Chloral Hydrate Is Not Acceptable for Anesthesia or Euthanasia of Small Animals

To the Editor—A recent paper reported experiments, using laboratory rats, on the effect of intraamygdala infusion of a γ-aminobutyric acid type A antagonist on propofol-induced amnesia for inhibitory avoidance training, as well as on expression of activity-regulated cytoskeleton-associated protein in the hippocampus. This work may elucidate the neural mechanisms of the amnestic effects of propofol, as well as the neurobiological mechanisms of general anesthesia and memory more generally.

The experiments reported in this paper required stereotaxic neurosurgery to implant cannulae aimed at the basolateral amygdala, and rats were subsequently euthanized for determination of activity-related cytoskeleton-associated protein levels or histologic verification of cannula placement. The authors used chloral hydrate in both procedures; for surgical anesthesia in the first and euthanasia in the second. Chloral hydrate is not a suitable drug in either case. Chloral hydrate is regarded by many to produce hypnosis and not anesthesia. It does not provide analgesia and causes marked respiratory depression at doses required for surgical anesthesia. Apart from its inadequate anesthetic properties, 20% chloral hydrate is extremely irritating and therefore unsuitable for intraperitoneal use. It is associated with ileus in rats, as well as peritonitis and gastric ulcers. Its use by intraperitoneal injection for survival surgery is not recommended. Thus, it is not the most refined choice of agent for the surgical procedure in which cannulae are chronically implanted to make drug infusions into the amygdala. The authors also used a higher dose of chloral hydrate for euthanasia. However, chloral hydrate is not an acceptable agent for euthanasia according to the guidelines of the American Veterinary Medical Association; its use for this purpose has been prescribed for some time.

There are no scientific justifications for using chloral hydrate for these experiments, as many other agents would be more suitable for both surgical anesthesia and euthanasia without interfering with the experimental endpoints. Indeed the chloral hydrate-induced hypoxemia which must occur during euthanasia as respiration becomes depressed, may compromise the experimental aims in terms of measuring protein and messenger ribonucleic acid levels of an activity-related protein. The noxious stimulus of an intraperitoneal irritant is not only inhumane, but if it leads to peritonitis the rats will be abnormal at the time of testing.

It seems that chloral hydrate has traditionally been used to provide anesthesia where the avoidance of agents with known receptor interactions is desirable. But it is likely that chloral hydrate has unknown receptor interactions. Therefore choosing a different agent whose receptor interactions are better characterized could be beneficial, not only in terms of animal welfare but also in terms of data interpretation.

The publication of this paper in Anesthesiology concerns us, because the standard of laboratory animal anesthesia used in this research is not acceptable.


References

1. Ren Y, Zhang FJ, Xue QS, Zhao X, Yu BW: Bilateral inhibition of gamma-aminobutyric acid type A receptor function within the basolateral amygdala blocked propofol-induced amnesia and activity-regulated cytoskeletal protein expression inhibition in the hippocampus. Anesthesiology 2008; 109:775–81

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majority of rats in our experiment recovered well from the neurosurgery, with normal appetite and defecation. Third, we admit that we neglect the potential problem of using chloral hydrate for euthanasia of rats. Chloral hydrate is a traditional anesthetic in animal experiments, and before we performed our study we also found that it is used for killing rats by either decapitation or cardiac perfusion in respectable published articles.\(^\text{5,6}\) Moreover, our research was approved by the Institutional Animal Care and Use Committee with no questions. Therefore, we never doubted the use of chloral hydrate for rat euthanasia. Now we feel deeply sorry for the possibility of inflicting pain on the animals because of using chloral hydrate.

Finally, we would like to extend our sincere gratitude to Baxter\(\text{et al.}\) for letting us understand animal euthanasia more deeply. We will pay much more attention to the euthanasia issue, adopt proper and scientific animal welfare methods, and try our best to decrease harm to the experimental animals as much as possible in future research.

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References

5. Reiner K, Sukhotinsky I, Devor M: Mesopontine tegmental anesthesia area projects independently to the rostromedial medulla and to the spinal cord. Neuroscience 2007; 146:1555–70

To the Editor.—We read with interest the recently published report by Langesæter\(\text{et al.}\)\(^\text{1}\) together with the accompanying editorial,\(^\text{2}\) describing the use of minimally invasive continuous cardiac output monitoring during spinal anesthesia for cesarean delivery. Based on derived values for cardiac output, the authors advocated allowing a 10 to 20% decrease in blood pressure and questioned as unnecessary the use of higher doses of phenylephrine given to maintain blood pressure near baseline. The findings from this paper are important and are a substantial contribution to our knowledge of the hemodynamic changes during regional anesthesia in parturients. However, we believe that some caution is required when extrapolating these findings to recommendations for everyday clinical practice.

Although placement of peripheral arterial catheters was regarded as “minimally invasive,” we believe that most clinicians would find them difficult to justify in routine elective cases and will continue to rely on the use of noninvasive blood pressure monitoring, despite its intermittent nature of measurement. From our previous work, we consider that, when using noninvasive blood pressure monitoring, the clinically optimal approach is to titrate a phenylephrine infusion with the target of maintaining systolic blood pressure near to the baseline value. Using this approach, with both manual\(^\text{3–5}\) and automated\(^\text{6}\) control, the incidence of nausea and vomiting is significantly reduced, as compared with less strict blood pressure control; this is a clearly defined and important endpoint, the clinical relevance of which is more immediately apparent as compared with derived values for cardiac output.

When using phenylephrine to maintain maternal blood pressure, it is important to appreciate that although this potent vasoconstrictor has a clearly defined and important endpoint, the clinical relevance of withholding administration while permitting a decrease in blood pressure to some arbitrary percentage threshold below baseline as suggested by Langesæter\(\text{et al.}\)\(^\text{1}\) risks the likelihood that blood pressure...