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Repozytorium

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Studying the influence of enflurane, isoflurane, and sevoflurane on the DPPC lipid bilayer using the analysis of variance and parallel factor analysis.

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The optimization of anesthetic dosage requires a clear understanding of the exact mechanism of an anesthetic action. To date, it is still not clear whether the mechanism involves the direct binding of the anesthetic molecule to the transmembrane protein or is based on the indirect influence of the protein activity throughout the perturbation of membrane lipids. The aim of this study was to clarify the mechanism of the anesthetic action of enflurane, isoflurane, and sevoflurane, which are preferred inhalation anesthetics in modern surgery due to their low toxicity and high lipid solubility. For this purpose, the influence of different concentrations of enflurane, isoflurane, and sevoflurane on the structural modification of the lipid membrane at various temperatures was studied using fluorescent probe spectroscopy. The resulting experimental multi-way excitation-emission data organized as *temperatures* × *excitation wavelengths* × *emission wavelengths* × *anesthetic concentrations* × *type of anesthetic* was explored and interpreted with a methodology combining analysis of variance (ANOVA) and parallel factor analysis (PARAFAC), which is in agreement with the underlying design of the experiment. The results suggest an indirect mechanism of action for all three anesthetics. Specifically, the strongest liquidizing effect is characteristic for sevoflurane thus indicating the weaker anesthetic action. Furthermore, the 'temperature × anesthetic' interaction factor is statistically insignificant, which confirms that the formation of an interdigitated phase does not depend on temperature. A transition from the gel-to-liquid-crystalline phase is observed due to the incorporation of sevoflurane into the bilayer, while the transition from an interdigitated to liquid-crystalline phase is due to the influence of enflurane and isoflurane on the bilayer.

Słowa kluczowe

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