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Reply to the Editor:

We thank Dr Corno for his suggestion that normothermic high-flow cardiopulmonary bypass would be likely to improve neurodevelopmental outcome relative to circulatory arrest or hypothermic reduced flow bypass, the two techniques that we studied. We agree with Dr Corno that many perfusion variables may influence late developmental outcome, and we recognize that few of these have been studied in detail. The Boston Circulatory Arrest Study, the subject of our recent report, was designed in 1987. Since that time, our laboratory studies have led us to undertake two subsequent prospective randomized clinical trials, one studying the role of pH¹ and one studying the role of hematocrit in influencing outcome after cardiopulmonary bypass.² Both

trials confirmed our laboratory results and resulted in important changes in our technique of bypass. However, our more recent laboratory studies investigating different temperature strategies for cardiopulmonary bypass have suggested that there is a disadvantage in using a higher temperature for cardiopulmonary bypass. For example, in a study that used intravital microscopy for direct examination of the cerebral microcirculation, we observed greater activation of white cells with increased numbers of rolling and adherent white cells when cardiopulmonary bypass was conducted at 34°C than at 15°C.³ We believe that this result reflects the fact that, despite Dr Corno's assertion to the contrary, cardiopulmonary bypass remains far from being a physiologic state. It is widely known that cardiopulmonary bypass is associated with multiple systemic inflammatory effects, both humoral and cellular. Our laboratory study has confirmed that a higher temperature exacerbates this inflammatory response. In addition, the high flow rate that is required to support the greater metabolic rate associated with a higher temperature also carries many disadvantages, including increased generation of emboli, increased left heart return necessitating greater suction volumes, reduced intracardiac exposure because of the need for multiple cannulas and increased left heart return, less effective myocardial protection with need for multiple reinfusions of cardioplegia (demonstrated to be a disadvantage in the neonate), and a reduced margin for safety in the event of equipment failure. The the-

oretical disadvantages of increased infection and bleeding that might result from hypothermia have not been confirmed in the neonate and infant.

In conclusion, we hope that Dr Corno and his associates will have the opportunity in the future to undertake developmental studies of their many patients who undergo normothermic high-flow bypass. Our own clinical studies will continue to be guided by translational research undertaken in the laboratory, which to date has not indicated any advantage for normothermic high-flow bypass.

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