

## Neonate illness and recovery, and potential long term effects

The Liver is what filters our blood, and in the neonate the liver is not yet fully formed, and functional tests of normal puppies have shown that glomerular filtration rates at birth range only 20-50% as that of an adult, this leads to slow filtration of toxins increased sodium levels and inability to conserve fluids. This in combination with an immune attack whether it is from a virus or bacteria can lead to multiple problems within the liver. An overworked, immature liver may not form properly through the sickness, leading to blood filtering problems in the future. Most of the time the liver is not effected, but certain illnesses, especially long lived ones can cause secondary problems with formation. Among these are several EBV associated infections, like hepatitis and even mild elevations of alkaline phosphates at 60% rate of liver damage, as well as mild elevations of aminotransferases, that last up-ward of two weeks of illness can result in a 90% rate of liver damage. Cytomegalovirus (CVM) a member of the Herpes family, if infected as a neonate can have 60-100% seroprevalence in adults. The true canine herpes also gives lasting damage to neonates at a rate of 62% with acute liver failure as a young adolescent. There are also several mosquito viruses that will effect liver development, these include Zoonotoc also know as breakbone fever' as well as a viral hemorrhagic fever. There are however more problems associated with bacteria effecting the liver long term. Even the indirect impact of these infections that are seen with the common sepsis, have dramatic effects. The formation of abscesses is a common problem form many bacterial infections. Brucellosis which is the common kennel cough if infected as a neonate can cause lesions formation, granulomas, bile duct calcification, and hepatomegaly and these symptoms can take up to a year to manifest.

The heart is another sensitive organ for neonates that can have lasting effects on adults that have recovered from a notable illness. Parvo is a big one here, as puppies that are exposed to Parvo during gestational, will get the heart form of Parvo, even after recovery, it can stay dormant in the cardiac fibers of the heart, leading to heart failure as an adult . This is because the neonate heart prior to two weeks of age is unresponsive to atropine due to the immaturity of the vagus nerve, the baroreceptors are not functional till 4 days after birth and pulmonary response is also minimal. This immaturity of the homeostatic cardiovascular mechanism can cause a vicious cycle of collapse and inadequate response that becomes irreversible. Multiple cases of viruses, especially in puppies sick for longer than two weeks can have lasting heart defects.

Drug interaction with neonates can also lead to lasting effects. Again due to the inefficient filtering rate of the liver and the immature functions of the heart the rate drugs are administered to neonates becomes much more crucial. Six types of P450 isozymes drugs are most notes for lasting problems if given before the immune system is mature, these are CYP1A2, CYP2C19, CYP2C9, CYP2D6, CYP2E1, and CYP3A4—that play important roles in drug metabolism have been identified (1, 2). Of these 6 isozymes, shared metabolism by the CYP3A4 isozyme has resulted in several clinically significant drug-drug interactions. These drugs are not fully metabolized and filters leading to a build up in the system that causes high levels of toxicity, increased serum levels. And Drugs that can be metabolized by more than one isozyme have greater safety in the neonate. Also the longer a drug is used the greater the risk for lang term lasting effects.

## References

Infectious Diseases and the Liver

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REVIEW ARTICLE

A review of Neonatal mortality in Dogs

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Drug interactions due to cytochrome P450

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