Jurnal Riset Veteriner Indonesia
Journal of the Indonesian Veterinary Research
P-ISSN: 2614-0187, E-ISSN:2615-2835
Nationally Accredited Journal, Decree No. 36/E/KPT/2019.
Volume 9 No. 2 (July 2025), pp. 1-6
journal.unhas.ac.id/index.php/jrvi/

The Impact of Animal Welfare Practices on Feed Consumption Levels in Laboratory Animal Management at Hasanuddin University Veterinary Teaching Hospital

Rini Amriani[a,*], A. Muh. Ichlasul Akmal[a], Muhammad Dirga Gifardi[a], Didik Imam Sakirin[a], Dwi Kesuma Sari[a], Andi Magfira Satya Apada[a]

[a]Veterinary Medicine Study Program, Faculty of Medicine, Hasanuddin University, Jl. Perintis Kemerdekaan Km. 10, Makassar, 90245, Indonesia

*corresponding author: riniamriani@unhas.ac.id

Abstract

Animal welfare encompasses all aspects related to the physical and mental condition of animals based on their natural behaviors. Animal welfare includes the management practices of laboratory animals, particularly regarding cage conditions, environmental comfort, and nutritional adequacy. The objective of this study is to examine the correlation between the application of animal welfare aspects, including housing management, environment, and nutrition, on the feed consumption levels of laboratory animals. The research method involved dividing the treatment groups into eight groups, with each group consisting of three rats, for a total of 24 rats. The rat groups were categorized based on housing management, which was based on two or four rats in one cage, sterilized versus non-sterilized bedding, optimum versus non-optimum temperature and humidity, and the frequency of feeding once a day or twice a day. The results showed that groups one and two exhibited higher average feed consumption levels compared to the other groups (17.5 and 16.5 grams, respectively), while groups four and five exhibited the lowest feed consumption levels (10.5 and 11.5 grams). Normality tests indicated that the data were normally distributed ($P>0.05$), and homogeneity tests showed that the data from the different groups were consistent (homogeneous) ($P>0.05$). Based on the normality and homogeneity tests, statistical analysis (ANOVA) was conducted. The ANOVA results indicated a significant effect ($P<0.05$) of animal welfare aspect implementation in housing management on feed consumption levels. This finding suggests that animal welfare aspects influence the feed consumption levels of Wistar rats. In conclusion, the application of animal welfare aspects in housing management affects the feed consumption levels of laboratory animals.

Keywords: *Animal welfare, Feed Consumption Levels , Laboratory animals*

Introduction

Animal welfare encompasses all aspects related to the physical and mental condition of animals based on their natural behaviors. In laboratory settings, animal welfare can be seen from the aspects of cage management, environment, and nutrition. Therefore, the management of

laboratory animals should be in a comfortable condition to achieve the expected research outcomes (Mu'nisa et al., 2022). Animal welfare is a principle that emphasizes fulfilling the physiological, psychological, and natural behavioral needs of animals to ensure their quality of life remains optimal. In the context of scientific research, laboratory animals play an important role as biological models to understand biological phenomena, diseases, and therapeutic development. Therefore, the implementation of animal welfare aspects in laboratory animal management is not only important for ethical reasons but also affects the validity of research results (National Research Council, 2011). Animal welfare has five freedom: "freedom from hunger and thirst," "Freedom from pain, injury, and disease," "Freedom from discomfort," "Freedom from fear and stress," and "Freedom to express normal behavior" (Webster, 2016). The application of the Five Freedoms principles in laboratory animal management significantly influences feed consumption levels levels. Freedom from hunger and thirst can be achieved by providing food that is not only sufficient but also enjoyable for the animals, thereby improving food intake and overall health. On the other hand, discomfort or stress due to an inappropriate environment (e.g., cramped cages, poor management, or inability to express natural behaviors) can impair feed consumption levels and lead to a decline in the quality of life for laboratory animals (Broom & Johnson, 2017; McMillan, 2017).

The feed consumption levels, or the level of acceptance of animals toward environmental conditions and management practices, greatly affects the health and behavior of the animals. Factors such as appropriate feeding, stress management, cage environmental control, and minimal invasive experimental procedures are key components that support laboratory animal welfare. Ignoring these principles can lead to chronic stress, metabolic disturbances, and abnormal behaviors, ultimately reducing the accuracy and reproducibility of research results (Olsson & Dahlborn, 2002). Research on laboratory animals now presents unique challenges due to the need for a balance between operational efficiency and adherence to international ethical regulations, such as the 3Rs Principle (Replacement, Reduction, Refinement). Measuring the level of feed consumption levels related to the implementation of animal welfare aspects can provide valuable insights into the effectiveness of the applied management and serve as a basis for continuous improvements in laboratory animal care practices (Flecknell, 2002). Recent studies show that good environmental conditions, environmental enrichment, and the application of strict welfare standards can enhance food intake and minimize stress.

Approximately 40% of studies use rodent species as laboratory models. Wistar rats (Rattus norvegicus) are often used in laboratory research related to physiology, pharmacology, toxicology, pathology, and histopathology (Mutiarahmi & Lesmana, 2021). Research on rats has been conducted for centuries, and the historical foundation of this research can be traced back to ancient times. Rats, particularly laboratory Wistar rats, have become a popular subject in many research fields, including biology, pharmacology, medicine, and health. One reason why rats are a common research subject is their genetic similarity to humans. Rats share about 90% of their genes with humans, allowing researchers to study various human diseases and search for new drugs using rats as experimental models (Wati, 2024). Therefore, it is important to understand the relationship between animal welfare and feed consumption levels and how the application of animal welfare principles can optimize the management of laboratory rats. Along with this, further research on feed consumption levels and animal welfare conditions in laboratories is necessary to improve ethical and efficient animal care standards, resulting in more valid and reliable experimental data in laboratory animals (Franco & Olsson, 2014; Orozco & Garcia, 2019).

Materials and Methods

Animal and Housing

In this study, 24 Wistar rats (*Rattus norvegicus*) were used as the research sample. The rats were acclimatized for 7 days, and the experiment lasted for 21 days at the animal laboratory of Hasanuddin University. The rats used in this study had a body weight ranging from 200 to 300 grams.

Materials and Equipments

The equipment used in this study included plastic rat cages, a digital scale, rat feeding dishes, rat drinking bottles, an oven, aluminum foil, storage tubes, and a hygrometer. The materials used were 24 Wistar rats, rice husks, pellet feed, and water.

Experimental Design and Grouping

The experiment was designed to test the effects of three animal welfare factors—housing density and bedding sterilization (housing), temperature and humidity (environment), and feeding frequency (nutrition)—on feed intake. Rats were divided into eight groups representing combinations of these three factors. The cages were prepared with plastic boxes measuring 40x30x20 cm, where the experimental animals were housed and grouped as follows:

Table 1. Group of Wistar Rats (*Rattus norvegicus*)

Group	Treatment		
	Housing	Environment	Nutrition
1	++	**	##
2	++	**	#
3	++	*	##
4	++	*	#
5	+	*	#
6	+	*	##
7	+	**	#
8	+	**	##

Note: (++) indicates housing with 2 rats per cage and sterilized bedding; (+) indicates 4 rats per cage with non-sterilized bedding. (**) represents optimal environmental conditions (temperature 18–25°C and humidity 50–70%), while (*) indicates suboptimal conditions (temperature >25°C and humidity >70%). (##) denotes feeding twice daily, and (#) denotes feeding once daily.

Observations and Measurement

In this study, observations were made on animal care management, body weight, and food waste of Wistar rats. Feed intake was measured daily by weighing feed provided and the residual feed after 24 hours. Evaluations were conducted periodically to monitor changes in body weight and food consumption of the Wistar rats in each group.

Statistical Analysis

Data analysis was conducted quantitatively, including Shapiro-Wilk Test (normality $P > 0.05$) and Levene Test (homogenecity $P > 0.05$) for each treatment group using the SPSS application. This analysis was performed to determine the most optimal group. Following that, the Analysis of Variance (ANOVA) method was applied to the sample data obtained to compare each treatment group and test for significant differences between them.

Results

The feed consumption levels data for each group were measured weekly for three weeks by weighing the amount of food provided and the leftover food in the rat cages every morning.

Based on these data, it was found that the groups with the best feed consumption levels scores were Group 1 and Group 2 ($P < 0.05$), week by week. All groups were tested, each with varying management approaches in implementing animal welfare principles (Table 1).

Table 2. Average the Feed Consumption Levels Data of the Treatment Groups

Data of Average Feed Consumption Levels (gr)				
Group	First Week	Second Week	Third Week	Mean
1	17.5	16	17	16.8 ±0.76[a]
2	16.5	16	16	16.2 ±0.29[a]
3	13.25	13.5	13.5	13.4 ±0.14[c]
4	11.5	10.5	10.25	10,8 ±0.66[d]
5	10.5	11	10.25	10.6 ±0.38[d]
6	13	13.5	13.25	13.3±0.25[c]
7	14.75	14.5	15.25	14.8±0.38[b]
8	15.25	15	15.5	15.3±0.25[b]

Note : Same letter in the script has the same value ($P > 0.05$).

Group 1 (which had the best implementation of animal welfare aspects) showed the best feed consumption levels results compared to the other five treatment groups. The data obtained indicated that this group had the highest feed consumption score, with an average food preference value reaching 85%, significantly higher than the other treatment groups, whose average preference values ranged between 50-65%. This study aims to evaluate the feed consumption levels in several treatment groups that apply animal welfare aspects in their management.

Specifically, Group 1, which prioritized animal welfare in terms of nutrition (feeding), environment, and housing management, was found to provide higher feed consumption levels to the animals being kept. This was reflected in the higher food consumption over the three-week observation period (Figure 1). This suggests that the more optimal implementation of animal welfare principles can enhance the enjoyment and acceptance of food by the animals being kept.

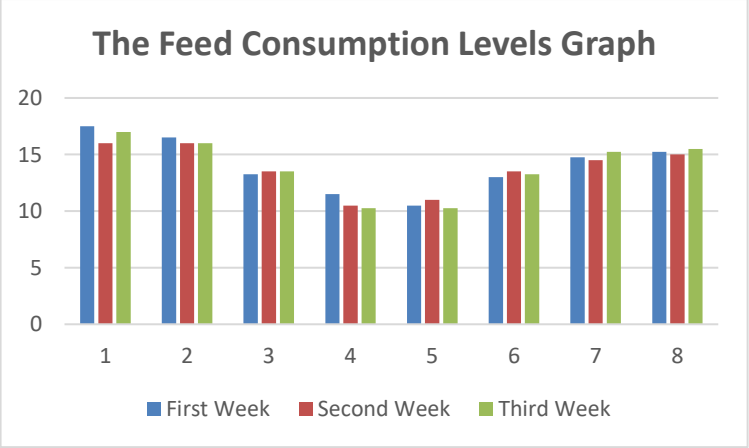

Figure 1. The Feed Consumption Levels Graph of the Treatment Groups

Discussion

Based on the results of the feed consumption level data described in the table 2, it can be seen that group 1 and group 2 are the groups with the highest feed consumption level compared to

the other groups (P<0.05). In addition, group 7 and group 8 explained that these groups was able to increase the feed consumption level (P<0.05) (table 2). Furthermore, in group 3 and group 6 based on the feed consumption level results in table 2 illustrates that the feed consumption level of group 3 and group 6 is higher (P<0.05) compared to group 4 and group 5 which are groups that have the lowest feed consumption level values compared to other groups (P<0.05).

The results of this study support the hypothesis that the better implementation of animal welfare aspects can influence the feed consumption levels of feed. Based on the obtained results, the group that implemented the animal welfare principles comprehensively (Group 1) showed the best feed consumption levels results, indicating a positive correlation between animal welfare and feed preference levels.

The application of animal welfare aspects in management includes providing a comfortable environment, offering quality feed, and routine health monitoring. According to Miele et al. (2021), well-maintained animal welfare, including feed and medical care, can improve the physiological and psychological responses of animals, which ultimately affects the feed consumption levels. With a more comfortable and environment management, animals are more likely to accept and consume feed better, as seen in Group 1 in this study.

Furthermore, research by Roush et al. (2021) suggests that improving animal welfare in terms of the environment and feed management can increase feed consumption, which results in better eating patterns. Animals kept in more comfortable, stress-free conditions with better health care are more likely to consume feed more effectively.
A study by Rojas et al. (2023) indicates that optimal health management and the provision of feed that meets the physiological needs of animals can increase appetite and feed preference, which contributes to improved animal productivity. This aligns with the findings in this study, where Group 1 showed higher the feed consumption levels compared to the other groups that applied animal welfare with lower intensity.

Furthermore, research by Wathes et al. (2008) revealed that good animal welfare contributes to more regular eating patterns and higher feed preferences, as animals tend to feel safer and more comfortable eating in healthy and stress-free conditions. Stress caused by an unsuitable environment or poor management can reduce animals' appetite, which affects feed consumption levels (Verstegen et al., 2013).

Overall, these findings suggest that improving the quality of animal welfare management can enhance feed consumption levels, which in turn can improve production efficiency and animal welfare in farming systems.

Conclusion

The implementation of better animal welfare principles is positively associated with improved feed consumption levels in animals. Group 1, which optimally applied animal welfare aspects, showed the highest the feed consumption levels scores compared to other treatment groups. This indicates that better management concerning a comfortable environment, quality feed provision, and attention to animal health can enhance appetite and feed preference in animals.

Acknowledgments

The Hasanuddin University Research and Community Service Institution (LPPM UNHAS) for the funding assistance provided for this activity through the Community Service Program-Partnership Program (PPMU-PK) Hasanuddin University Grant No.

02278/UN4.22.2/PT.01.01/2024. Special thanks are also given to the Hasanuddin University Veterinary Teaching Hospital as a partner in this activity. The author states there is no conflict of interest with the parties concerned in this research.

References

Broom, D. M., & Johnson, M. (2017). *Animal Welfare: Stress and Behaviour*. Springer.

Cardoso, C. S., & Leal, D. B. (2022). *Animal welfare and farm management: Effects on animal health and productivity*. Journal of Dairy Science, 105(6), 5124-5134. https://doi.org/10.3168/jds.2021-21031

Flecknell, P. A. (2002). *"Animal Welfare and the 3Rs: Reducing, Refining, and Replacing the Use of Animals in Research."* Laboratory Animals, 36(1), 1–10

Franco, N. H., & Olsson, I. A. S. (2014). "What Do We Really Know About the Use of Animals in Biomedical Research?" *Lab Animal*, 43(4), 245-249.

McMillan, F. D. (2017). "Advances in Laboratory Animal Welfare." *International Journal of Animal Welfare*, 32(2), 18-30.

Miele, M., Di Bella, C., & Manfredini, M. (2021). Animal welfare and livestock production: Effects of welfare-friendly practices on health, behavior, and productivity. *Animal Production Science*, 61(3), 350-359. https://doi.org/10.1071/AN20854

Mu'nisa, A., Jumadi, O., Junda, M., Wharto, M., dan Hamjaya, H. 2022. *Teknik Manajemen Dan Pengelolaan Hewan Percobaan Memahami Perawatan Dan Kesejahteraan Hewan Percobaan.* Penerbit Jurusan Biologi FMIPA UNM : Makassar.

Mutiarahmi, C. N., Hartady, T., dan Lesmana, R. 2021. Kajian Pustaka: Penggunaan Mencit sebagai hewan coba di laboratorium yang mengacu pada prinsip kesejahteraan hewan. *Jurnal Indonesia Medicus Veterinus. 10*(1): 134-145.

National Research Council (2011). Guide for the Care and Use of Laboratory Animals. 8th Edition. National Academies Press.

Olsson, I. A. S., & Dahlborn, K. (2002). *"Improving Housing Conditions for Laboratory Animals: The Effect of Environmental Enrichment on Animal Welfare and Experimental Results."* ILAR Journal, 43(1), 59–69.

Orozco, L. M., & Garcia, J. P. (2019). "Impact of Housing and Enrichment on Animal Welfare and Research Validity." *Animal Welfare Science*, 38(3), 105-115.

Rojas, M., Sousa, R., & Alves, S. P. (2023). *Effects of animal welfare measures on feed intake and productivity in dairy cows: A review*. Livestock Science, 264, 104778. https://doi.org/10.1016/j.livsci.2023.104778

Roush, R. M., McLeod, B., & Ferguson, M. (2021). *Animal welfare and food production: A review of the role of welfare-friendly practices in livestock production systems*. Animals, 11(12), 3481. https://doi.org/10.3390/ani11123481

Verstegen, M. W. A., den Hartog, L. A., & van der Peet-Schwering, C. M. C. (2013). Animal welfare and environmental management: Their interrelationship. *Livestock Science*, 155(1-3), 9-16. https://doi.org/10.1016/j.livsci.2013.02.005

Wathes, C. M., Kristensen, H. H., Aerts, J. M., & Berckmans, D. (2008). The effects of housing and management on the welfare of dairy cows. *Journal of Dairy Science*, 91(5), 1866-1875. https://doi.org/10.3168/jds.2007-0874

Wati, D.N., Ilyas, S., dan Yurnadi. 2024. Prinsip Dasar Tikus Sebagai Model Penelitian. USU Press : Medan.

Webster, J. (2016). Animal Welfare: Freedoms, Dominions and "A Life Worth Living". *Animals*, *6*(6), 35.