

Minimizing Stress In Pigs In Confinements When Conducting Research - A Review

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Abstract: Very often when conducting biomedical research involving pigs, the animals are required to be in a confined environment such as metabolic crates. In confined conditions there are guidelines to be followed as to minimize stress on the animals in order to avoid biasing the data that would eventually be obtained from such studies. The guidelines are simply good practices for the confined animals to be observed as to ensure quality maintenance and safety of the animals while conducting the biomedical or behavioral research, especially when testing for products. Furthermore, they promote the humane care of the animals with specific specifications with the sole objectives that will enhance animal well-being and welfare. Overall, these guidelines fall under three categories of environmental, management and human factors.

Key words: Confinements, Minimizing Stress, Pigs and Research

1 Introduction

In modern research studies involving animals, such as pigs they are often required to be in confinement, such as in metabolic crates. Under the confined conditions, they are required by regulations, such as the Animal Welfare Committees established in the Universities and by nations, such as The Canadian Council on Animal Care [2] guidelines that good practices for the confined animals be observed to ensure good quality maintenance and safety of the animals while conducting biomedical and behavioral research and testing products. The goals of these guidelines are to promote the humane care of the animals with the basic objective of providing specifications that will improve animal well-being and quality in the pursuit of advancement of biological knowledge that is relevant to humans and animals [12]. In line with these guideline requirements, the measures that can be adopted to minimize stress in confined pigs during research can be categorized into: environment factors, management factors and human factors.

Environmental factors

Pigs are social animals and are very sensitive to their living conditions and want to control their social environment; therefore environmental factors such as space, temperature and ventilation are very important in minimizing pigs' stress [12]. Therefore, in confining pigs adequate and quality space allowance should be considered to give pigs the room to lie, stand, eat and defecate with convenient barriers that allow them to see each other for their various activities. In this respect, the provisions of manipulable objects like pet toys and balls for the pigs' to play with reduce stress on the pigs. Adequate space gives pigs' the opportunity to choose their resting area away from their dung. This observation is supported by findings from independent studies: [13] that studied the influence of a barrier on the behavior and growth of early-weaned piglets during a 4-week period following weaning found that the frequency of aggressiveness was 40% lower and growth was 15% greater in piglets housed with adequate space and convenient barrier compared with the control. [8]-[9], [12] that investigated the effect of space

restriction and provision of toys during rearing on the behavior, productivity and physiology of male pigs further supported that adequate and comfortable space provisions as well as toys for pigs reduced stress. Also, in this study higher levels of cortisol were also observed in the plasma of pigs with space restriction confirming that the pigs were chronically stressed. Due to the extreme importance of space, pigs in confinement, such as in metabolic crates with little space for their adaptations to test diets and sample collections, such as digesta and feces; after the collection periods such pigs should be moved to areas with adequate space for them to exercise and enjoy some comfort before the next period to minimize stress resulting from the previous period. Pigs are social animals and as such communicate requiring the need of allowing them to see each other while in confinement. This aids in minimizing stress. Thus, promoting other means of communications, such as provision of music where pigs are confined aid in minimizing stress and enhance their comfort. This approach is usually used at the University of Guelph. Music is always left on in the rooms housing the confined animals for their comfort [9]. The environmental temperature where pigs are confined can induce stress. Therefore, environmental temperatures should be maintained within the range that keeps or maintains the thermo-neutral zone of the pig that aids the pigs to be within their comfort zone. Usually for grower-finisher pigs the room temperature should be at about 19 – 22°C. However, the temperature required to keep pigs within their comfort zones varies depending on their physiological status. For young, piglets, such as early-weaned piglets comfort zone is within 34 - 35°C initially but as they grow older their heat requirements reduce. The normal practice is to reduce their room temperature weekly by 1°C until they become growers during which the temperature is constantly maintained within 19 – 22°C. In areas where the room temperature cannot be automated regulated heat lamps become handy. Here, it is important to use the heat lamps according to the needs of the animals based on the temperature ranges given above. This very important because unlike humans pigs do not sweat to cool themselves through evaporative cooling process when the

temperature is high which can impact feed intake negatively and thus results in stress of the animals [12]. Closely related to environmental temperature is ventilation. There should be adequate ventilation for the pigs because it also reduces stress on the animals. Additionally, fresh, potable and uncontaminated water should be provided ad libitum for the pigs. Furthermore, periodic monitoring of microbial contamination in their drinking water should be carried out. Water devices, such as drinkers should be routinely checked to ensure that they are operating properly to always ensure that the pigs are having enough water at all times for their satiety as to avoid stress [12]. Animals should be regularly fed and be observed constantly for any signs of ill-health. Other factors of importance are management and human factors.

Management factors

Pigs in confinements are actually housed in most cases individually in their pens or metabolic crates with adequate space. Beyond space, the animals in confinements should be given effective management. Aspects of effective management include the pig hygiene, keeping to feeding schedules, effective monitoring of the animals' health and veterinary care [12]. It is therefore, mandatory that before research pigs arrive in their crates or pens, they must be thoroughly cleaned and their crates well sanitized to ensure germ-free environments for the pigs. By this, the pigs are protected against pathogenic attacks. From here a well-articulated program must be designed to control, eliminate and prevent the presence of pests in the sanitized environment, thereby maintaining the sanitized status of the crates and rooms housing them from the beginning of the study to the end. Overall, these measures ensure no pathogen presence to possibly stimulate the animal immune systems leading to achieving unbiased result data. When any of these management tips is slacked it can result in stress of the animals and lead to reduction in feed intake and thus suppresses skeletal muscle growth [1], [10]. Denying the animals their feeds at the due time leads to stress and therefore should be avoided [12]. Again, the health of the animals should be closely monitored on daily basis, including weekends and holidays to ensure their well-being to minimize stress. This can be done by keeping data monitoring sheets indicating their feed intakes on daily basis, including body temperature and any signs of deviation from their normal activities. Data monitoring sheets aid in the detection of early symptoms of ill-health and thus early veterinary attention to minimize stress. Animals that do not respond to such early treatments must be discontinued from the study and in extremely cases humanely euthanized. The stockman or the technician must be trained to be very familiar with these protocols.

Human factors

These include personal hygiene and human-animal relationship. The animal attendant must be hygiene-conscious in the pig environment as not to introduce pathogen to the animals' environment. The attendant must handle pigs very pleasantly. Pigs handled unpleasantly are highly fearful of humans and this has been shown to increase acute or chronic stress response [12], thereby placing their productivity and welfare at risk [8]. Friendly pigs should be humanely played with and handle humanely whereas more care should be taken in dealing with the hostile ones until

they get acquainted with the stockman to avoid exposing them to stress.

Table 1: Pigs' responses to positive, minimal and aversive treatments – summary of five studies.

Item	Handling treatment		
	Positive	Minimal	Aversive
Study and parameters measured		Mean value of parameter	
[4]			
Time to interact with experimenter (s) [†]	119	-	157
Growth rate from 11-22 weeks (g/day)	709 ^b	-	669 ^a
Free corticosteroid concentrations (ng/ml) [#]	2.1 ^x	-	3.1 ^y
[3]			
Time to interact with experimenter (s) [†]	73 ^a	81 ^{ab}	147 ^b
Growth rate from 8-18 weeks (g/day)	897 ^b	881 ^{ab}	837 ^a
[5]			
Time to interact with experimenter (s) [†]	48 ^x	96 ^y	120 ^z
Pregnancy rate of gilts (%)	88 ^b	57 ^{ab}	33 ^a
Age of fully coordinated mating response by boars (days)	161 ^x	176 ^{xy}	193 ^y
Free corticosteroid concentrations (ng/ml) [#]	1.7 ^a	1.8 ^{ab}	2.4 ^b
[6]			
Time to interact with experimenter (s) [†]	10 ^x	92 ^y	160 ^z
Growth rate from 7-13 weeks (g/day)	455 ^b	458 ^b	404 ^a
Free corticosteroid concentrations (ng/ml) [#]	1.6 ^x	1.7 ^x	2.5 ^y
Hemsworth and Barnett (1991)			
Time to interact with experimenter (s) [†]	55 ^a	-	165 ^y
Growth rate from 15kg for 10 weeks (g/day)	656	-	642
Free corticosteroid concentrations (ng/ml) [#]	1.5	-	1.1

Means in same row with different superscripts differ significantly (^{a,b,c} $P \leq 0.05$; ^{x,y,z} $P \leq 0.01$); [#]Treatment involving minimal human contact; [†]Standard test to assess level of fear of humans; [#]Blood samples remotely collected at hourly intervals from 0800 to 1700 hours. Source: [8].

2 Conclusions

During most biomedical studies involving pigs, the animals are required to be in confinements, such as in metabolic crates. Confining of pigs during such studies can easily expose the animals to stress. Therefore, during such studies good environmental, management and human factors should be employed in ensuring that stress is not induced in the animals. When these factors are not properly used in the management and regulation of activities around the animals they become stressed. These observations are further confirmed with the results of five different independent studies showing pig responses based on the handling management type and the physiological factors assessed data are shown in Table 1. Corticosteroids productions are based on the degree of stress the animals were exposed to in respect to the factor involved. These results also support the fact that aversive handling of pigs increases stress compared with positive (humane) handling of the pig. Additionally,

they support the fact that stockpersons/technicians must be adequately trained in pig handling and treatment to minimize fear and stress on the animal. Overall, on the whole therefore, frantic efforts should be made in line with the afore-stated factors to avoid stress on the animal as stress often stimulate of stress signaling pathway which usually impacts the animals negatively on their important physiological functions while in confinements. This key understanding is very crucial because the stimulation of stress signaling pathway in the pig results in intestinal dysfunction [11].

3 References

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