperature fluctuations. Adequate humidity should also be maintained to minimize dehydration and support respiratory health.

Adequate Nutritional Management

Appropriate nutritional management during the neonatal period is one of the most critical determinants of puppy survival, growth, and long-term health. Neonatal puppies undergo rapid physiological development during the first few weeks of life and depend almost entirely on maternal milk to meet their nutritional, immunological and energy requirements. Unlike adult dogs, newborn puppies have immature digestive, thermoregulatory, immune, and metabolic systems, making them particularly vulnerable to nutritional deficiencies and environmental stressors. Consequently, inadequate nutritional support during this period can quickly result in weakness, hypoglycemia, hypothermia, dehydration, impaired growth, increased susceptibility to disease and mortality.

Under normal circumstances, healthy maternal milk supplies all nutrients required for optimal neonatal development. However, various situations may compromise nursing and necessitate supplemental or complete artificial feeding. Common indications include orphaning, large litter sizes, inadequate milk production (agalactia), mastitis, maternal illness, poor maternal behavior, abandonment, congenital abnormalities preventing nursing and weakness in individual puppies. In such cases, carefully implemented nutritional intervention can significantly improve survival rates and developmental outcomes. Canine milk is considerably different from bovine milk and is specifically adapted to meet the demands of rapidly growing puppies. It contains relatively high concentrations of protein and fat while maintaining moderate lactose levels. This unique composition provides a concentrated source of energy that supports growth and thermoregulation. Compared with cow's milk, bitch's milk contains:

- Higher protein concentration
- Higher fat content
- Greater energy density
- Lower lactose concentration
- Balanced calcium and phosphorus levels
- Essential fatty acids and fat-soluble vitamins

Because of these differences, cow's milk should not be used as a routine substitute for neonatal puppies. Therefore, specially formulated canine milk replacers should be used whenever maternal milk is unavailable. Successful formula feeding requires attention not only to the volume and frequency of feeding but also to environmental temperature, hydration, weight monitoring and proper feeding technique.

Milk Replacer

An ideal canine milk replacer should closely mimic the nutritional profile of canine milk while providing highly digestible nutrients that support the rapid growth and physiological development characteristic of the neonatal period. Properly formulated milk replacers help maintain body weight, support organ maturation, reduce the risk of nutritional deficiencies, and improve survival rates among neonates.

Optipup is a scientifically developed canine milk replacer formulated to closely mimic maternal milk and meet the specific nutritional requirements of neonatal puppies. It supports healthy growth, digestive function, immune competence and neurological development during the critical first few weeks of life.

Key Nutritional Benefits

1. **Essential Amino Acids:** The inclusion of five essential amino acids supports tissue growth and muscle development, enhances enzyme synthesis, facilitates the clearance of toxic urea waste, and strengthens immune function. It also promotes optimal liver function, aids internal detoxification processes, and contributes to maintaining healthy skin and a glossy coat.
2. **Optimal Fat Content and Essential Fatty Acids:** Fat serves as the primary energy source for growing puppies and provides approximately twice the energy density of carbohydrates or proteins. It contains high-quality fats along with essential fatty acids, including Omega-3 and Omega-6 fatty acids, which are required for cell membrane integrity, skin health and immune regulation. The inclusion of Docosahexaenoic Acid (DHA) plays a particularly important role in brain and retinal development. Adequate DHA intake during the neonatal period has been associated with improved cognitive function, learning ability, visual acuity, and neurological maturation.
3. **Balanced Vitamins and Minerals:** Growing puppies require precisely balanced levels of vitamins and minerals to support growth and development. Excesses or deficiencies during the neonatal period may adversely affect puppy's overall growth. The balanced nutrient composition supports immune function, antioxidant defense mechanisms, energy metabolism, hematopoiesis and overall growth. The inclusion of SunActive Iron (micronized water-dispersible ferric phosphate) provides a highly bioavailable and well-tolerated source of dietary iron. It helps prevent and manage iron-deficiency anemia and unlike conventional iron salts, **SunActive Iron** offers superior gastrointestinal tolerability and avoids the unpleasant metallic taste commonly associated with iron supplementation, making it particularly suitable for neonatal and growing puppies.
4. **Gastrointestinal and Immune Support:** Neonatal intestine undergoes rapid growth and functional maturation during the first few weeks of life, making gastrointestinal support critical for optimal health and development. This formulation contains a synergistic blend of prebiotics and probiotics, including **Bacillus subtilis**, **Mannan-oligosaccharides (MOS)**, and **Fructo-oligosaccharides (FOS)**. Working together as a **synbiotic system**, maintain a balanced gut microbiota by surviving gastrointestinal environment and promoting the growth of beneficial microorganisms. They enhance nutrient digestion and absorption, competitively inhibit pathogenic bacteria, strengthen intestinal barrier function, and support the development of a robust immune system.

Feeding Techniques

Appropriate feeding techniques are essential for ensuring adequate nutrition, growth and survival of neonatal puppies. The two primary methods of feeding include bottle feeding and tube feeding, with the choice depending on the puppy's age, health status and suckling ability.

- **Bottle Feeding:** It is appropriate for alert puppies with a strong suckling reflex. Puppy should be placed in a natural nursing position with the body in sternal recumbency. Feeding puppies in dorsal recumbency should be avoided because it substantially increases the risk of aspiration and pneumonia. Nipple opening should allow slow milk flow. Excessively large openings may cause aspiration, whereas very small openings increase feeding time and energy expenditure.
- **Tube Feeding:** It is useful for weak, premature or orphaned neonates that cannot suckle effectively. It often allows accurate administration of nutritional requirements while minimizing stress and energy expenditure.

Monitoring Nutritional Adequacy

Daily body weight measurement is the most reliable indicator of successful neonatal nutrition. Birth weight varies with breed size, but healthy puppies should begin gaining weight within the first 24 hours after birth. After a transient weight loss of up to 10% during the first few days, puppies are expected to gain approximately 5-10% of their body weight daily and typically double their birth weight by 7-10 days of age. Consistent weight gain is one of the most reliable indicators of neonatal health and adequate nutrition. Conversely, adequate nutrition may be manifested by;

- Regular weight gain
- Quiet behavior between feedings
- Strong suckling reflex
- Good hydration
- Warm body temperature
- Normal stool consistency



Disease Management

Infectious diseases are among the most significant causes of morbidity and mortality in neonatal puppies, particularly during the first few weeks of life when both innate and adaptive immune mechanisms are immature and not fully functional. During this critical period, neonatal puppies are dependent on maternally derived immunoglobulins, and failure of passive transfer substantially increases the risk of septicemia, parasitemia and other neonatal infections. Additional risk factors such as poor maternal health, unsanitary whelping environments, overcrowding, hypothermia, malnutrition, and inadequate nursing further compromise neonatal immunity and predispose puppies to both bacterial and parasitic diseases.

The management of bacterial infections in neonatal puppies is particularly challenging due to the physiological immaturity of major organ systems, which alters antimicrobial pharmacokinetics and increases the risk of drug toxicity. Successful management of infectious disease extends beyond antimicrobial therapy and must include comprehensive supportive care. Correction of hypothermia, dehydration, hypoglycemia, and electrolyte imbalances is often critical to survival. Parasitic control is another essential component of neonatal health management. Puppies are commonly infected with intestinal nematodes, particularly Ascarids, through transplacental transmission and transmammary transmission. These parasites can establish infection very early in life and may contribute to poor growth, malnutrition, diarrhea, anemia, impaired immune function, and increased susceptibility to secondary bacterial infections. Consequently, deworming should be initiated as early as 2 weeks of age. Administration of anthelmintic containing Pyrantel and Febantel (**Eazypet Puppy**) is recommended to effectively control early nematode infections. Early and routine deworming not only protects the individual puppy but also reduces environmental contamination with infective parasitic stages, thereby decreasing infection pressure within the litter.

Effective disease management in neonatal puppies requires a holistic approach that combines adequate passive immune protection, early diagnosis, judicious antimicrobial therapy, supportive care, and timely parasite control. Appropriate management of bacterial and parasitic infections, together with optimal nutrition, hygiene and environmental conditions, is essential for reducing neonatal morbidity and mortality and promoting healthy growth and development.



Conclusion

Neonatal period represents the most vulnerable stage of canine life, during which physiological immaturity of thermoregulatory, immune, gastrointestinal, renal, and metabolic systems predisposes puppies to a high risk of morbidity and mortality. Successful neonatal management is founded on three interdependent pillars: effective resuscitation at birth, optimal environmental management and adequate nutritional support. Early identification and correction of hypothermia, hypoglycemia, dehydration, hypoxia and infectious diseases are critical for improving neonatal survival. When maternal milk is insufficient or unavailable, the use of a scientifically formulated canine milk replacer that closely mimics the composition of maternal milk can help meet the nutritional, developmental, and immunological requirements of neonatal puppies. Collectively, a proactive and systematic approach to neonatal care can substantially reduce mortality, enhance growth and development, and establish the foundation for optimal long-term health and wellbeing.



References

1. Aydemir, M. and Erdoğ̃an, H.M. (2025). A Review on Colostrum and Neonatal Canine Health. *Turkish J. Vet. Internal Med.* **4**: 29-39.
2. Case, L.P., Daristotle, L., Hayek, M.G. and Raasch, M.F. (2011). Canine and Feline Nutrition: A Resource for Companion Animal Professionals, 3rd ed. St. Louis, MO: Elsevier Mosby.
3. Davidson, A.P. (2025). Management of the Neonate in Dogs and Cats. *Merck Veterinary Manual*. Updated.
4. Greer, M.L. (2016). Neonatal care. *Clin. Theriogenol.* **8**: 171-187.
5. Grundy, S.A. (2023). Canine Neonatal Health. *Vet. Clin. North America: Small Anim. Pract.* **53**: 1161-1193.
6. Kesler, R. (2021). Understanding Canine Neonatology. *Royal Canin Scientific Services*.
7. Pereira, K.H.N.P., Fuchs, K.D.M., Corrêa, J.V., Chiacchio, S.B. and Lourenço, M.L.G. (2022). Neonatology: Topics on Puppies and Kittens Neonatal Management to Improve Neonatal Outcome. *Animals* **12**: 3426.
8. Pereira, K.H.N.P., Fuchs, K.D.M., Mendonça, J.C., Xavier, G.M., Câmara, D.R., Cruz, R.K.S. and Lourenço, M.L.G. (2024). Neonatal Clinical Assessment of the Puppy and Kitten: How to Identify Newborns at Risk? *Animals* **14**: 3417.

ALL STAGES OF PUPPYHOOD DEMAND SPECIAL SUPPORT AND CARE



CaniShot®

Unique Protection for the Ones We Love

Eazypet®
PUPPY

Help them to overcome the first hurdle

OPTIPUP®

Weaning formula

Zip®
Vit

Multi-vitamin and Amino Acids Tonic

® Registered Trademark of Intas

® Trademark of Intas



Printed and Published by
TECHNICAL CELL

INTAS PHARMACEUTICALS LIMITED,

Corporate House, Near Sola Bridge, Sarkhej-Gandhinagar Highway, Thaltej, Ahmedabad - 380054. Gujarat. INDIA

E-mail: petpod@intaspharma.com | Telephone: +91 (79) 61577000, 61577843

Website: www.intasanimalhealth.com | Corporate website: www.intaspharma.com

2233273