

Corncob :A comfort to laboratory rodents or A risk to research objectives ?

Bhavin R. Kansara¹, Jayant P. Hole², Himanshu Joshi³, Pradeep B. Deshmukh⁴

¹ Small Animal Facility for Experimentation (SAFE), Department of Biological Sciences, Indian Institute of Science Education & Research (IISER) Mohali, Sector 81, Mohali - 140306, Punjab

² Experimental Animal Facility, Centre for DNA Fingerprinting and Diagnostics (CDFD), Opp. M.J. Market, Tuljaguda Complex, Nampally, Hyderabad - 500 001, Telangana

³ NGSMIPS, Paneer Derlakhate, Mangalore – 575018, Karnataka

⁴ Innova Consultancy Services, C-2/802, Kumar Shantiniketan, Sus-Pashan Road Walkeswar Chowk, Pashan, Pune – 411021, Maharashtra

Corresponding author:

Bhavin R. Kansara,

Small Animal Facility for Experimentation (SAFE), Department of Biological Sciences
Indian Institute of Science Education & Research (IISER),

Sector 81, Mohali, Punjab - 140306

Phone: +91 7696409391, Email: bhavinkansara@gmail.com

Abstract

Corncob has been the most common choice of bedding material for laboratory animals in many countries due to its ready availability, low cost and better absorbance properties. However, corncob has been reported to have estrogenic, endocrine disruption and mitogenic properties by few authors. Animal facilities need to make a wise decision while selecting a particular bedding type, such that the unwanted effects associated with bedding like corncob, may not interfere with the research objectives. Chip bedding made from hardwood is one of the most common choices of bedding by most international animal facilities for commercial breeders, academic research institutes, pharmaceutical industry and pre-clinical contract research organisations.

Key words: Corncob, estrogenic, endocrine disruption, mitogenic, hardwood chips

Background

Animal housing practices have improved over the time with progress and update in research findings on laboratory animal science. Most animal house facilities do not use paddy husk due to its high dust content and increased incidence of spontaneous lesions in respiratory tract caused by heavy load of allergens reported by its use as bedding material. Corncob has been the most common choice of bedding material for laboratory animals in developing countries these days, with both conventional cages and individually ventilated caging (IVC) systems. Due to increasing use of IVC systems, corncob has become a primary choice of bedding type because of its comparatively high absorption properties, low dust/allergen content as compared to rice husk and its ready availability. Better absorption also saves time and man-power associated with frequent bedding changes.

Adverse effects related to use of corncob bedding

Corncob is available in India over a wide range of qualities, from local manufacturers as well as imported one. However, issues related to estrogenic, endocrine disruption and mitogenic properties of corncob (Barry *et al.*, 2002; Villalon *et al.*, 2012; Trainor *et al.*, 2013) needs to be considered before making choice of corncob as bedding material. It was reported that animals eat corncob bedding (Villalon *et al.*, 2012) which may result in unusual increase in body weight and changing nutritional status of animals. Thus animals raised on corncob bedding can have these adverse effects on physiology including variations in molecular events of normal physiology, affecting the experimental outcome and hypothesis of a research plan. Further, particle size of available corncob is not much uniform and due to its spherical shape animals are not comfortable to rest on corncob bedding (Ras *et al.*, 2002).

Availability and decision to use an alternate bedding type

Animal facilities in India have not shifted to alternative bedding material like hardwood bedding, either due to lack of awareness of recent publications related to adverse effects with corncob bedding, due to insufficient budget allotted from the facility management or due to non-availability of a newer bedding type. Hardwood chip bedding has been the primary choice of bedding these days with most animal facilities in US and Europe for both industrial and academic organizations, since it has no such issues as reported with corncob. Further, absorbance properties, dust content, and particle size can be better controlled for wooden chip bedding at the time of manufacturing process, giving animals a better, safe, natural and comfortable environment inside the cage. Moreover, hardwood chip bedding has been reported to be more preferred by rats and mice over corncob (Thomas and Axel, 2008).

Need for alternate bedding type in India

Animal facilities in India need to transform to a newer and globally accepted bedding type. Commonly used corncob bedding having estrogenic, mitogenic and endocrine disruption properties may adversely affect the research outcome, while wasting other expensive consumables procured to perform downstream molecular experiments, time for conduct of research and inadvertently reporting unexpected or wrong results by the investigators.

Discussion

Investing a little more money while choosing a better and globally accepted bedding material can save time, money and man-power being invested on animal research. This approach will also ensure that the influence of variables such as endocrine disruption, mitogenic and estrogenic activities, unwanted change in nutritional status and unusual body weight increase as reported with use of corncob bedding can be minimized on the test system. Associations for Laboratory Animal Science could play a lead role to educate, train and

spread awareness among animal facility managers, biological scientists, technicians and support staff to adopt newer and globally accepted practices, so that publications and regulatory reports generated in India from *in-vivo* studies are internationally accepted and well recognized. Villalon *et al.*, (2012) reported that investigators should mention the type of bedding used for animal experimentation in manuscripts submitted to the scientific journals for publications.

Animal facilities should make a thorough assessment of scientific justification for using a particular bedding type, its annual costing, ensure its regular supply from a reliable source so that it does not change frequently, safety of a particular bedding type, and most important to consider the comfort of animals.

References

- Barry M, Shaila M, Mary AA *et al.*, (2002). A Novel Endocrine-Disrupting Agent in Corn with Mitogenic Activity in Human Breast and Prostatic Cancer Cells. *Environ.Health Perspect.* 110(2): 169-177.
- Ras T, van de Ven M, Patterson-Kane EG, Nelson K (2002). Rats' preferences for corn versus wood-based bedding and nesting materials. *Lab. Anim.* 36(4): 420-425.
- Thomas CK, Axel KH (2008). Evaluation of Corncob as Bedding for Rodents. *Scand. J. Lab. Anim. Sci.* 35 (4) : 231-236.
- Trainor BC, Takahashi EY, Campi KL *et al.*, (2013). Sex differences in stress-induced social withdrawal: independence from adult gonadal hormones and inhibition of female phenotype by corncob bedding. *Horm.Behav.* 63(3):543-550.
- Villalon LR, Morisseau C, Yoo HJ, Fu SH, Hammock BD, Trainor BC (2012). Corncob Bedding Alters the Effects of Estrogens on Aggressive Behavior and Reduces Estrogen Receptor- α Expression in the Brain. *Endocrinol.* 153(2):949-953.