Children with congenital heart disease at risk from harmful toxins

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Babies and toddlers with congenital heart disease are at an increased risk of having harmful toxins in their blood, particularly following surgery, according to research by a team at Imperial College London.

The study, published today in the American Journal of Respiratory and Critical Care Medicine, found that children with high levels of toxins from gut bacteria in their blood are likely to take longer to recover from surgery and spend more time in intensive care.

The researchers say that more work needs to be done to protect children who have heart surgery from bacterial toxins, perhaps using drugs that neutralise them or treatments that protect the gut.

Congenital heart disease is one of the most common types of birth defect , affecting about 1 in every 145 births. Some abnormalities are minor and do not require treatment, but many babies and young children have to undergo surgery to correct the defect.

Dr Nazima Pathan, the lead author of the study from the National Heart and Lung Institute at Imperial College London, said: "The gut usually acts as a barrier that protects the body from toxins. However, our study suggests that in some babies with congenital heart disease, the gut isn't able to do this job properly. These babies are often small and undernourished, and the heart defect can mean that the blood supply to the gut is abnormal. On top of this they have to cope with the trauma of surgery and our study suggests that all these factors can affect the

protective barrier function of the gut."

Bacterial fragments called endotoxins that cross into the blood from the gut stimulate the body's immune system and can affect the function of vital organs.

Dr Pathan and her team measured the levels of endotoxins in 40 children requiring surgery for congenital heart disease, admitted to the paediatric intensive care unit at Royal Brompton Hospital, where Dr Pathan is a paediatric consultant. The children ranged in age between 2 and 46 months.

The results showed that even before surgery, over a fifth of children had higher than normal levels of endotoxin, and levels rose after surgery. Overall 27.5 per cent of the children had raised endotoxin levels after surgery. The highest endotoxin levels were measured in small children and those whose heart defects resulted in compromised blood supply to the gut. Importantly, children with high endotoxin levels showed more signs of organ dysfunction and tended to spend longer in intensive care.

The children may have been exposed to bacterial toxins during surgery. However, the levels of toxins in the blood continued to rise in the days after surgery, suggesting that bacteria in the gut were the main source.

"We were surprised at how common endotoxaemia was in these children and how strongly endotoxin levels correlated with poor clinical outcomes," Dr Pathan added. "Most children recover well from surgery for congenital heart disease, but we want to reduce the chances of further complications so that young children don't have to spend as long in intensive care. We're now working with colleagues at Imperial to look at how we can protect vulnerable children from harmful toxins."

The study was funded by Heart Research UK and the Higher Education

Funding Council for England (HEFCE). Barbara Harpham, National Director at Heart Research UK, said: "We're so pleased that the £84,500 research grant we awarded has provided such a valuable insight, which could help children with congenital heart disease. Obviously, more research is needed but these initial findings could lead to some important developments in treatments for children and babies undergoing lifesaving surgery."

More information: N. Pathan et al. 'Intestinal injury and endotoxaemia in children undergoing surgery for congenital heart disease.' American Journal of Respiratory and Critical Care Medicine, 26 August 2011.

Provided by Imperial College London