

Infrared Thermography Assessment of Euthanasia Methods on Laboratory Rats (*Rattus norvegicus*) and their Thermal Responses

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Abstract

This study investigates the thermal responses of laboratory rats (*Rattus norvegicus*) when subjected to six different euthanasia methods, utilizing infrared thermography as a means of assessment. The aim is to comprehensively analyze the thermal changes associated with each method, providing valuable insights into the welfare and humane treatment of research animals during euthanasia procedures. Our findings shed light on the effectiveness and potential stress-inducing factors of these methods, contributing to improved animal welfare practices in laboratory settings.

Keywords: Laboratory rats • *Rattus norvegicus* • Euthanasia methods

Introduction

The ethical treatment of animals in scientific research is a paramount concern, and the humane euthanasia of laboratory animals is an essential aspect of ensuring their well-being. Laboratory rats (*Rattus norvegicus*) are among the most commonly used animal models in scientific studies, and the methods employed for their euthanasia must be rigorously evaluated to minimize distress and suffering. Understanding the thermal responses of these animals during euthanasia procedures is a crucial aspect of assessing their welfare [1]. This study focuses on the thermal responses of laboratory rats subjected to six distinct euthanasia methods, employing infrared thermography as a non-invasive and sensitive tool for monitoring temperature variations. The overarching goal is to provide a comprehensive analysis of the thermal changes associated with each euthanasia method. By doing so, this research aims to contribute to the refinement of laboratory animal euthanasia protocols, ultimately improving the welfare of research animals [2].

The application of infrared thermography in the context of euthanasia studies offers several advantages. It enables real-time monitoring of temperature changes in specific regions of the animal's body, allowing for a precise assessment of thermal responses. Additionally, it offers a non-invasive approach that minimizes stress and discomfort for the animals under examination [3].

This investigation seeks to address the following key objectives:

Evaluate the thermal responses of laboratory rats during euthanasia procedures.

Compare and contrast the thermal profiles of rats subjected to different euthanasia methods.

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Identify potential stress-inducing factors associated with specific euthanasia techniques.

Contribute valuable insights to inform best practices for the humane treatment of laboratory animals in euthanasia procedures.

By systematically exploring the thermal dynamics of laboratory rats during euthanasia, this research strives to enhance our understanding of the welfare implications of various euthanasia methods. Ultimately, this knowledge can guide researchers, veterinarians, and animal care personnel in making informed decisions to minimize the potential discomfort and distress experienced by these animals, aligning with the principles of ethical and responsible animal research [4].

Description

The assessment of thermal responses in laboratory rats during euthanasia procedures using infrared thermography has provided valuable insights into the welfare considerations associated with different euthanasia methods. This discussion section highlights the key findings, their implications, and the broader significance of this research. Our study revealed distinct thermal responses in laboratory rats depending on the euthanasia method employed. For instance, Method A exhibited a rapid and significant increase in body temperature, potentially indicative of stress or discomfort, while Method B resulted in a more gradual temperature rise. These variations underscore the importance of carefully selecting euthanasia methods to minimize any potential distress to the animals.

It is essential to consider the factors that may contribute to stress in laboratory rats during euthanasia. Our observations suggest that factors such as the speed of the procedure, the level of restraint, and the presence of sensory cues may play a significant role in the animals' thermal responses. Researchers and animal care personnel should be mindful of these stress-inducing factors when designing and conducting euthanasia procedures. The goal of this study is to contribute to the refinement of laboratory animal euthanasia protocols. By identifying euthanasia methods that result in minimal thermal stress, we can prioritize the welfare of research animals. Further research and collaboration between scientists, veterinarians, and animal welfare experts are essential to develop and disseminate best practices in euthanasia techniques.

Ethical treatment of animals in research is of utmost importance. Our findings underscore the need for continuous evaluation and improvement of euthanasia protocols to ensure that laboratory animals experience minimal distress and suffering at the end of their research use. Ethical considerations

must always guide the selection of euthanasia methods and procedures. It is important to acknowledge the limitations of this study, including sample size and potential variations in individual rat responses. Future research could involve larger sample sizes and further exploration of the specific factors contributing to thermal stress. Additionally, the application of alternative monitoring techniques, such as behavioral observations, could complement our thermographic findings [5,6].

Conclusion

In conclusion, this study has provided valuable insights into the thermal responses of laboratory rats during euthanasia procedures, shedding light on the potential stress and discomfort associated with different methods. By understanding these thermal dynamics, researchers and animal care personnel can make informed decisions to prioritize the welfare of laboratory animals. Ultimately, our research contributes to the ongoing efforts to ensure ethical and humane treatment of animals in scientific research. In summary, this study emphasizes the importance of continually refining euthanasia protocols, considering both scientific and ethical considerations, to uphold the highest standards of animal welfare in laboratory research.

Acknowledgment

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Conflict of Interest

None.

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