



MARKHOR

THE JOURNAL OF ZOOLOGY

<https://www.markhorjournal.com/index.php/mjz>
 ISSN (E): 2790-4385, (P): 2790-4377
 Volume 7, Issue 1 (Jan - Mar 2026)



Original Article



Interlinking Domestication History, Behavioral Ecology, and Emerging Market Dynamics of Guinea Pigs (*Cavia porcellus*) in Karachi, Sindh, Pakistan

Shahzana Zerishk¹, Roohi Kanwal¹ and Asifa Ali Rehmani¹

¹Department of Zoology, University of Karachi, Karachi, Pakistan

ARTICLE INFO

Keywords:

Guinea Pig, *Cavia porcellus*, Social Behavior, Dominance Hierarchy, Behavioral Traits, Multigenerational Observation, Captive Management

How to cite:

Zerishk, S., Kanwal, R., & Rehmani, A. A. (2026). Interlinking Domestication History, Behavioral Ecology, and Emerging Market Dynamics of Guinea Pigs (*Cavia porcellus*) in Karachi, Sindh, Pakistan: Interlinking Domestication History and Emerging Market Dynamics of Guinea Pigs (*Cavia porcellus*). MARKHOR (The Journal of Zoology), 7(1), 03-10. <https://doi.org/10.54393/mjz.v7i1.201>

*Corresponding Author:

Roohi Kanwal
 Department of Zoology, University of Karachi,
 Karachi, Pakistan
rkanwal@uok.edu.pk

Received Date: 19th November, 2025

Revised Date: 29th January, 2026

Acceptance Date: 2nd February, 2026

Published Date: 31st March, 2026

ABSTRACT

Within the urban setting of South Asia, especially in Pakistan, guinea pigs (*Cavia porcellus*) are becoming a new household pet, but very little is known about their ecology and the new market.

Objectives: To synthesize existing literature on guinea pig domestication and behavior and explore its convergence with emerging market dynamics in Karachi, Pakistan, using a socio-zoological review framework. **Methods:** A narrative analysis of historical and contemporary literature was integrated with preliminary, non-invasive behavioral observations of a small multi-generational captive cohort (n=30) and qualitative insights from local breeders and vendors. Observational data were used solely to generate descriptive behavioral patterns within a controlled setting. **Results:** The findings demonstrate how the developed domestication pathways and adaptations of behavior occur in an unfamiliar urban South Asian setting. The captive cohort exhibited stable social hierarchies, reproductive behaviors, and patterns of habituation. The market intelligence indicates that there will be an increasing demand based on the ownership of companions, which are based on initial thematic trends and not the market findings of the city. **Conclusions:** This combined evaluation explains the socio-economic and ethological background of guinea pigs in Pakistan and gives a basis for future specific behavioral and market studies. Noted intergenerational behavioral differences are explained as an acquired or familiar pattern among a closed group, and no assertions of genetic inheritance or generalization to a larger market.

INTRODUCTION

Domestication is a complex biological, cultural, and evolutionary process in which wild species begin to benefit in response to human domestication. This is a very selective process that only a small percentage of typical wild animals have the behavioral plasticity, physiological flexibility, and reproductive compatibility to survive in human care [1]. The guinea pig (*Cavia porcellus*) is one of the most incredible examples of those species that have been successfully domesticated. Previously a shy native Andean highlands animal, the guinea pig has, over 1000 years of evolution, turned into a docile and socially interactive mammal deeply intertwined into human culture as a

companion, research subject, and icon. The archaeological and genetic data indicate that the domestication of guinea pigs started in 5000 B.C. in Peru when early Andean cultures started to selectively breed wild cavies as a source of food, rituals, and companionship [2]. The result of this long history of domestication is that genetic, morphological, and behavioral differences between them and their wild ancestors are great. In contemporary domestic guinea pigs, there are unique color patterns, body shapes, and temperaments brought about by continuous human selection. Their dissemination around the world started with the growth of European trade routes



between the 16th and 18th centuries, whereby the Spanish traders and merchants brought them into Europe, where they soon gained popularity among aristocrats and naturalists as exotic pets [3]. There, guinea pigs started finding their way to North America and more around the world, gradually growing out of a colonial curiosity all the way to a world-renowned companion animal. The history also records that they were initially used in homes, laboratories, and exhibitions, and are known to have been versatile and adaptable to use in different cultures [4]. Guinea pigs have an elaborate behavioral repertoire of actions and interactions that is both behaviorally diverse and reflects their evolutionary history as well as their domestic diversification. They are social animals, and thus they are bound together in groups, exhibit stable hierarchies, and very rich vocal communication serves to express feelings, warn other people of danger, or create social bonding [5]. Their utterances comprise wheezing, rumbling, purring, and churring that have diverse sociological and emotional purposes and, hence, are convenient and interactive pets to human caretakers. In their behaviors, they also have foraging behaviors, exploratory behaviors, territorial marking, and complex courtship behaviors, all of which reflect cognitively and sensitively well-established abilities. There are even studies that suggest that guinea pigs exhibit similar cognitive functions to some higher mammals and thus their usefulness in psychological and neuroscience studies [6]. Irrespective of the general behavioral characteristics of the species, individual guinea pigs are characterized by a high degree of temperament variation, stress response, flexibility, and preference for social interactions, which underscores the significance of appropriate environmental stimulation and maintenance [7]. In addition to their use in behavior studies, guinea pigs have applications in some key industries in the world. Their unusual physiology, such as the resemblances to the human metabolic, cardiovascular, and immunological systems have made them a valuable model organism in biomedical research, nutrition trials, and pharmacological studies. In certain parts of the world, they remain a standard source of protein in the diet of the locals, and in developed nations, they monopolize niche markets in the pet breeding industries, animal exhibition industries, and small-mammal supply chains [8]. The global pet industry has recorded remarkable growth over the past few decades due to the rise of urbanization, changing family settings, and the increased appreciation of animal companionship. In modern pet-keeping patterns, there was the increasing popularity of small and low-maintenance pets like guinea pigs in households, in apartments, and even among first-time pet owners. In contrast to the past, when owning pets was often considered a sign of a greater socioeconomic

status, contemporary families welcome pets as emotional and therapeutic companions, as well as for life improvement. In spite of this surge on the global scene, Pakistan is mostly under-represented in the academic research on small mammal domestication, behavior, and consumer trends. Guinea pigs are not much studied academically, even though they can be found in the local pet markets. Little is known about how these animals acclimatize to the climatic changes of Pakistan, their behavior in the normal urban domestic setting, and how their market forces, like supply, price, demand, and consumer demographics, behave. Karachi is the largest metropolis of the country and a special and multifaceted environment for studying these dimensions. Its multicultural population, emerging pet ownership culture, and the increasing number of pet stores present a good geographical area to explore the ways in which global pet trends are expressed in a South Asian megacity. Any text about historical origins, dispersal patterns, and general species-level behavioral adjustments (now found here as Historical Context, Pathways of Domestication, Specifics of Guinea Pig Domestication, Behavioral Adaptations) would be transferred here. As a result, the present manuscript is in the form of an integrated review and socio-zoological case study. It seeks to divide three overlapping themes of domestication history, behavioral ecology, and new market dynamics into the narrower, underreported geographic framework of Karachi, Pakistan.

Instead of introducing new empirical evidence into the market as a conventional research article, the presented work is a synthesis of existing literature sources in the context of observations and qualitative research on the market. In this way, one can not only populate an interesting interaction between these broad concepts in a new environment, but also await more rigorous hypothesis-driven research in the future, an initial ethically-conducted evaluation of the value of zoological and applied animal research. This study aimed to quantify social behavioral differences across three captive generations of guinea pigs in Karachi. Specifically, it tests whether offspring of dominant parents exhibit significantly higher frequencies of initiated aggressive interactions than offspring of submissive parents. The study hypothesize that behavioral profiles (dominant/submissive) are consistent over time and are associated with parental behavioral types. Variables include aggression frequency (counts/hr), parental behavior category, and offspring behavioral classification. The study aimed to integrate domestication science, behavioral ethology, and emerging pet market dynamics to improve understanding of guinea pig welfare, management, and sustainable market development in Pakistan.

METHODS

The study utilized an observational descriptive design with qualitative elements in investigating the behavior of guinea pigs in a controlled environment. This study was conducted at the Department of Zoology, University of Karachi, Karachi, Pakistan from January 2023 to January 2024. Non-invasive but structured observations, recording patterns and frequencies of social interactions, were the major method of collecting animal data. Qualitative thematic analysis of interviews with the stakeholders was added to these behavioral notes. This method may be characterized as descriptive observational research, not a formal mixed-methods study, because the quantitative components (counts, percentages) are to be applied to do the bare description, and not statistical hypothesis testing. The number of 30 guinea pigs was selected mainly due to the feasibility considerations, namely the laboratory housing space and logistical control of a multi-generational, controlled breeding colony. The number of cohorts is comparable to the sample sizes that were employed in previous pilot and descriptive behavioral research of captive guinea pigs that tend to range between 20 and 40 animals to accommodate an in-depth observational evaluation without compromising the welfare criteria. This figure helped to observe three consecutive generations, but is known to be inadequate to make inferences on a large scale. The animals represented three generations of consecutive animals, such that the first generation of animals represented parental stock, the second generation of animals represented the second generation of the animals and their third-generation progenies, which were born out of controlled breeding. The experiment was carried out on male and female guinea pigs who had various personalities. Animals were kept in well-ventilated cages in normal environmental conditions and kept at a temperature of 22-25°C±, a relative humidity of 50-60, and a 12-hour light-dark cycle. Guinea pigs were provided with clean bedding material and ad libitum access to fresh water and a balanced diet, which included the commercial guinea pig food, which was supplemented with fresh vegetables that contain enormous amounts of vitamin C that limit stress. Cages were washed frequently to maintain hygiene. The animals were described in terms of phenotypes, which were the color of the coat and marks (e.g., tricolor, tortoiseshell, Himalayan, tan, and agouti). The characteristics assisted in recognizing the visual approach and making individual identification when watching their actions. This study on guinea pigs and behavior, and the market trend in Karachi, will have a sampling plan of identifying the participants purposively. The purposive sampling has been used to conduct the in-depth interviews and observations to collect rich data. The literature on the relevant behaviors of guinea pigs,

domestication, and market trends in Karachi, Pakistan form the secondary sources of data used in this study. The available literature on the trends of the guinea pig market supports the analysis with information on consumer behavior and trends. Reputable sources were consulted to guarantee confidence, and the accuracy of the data was checked. Despite the limitations associated with the use of secondary data as a source of data, the availability of variables and quality of the data, prudent selection and analysis can enable one to have useful information on the market trends of guinea pigs in Karachi. The use of secondary data will enable a low-cost and efficient analysis without having to collect primary data. In this paper on the domestication of guinea pigs, their behavior and market trends in Karachi, Pakistan, the primary and secondary data have been employed to have a full picture. In the case of primary data, the open-ended interviews would be done on people at both ends of the spectrum of the guinea pig industry. These debates touched upon such issues as consumer tendencies, market dynamics, and competition. The interviews conducted provided valuable information about the sophistication of the industry through the first-hand accounts. At the same time, the observations were conducted in different domestic environments, including homes and markets. Through analysis of behavior, such as feeding habits and social behavior, coupled with responses to stimuli, guinea pig behavior was to be known more holistically. These observations were documented in the field using detailed field notes, hence the greater comprehension of behavioral patterns. In the case of secondary data, the literature review has been undertaken to concentrate on the domestication of guinea pigs, behavior, and market trends. Academic journals, industry publications, and reliable online sources were the primary depositories of the collection of past insights and theories. The results were put into perspective in this literature against the existing knowledge. The interviews and observations were conducted in a systematic way, with the interviews being recorded on audio with permission, transcribed, and the observational notes analyzed in themes. This was the method of secondary data, whereby the primary aim was to get information from credible and trusted sources to provide accurate data. The participants were given the utmost consideration of their rights and well-being. The informed consent took place because they were provided with extensive information regarding the study's purposes, procedures, risks, and benefits. The researchers also make the study voluntary and assure the participants of free withdrawal at will without consequences. Anonymity and confidentiality were ensured, and personal information was revealed when analysis and report writing were conducted. Any secondary data used was of high ethical standards, and it was ethically

sourced and credited. Only reliable second-hand sources have been referred to so as to have accurate data. Security measures of the data integrity were maintained, and all the intellectual property rights were honored. The best interests of the human and animal subjects were the central consideration and subject to the principle of minimal harm or distress. Every experiment that involved the use of animals was carried out in accordance with the set animal welfare principles. The study was seen to be conducted with caution so as to avoid stress and discomfort in the animals. None of the invasive procedures had been performed, and all the observations were non-invasive. In the research, the researcher sought to examine the data on domestication, behavior, and the market of guinea pigs in chosen regions of Karachi with the help of qualitative methods. The general aim is to identify similarities and trends among the information obtained. In the analysis of the qualitative data, the thematic analysis of interviews has been used, which enables recognition and arrangement of the patterns and themes associated with the guinea pig ownership. This was done through the initial coding of the data, then grouping the codes into common themes. The themes provided a detailed discussion of behavioral patterns of the guinea pigs, their domestication, and tendencies in the market in Karachi. In addition, the content analysis method was employed to extract the profound information in connection with domestication, behavior, and price tendencies of the guinea pig. In addition, the observations on the guinea pigs were analyzed by using themes and patterns on the behavior. The analysis of data has been carried out to provide a comprehensive perspective of these themes.

RESULTS

Guinea pigs showed a clear social pattern with dominance hierarchy and patterns of interaction that were similar within all three generations. The interactions integrated to express social behavior were mostly feeding, spatial positioning inside the enclosure, vocalization, and physical posturing. There were distinct differences between dominant and submissive individuals as observed over time. Dominant guinea pigs, especially males, often initiated social interactions and showed aggressive behaviors, including chasing, mounting, head raising, and displacing cage mates. Leadership was also manifested by dominant females during feeding and exploration, and under these circumstances, they showed lower aggression compared with dominant males. These behavioral patterns are summarized in table 1.

Table 1: Observational Data of Guinea Pigs Across Three Generations(n=30)

Sr. No.	Personality Trait	Generation	Coat Markings	Identifier
1	Dominant Male	First Generation	Tricolor	DM1
2	Submissive Male	First Generation	Tortoiseshell	SM1
3	Dominant Female	First Generation	Tan	DF1
4	Submissive Female	First Generation	Himalayan	SF1
5	Dominant Male	First Generation	Agouti	DM2
6	Submissive Female	First Generation	Tortoiseshell	SF2
7	Submissive Female (Litter 1)	Second Generation	Himalayan	S1
8	Submissive Female (Litter 1)	Second Generation	Tortoiseshell	W1
9	Submissive Male (Litter 1)	Second Generation	Tricolor	M1
10	Dominant Female (Litter 1)	Second Generation	Tan	D2
11	Submissive Male (Litter 2)	Second Generation	Tortoiseshell	V1
12	Submissive Female (Litter 2)	Second Generation	Agouti	S2
13	Dominant Male (Litter 2)	Second Generation	Himalayan	D3
14	Submissive Female (Litter 2)	Second Generation	Tricolor	S3
15	Submissive Male (Litter 3)	Second Generation	Tortoiseshell	M2
16	Submissive Female (Litter 3)	Second Generation	Tan	S4
17	Dominant Female	Third Generation	Tortoiseshell	T1
18	Submissive Female	Third Generation	Himalayan	T2
19	Submissive Male	Third Generation	Tricolor	T3
20	Dominant Male	Third Generation	Agouti	T4
21	Submissive Female	Third Generation	Tortoiseshell	T5
22	Submissive Male	Third Generation	Tan	T6
23	Submissive Female	Third Generation	Himalayan	T7
24	Dominant Female	Third Generation	Tricolor	T8
25	Submissive Male	Third Generation	Tortoiseshell	T9
26	Submissive Female	Third Generation	Agouti	T10
27	Dominant Male	Third Generation	Tan	T11
28	Submissive Female	Third Generation	Himalayan	T12
29	Submissive Male	Third Generation	Tricolor	T13
30	Submissive Female	Third Generation	Tortoiseshell	T14

Submissive individuals displayed avoidance behaviors, including retreat, reduced vocalization during social interactions, and delayed access to shared resources. Submissive females, particularly in the second and third generations, formed affiliative associations, frequently resting in proximity and adopting mutual resting patterns. Submissive males were less competitive and commonly yielded during social encounters. The distribution of dominant and submissive traits across generations is presented in figure 1.

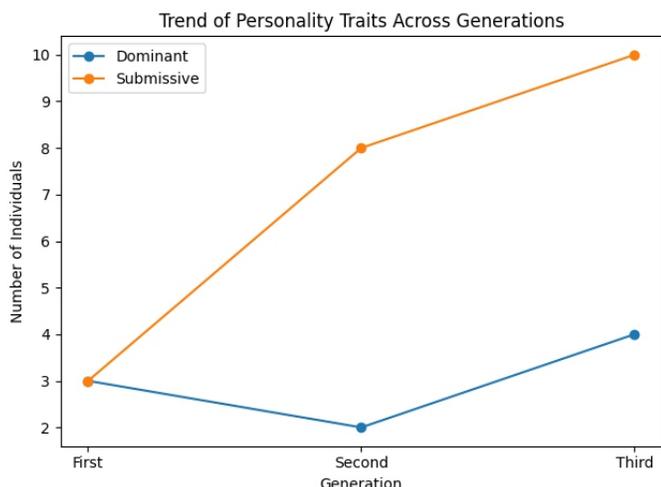


Figure 1: Trend of Dominant and Submissive Personality Traits Across Generations

All the behavioral observations had the individual animal as a unit of analysis. All 30 guinea pigs were individually evaluated and given a behavioral profile (dominant or submissive) according to repeated focal observations. Generational comparisons are descriptive summaries of such individual-level classifications. The social rank was closely related to reproductive behavior. The major breeding was between receptive females and dominant males. Dominant males displayed more courtship behaviours, such as vocalization, circling, sniffing, and mounting, whereas submissive males were less active in reproduction and were frequently chased out in the course of mating exchanges. The female behavioral patterns

involved estrus locomotion and openness to male attention. Effective mating led to pregnancies, which developed in the normal course of being raised in normal husbandry conditions. The sizes of litter differed among individuals, and females in the second and third generations were relatively more reproductively efficient. Parents took care of their children in a rather feminine way with little involvement of male. The female gender displayed postnatal behaviors immediately after birth, including grooming of pups, initiating physical activity, and ensuring intimate contact with pups to offer warmth and comfort. The nursing behavior started in the early years and went on in early postnatal years. Birth of offspring was precocial, and they were open-eyed, furred, and moved early. Maternal presence was still important in early survival, although there was some independence. Dominant females were more reliable in pup protection, whereas submissive females were sometimes able to relocate pups according to social interaction. The predominant occasions on which aggressive behavior was witnessed were in the establishment of dominance, resource competition, and mating interactions. The total levels of aggression were moderate and were not usually injurious. The behavior of dominant males included chasing, teeth chattering, thrusting of the head, mounting, and expelling other members of the group. Physical fighting was rare. Reproductive observations, types of aggression observed, and aggression-related observations are summarized in table 2.

Table 2: Maternal Behaviour and Reproductive Performance and Types of Aggression Observed in Guinea Pig

Parameters	Observations	Notes
Average Litter Size	2-3 pups per litter	Includes both surviving and stillborn pups
Maternal Care	Grooming, licking, nursing	Displayed by all mothers: strong maternal instincts
Survival Rate	70-80% of pups survive to weaning	Mortality is mainly due to stillbirths or stress
Postpartum Aggression	Observed in ~40% of mothers	Aggressive behaviour toward males or other juveniles
Types of Aggression Observed		
Territorial / Dominance	New introductions, mating	Common in dominant males (30%)
Maternal / Protective	Offspring disturbance	Observed in all mothers with pups
Resource-Based	Competition for food or hay	Occasionally, especially during high-value feeding
Stress-Induced	Handling environmental changes	Moderate; affects both sexes
Types of Behavioural Traits		
Dominance Display	Mounting, rumble strutting, chasing, scent marking	Observed in 30% of males, establishes hierarchy
Grooming / Bonding	Mutual grooming, gentle nibbling	Observed in all individuals; indicates social bonding
Submissive Behaviour	Retreating, avoiding confrontation	Seen in subordinate males and females (25%)
Vocal Communication	Wheezing, squeaking, rumbling	Used to signal dominance, distress, or mating interest

Feeding behavior was structured according to social hierarchy. Dominant individuals consistently accessed food first, whereas submissive animals fed later or from peripheral locations. Juvenile guinea pigs acquired feeding behaviors through observation of adults. Feeding patterns are summarized in table 3.

Table 3: Feeding Habits and Dietary Observations of Guinea Pigs

Parameters	Observations	Notes
Main Diet	Timothy hay, leafy greens, occasional fruits	Provided ad libitum, ensures fiber and vitamin C intake
Grazing Pattern	Frequent, small meals throughout the day	Natural grazing behaviour was observed in all individuals
Special Feeding	Increased food during pregnancy/lactation	Important for maternal and pup health
Food Novelty Response	Gradual adaptation to new foods	Individual variation observed; some are hesitant to try new items

Habituation behavior was evident across generations. First-generation guinea pigs required longer periods to adjust to handling and environmental conditions, while second- and third-generation animals showed faster habituation, reduced fear responses, and increased exploratory behavior. Habituation patterns are summarized in table 4.

Table 4: Habituation Levels and Responses in Guinea Pigs

Habituation Levels	Observations	Frequency / Notes
Fast	Adapt quickly to handling, calm behaviour	30% of individuals, mostly younger or more social guinea pigs
Moderate	Adapt gradually, show occasional vocalizations	50% of individuals
Slow	Remain fearful or stressed with handling	20% of individuals, usually older or less social guinea pigs
Response to Repeated Stimuli	Reduced fear, increased calmness	Observed in most individuals after consistent exposure

Analysis illustrates the interrelationship among three major factors: domestication, behavioral adaptations, and market dynamics. The domestication process leads to the evolution of preferred traits, which in turn influence market demand. Behavioral adaptations, resulting from genetic selection and population-environment interactions, affect guinea pigs' responses toward humans, conspecifics, and the environment. Market dynamics, including consumer preferences and economic forces, influence breeding strategies and trait selection. The intersection points of the diagram highlight feedback loops where domestication, behavior, and market forces jointly affect guinea pig welfare, social traits, and commercialization (Figure 2).

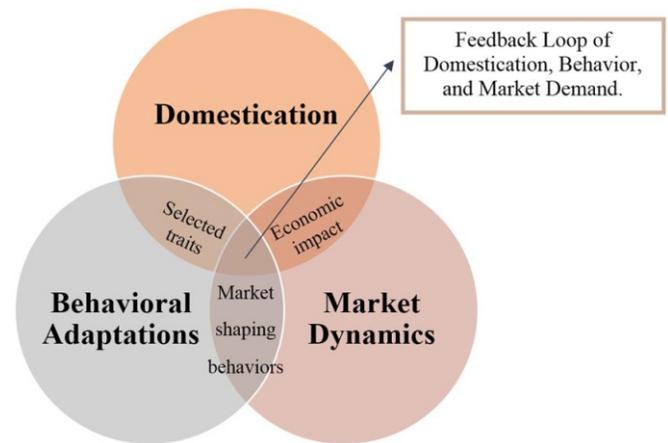


Figure 2: The Interrelationship among Three Major Factors: Domestication, Behavioral Adaptations, and Market Dynamics

DISCUSSION

The results of the current experiment show that the captive guinea pigs establish a consistent hierarchy of dominance that affects socialization, mating, aggression, food consumption, and habituation. The introduction of the same dominant and submissive behavior patterns in three generations of individuals points to the idea that these social systems are preserved under the conditions of controlled captivity. The relationship of dominance status and reproductive success in the present study is in line with the reports in domesticated and laboratory-kept cavies, where dominant males usually exhibit higher courtship and mating access [9-11]. The behaviors of maternal care were strong in both females and seemed to be vital to the survival of offspring, irrespective of whether the guinea pig neonates were precocial or not. The postnatal protective behaviors, such as maternal aggression and pup relocation, are probably adaptive to social competition [12-14]. This means that behavioral adaptation to captivity is based on the decrease in aggressive encounters and hastened habituation in the subsequent generations. These patterns have been indicated in domesticated mammals, where recurrently undergoing normal environment and human handling makes stress responsiveness less and exploratory behavior more prominent [15-18]. According to historical and ethological literature, the guinea pig was domesticated many thousands of years ago, based in the Andean region, and took a commensal route of domestication [19, 20]. The reduced aggression, increased sociability, and altered stress-reactions have been linked to selective breeding and also lengthened contact with humans [21, 22]. The domestication-associated traits that are recorded are aligned with the behavioral trends, which are shown in the current analysis. On the whole, the findings offer novel observational data that social rank is a key determinant of the organization of behavior among captive guinea pigs.

The results lead to a deeper appreciation of the guinea pig behavior in a controlled state and have some applications in the welfare, breeding management, and behavioral studies of this species [23-26].

The primary limitations of the research are that it was an observational study only conducted in a controlled and captive environment, and thus does not extrapolate the results to wild populations or even to other captive environments. The small sample size and the limited scope of the three generations of study also discourage this, and one can never make a definitive finding on the long-term evolutionary patterns. Experimental manipulations of social structure should also be conducted on larger and multi-generational cohorts in the future, in a manner that allows for causal relationships using large cohorts. Comparative studies of wild, domestic, and laboratory strains also need to be done in order to better disentangle the naturally occurring behavioral phenotypes from the effects of imprisonment and domestication.

CONCLUSIONS

Domestication and human management shape guinea pig behavior, reproduction, and social structure. The emerging guinea pig market in Karachi is stable, diverse, and shows strong growth potential. Comparisons with traditional markets, such as those in the Andean region, highlight the value of culturally informed approaches in promoting sustainable development and integrating guinea pigs into local pet and breeding enterprises.

Authors' Contribution

Conceptualization: SZ
 Methodology: SZ, RK, AAR
 Formal analysis: RK, AAR
 Writing and Drafting: SZ, RK
 Review and Editing: SZ, RK, AAR

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

REFERENCES

- [1] Elsbacher T, Sommese A, Waiblinger S, Künzel F, Arhant C, Windschnurer I. Guinea Pig (*Cavia porcellus*) Welfare: Associations Between Husbandry Practices, Human-Animal Interactions, and Animal Behaviour. *Animals*. 2025 Apr; 15(8): 1157. doi: 10.3390/ani15081157.
- [2] Crockford SJ. Animal Domestication and Heterochronic Speciation: The Role of Thyroid Hormone. *Human Evolution Through Developmental Change*. 2002: 122-53.
- [3] Powell DM, Kozłowski CP, Clark J, Seyfried A, Baskir E, Franklin AD. Physical and Physiological Indicators of Welfare in Guinea Pigs (*Cavia porcellus*) Serving as Ambassador Animals. *Animals*. 2020 May; 10(5): 815. doi: 10.3390/ani10050815.
- [4] Pinchao-Pinchao Y, Serna-Cock L, Osorio-Mora O, Tirado DF. Guinea Pig Breeding and Its Relation to Sustainable Food Security and Sovereignty in South America: Nutrition, Health, and Production Challenges. *CyTA-Journal of Food*. 2024 Dec; 22(1): 2392886. doi: 10.1080/19476337.2024.2392886.
- [5] Donoso G, Galecio JS, Fuentes-Quisaguano OG, Pairis-Garcia M. Guinea Pig Meat Production in South America: Reviewing Existing Practices, Welfare Challenges, and Opportunities. *Animal Welfare*. 2025 Jan; 34: e29. doi: 10.1017/awf.2025.26.
- [6] Lee KN, Pellom ST, Oliver E, Chirwa S. Characterization of the Guinea Pig Animal Model and Subsequent Comparison of the Behavioral Effects of Selective Dopaminergic Drugs and Methamphetamine. *Synapse*. 2014 May; 68(5): 221-33. doi: 10.1002/syn.21731.
- [7] Lord E, Collins C, deFrance S, LeFebvre MJ, Pigièrre F, Eeckhout P et al. Ancient DNA of Guinea Pigs (*Cavia* spp.) Indicates A Probable New Center of Domestication and Pathways of Global Distribution. *Scientific Reports*. 2020 Jun; 10(1): 8901. doi: 10.1038/s41598-020-65784-6.
- [8] Guan T, Guo J, Lin R, Liu J, Luo R, Zhang Z, Pei D, Liu J. Single-Cell Analysis of Preimplantation Embryonic Development in Guinea Pigs. *BioMed Central Genomics*. 2024 Sep; 25(1): 911. doi: 10.1186/s12864-024-10815-z.
- [9] Künzl C, Kaiser S, Meier E, Sachser N. Is A Wild Mammal Kept and Reared in Captivity Still a Wild Animal? *Hormones and Behavior*. 2003 Jan 1; 43(1): 187-96. doi: 10.1016/S0018-506X(02)00017-X.
- [10] Rosero¹ J, Rosero-Alpala MG, Rosero D, Rosero A, Tapie WA. Phenotypic Variability of Native Guinea Pig (*Cavia porcellus*) Lines Associated with Productive and Reproductive Variables in the Traditional Production Systems of the Pastos Indigenas Reserve. *World*. 2024; 14(4): 559-71. doi: 10.54203/scil.2024.wvj64.
- [11] Vargas-Jauja YC, Casilla-Huallpa KM, Chino-Velasquez LB, Díaz-Céspedes MA, Gómez-Quispe QE, Camero-DeLaCuba J et al. Production and Reproduction of Primiparous Guinea Pigs

- Concerning Lysine Levels. *American Journal of Animal and Veterinary Sciences*. 2025; 20(2): 103-111. doi: 10.3844/ajavsp.2025.103.111.
- [12] Hudson R and Trillmich F. Sibling Competition and Cooperation in Mammals: Challenges, Developments and Prospects. *Behavioral Ecology and Sociobiology*. 2008 Jan; 62(3): 299-307. doi: 10.1007/s00265-007-0417-z.
- [13] Von Engelhardt N, Kowalski GJ, Guenther A. The Maternal Social Environment Shapes Offspring Growth, Physiology, and Behavioural Phenotype in Guinea Pigs. *Frontiers in Zoology*. 2015 Aug; 12(Suppl 1): S13. doi: 10.1186/1742-9994-12-S1-S13.
- [14] Maigado AI, Ma'aruf BS, Shuaibu A, Ahmadi B. Heritability Estimate of Birth Weight in Guinea Pig (*Cavia porcellus*). *Nigerian Journal of Animal Production*. 2020: 189-92.
- [15] Genzer SC, Flietstra T, Coleman-McCray JD, Tansey C, Welch SR, Spengler JR. Effect of Parental Age, Parity, and Pairing Approach on Reproduction in Strain 13/N Guinea Pigs (*Cavia porcellus*). *Animals*. 2023 Mar; 13(5): 895. doi: 10.3390/ani13050895.
- [16] Tobou Djoumessi GF, Tendonkeng F, Kenfack LB, Miégoué E, Fokom DW, Kuitche HM et al. Characterization and Typology of Guinea Pig Breeding in the Department of Menoua-Western Region, Cameroon. *Tropical Animal Health and Production*. 2023 Dec; 55(6): 423. doi: 10.1007/s11250-023-03838-3.
- [17] Herman YC, Fon Dorothy E, Felix M, Niba AT, Manjeli Y, Djikeng A. Cavies for Income Generation, Manure for the Farm and Meat for the Table. *Higher education*. 2014; 6: 2-60.
- [18] Zeder MA. Pathways to Animal Domestication. *Biodiversity in Agriculture: Domestication, Evolution, and Sustainability*. 2012 Jan; 10: 227-59. doi: 10.1017/CB09781139019514.013.
- [19] Brust V and Guenther A. Domestication Effects on Behavioural Traits and Learning Performance: Comparing Wild Cavies to Guinea Pigs. *Animal Cognition*. 2015 Jan; 18(1): 99-109. doi: 10.1007/s10071-014-0781-9.
- [20] Baharun A, Putra WP, Rahmi A, Handarini R, Setiawan BA. The Origin of Indonesian Guinea Pig (*Cavia porcellus*) Inferred from Mitochondrial Cytochrome-b Gene. *Pakistan Journal of Zoology*. 2025 Dec; 57(6): 2985. doi: 10.17582/journal.pjz/20240130051740.
- [21] Kleven GA. Behavioral Biology of Guinea Pigs. In *Behavioral Biology of Laboratory Animals*. 2021 Aug; 131-146. doi: 10.1201/9780429019517-10.
- [22] Bislava MB, Igwebuiké JU, Buba S, Bukar AI. Understanding Standard for Guinea Pig Production in Nigeria: A Review. *Nigerian Journal of Animal Science*. 2022 May; 24(1): 90-9.
- [23] Machatschke IH, Bauer BE, Schrauf C, Dittami J, Wallner B. Conflict-Involvement of Male Guinea Pigs (*Cavia Aperea F. Porcellus*) as A Criterion for Partner Preference. *Behavioral Ecology and Sociobiology*. 2008 Apr; 62(8): 1341-50. doi: 10.1007/s00265-008-0562-z.
- [24] Quispe-Ccasa HA, Briceño-Mendoza YM, Cayo-Colca IS. Guinea Pig Sperm Morphology and Fertility under Different Photoperiods. *Animals*. 2023 Jul; 13(14): 2249. doi: 10.3390/ani13142249.
- [25] Mukhopadhyay M. Guinea Pigs as Embryo Models: Developmental Biology. *Nature Methods*. 2025 Jun: 1-. doi: 10.1038/s41592-025-02733-z.
- [26] Market Research Analytics. Guinea Pig Treats Market's Role in Emerging Tech: Insights and Projections 2025-2033. 2025. <https://www.marketreportanalytics.com/reports/guinea-pig-treats-69737>.