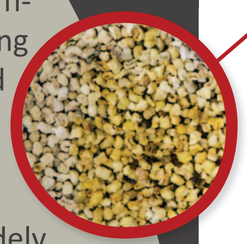
Cellulose-based Bedding as an Alternative to Corn-cob for Breeding Colonies

S Fowler, PhD, RLATG*, B Hibl, DVM, G Esquivel, C Southern , RLATG, CMAR, CA Buckmaster, PhD, CMAR, RLATG
Baylor College of Medicine. Houston, TX

BACKGROUND

Bedding material used in rodent cages is constantly being re-evaluated in terms of cost efficacy, animal preference, and advances in animal welfare. Determining which bedding choice is ideal for a facility can be challenging due to lack of directly comparable metrics. Our facilities, including the breeding colony, have historically used pelleted corn-cob bedding for rodents. However, corn cob bedding is less than ideal because it contains linoleic acid derivatives, which act as an endocrine disruptor, as well as low levels of acetic acid and sulfur dioxide (1, 2).



Cellulose-based bedding, which has become more widely used in recent years, has superior ammonia/odor control compared to other bedding types (3). Additionally, its increased absorbency by weight and decreased dust levels provide tangible benefits in respiratory studies due to decreased potential for contact with endotoxins (when compared to corn-cob and wood) (4).

The Guide for the care and use of laboratory animal medicine recommends that "enclosures and accessories should be sanitized at least once every 2 weeks", but cages should be changed as necessary to ensure an environment free from excess moisture and dirtiness (5). Our program currently stipulates that individually ventilated cages (IVC's) undergo a complete cage change-out every 2 weeks, with localized off-cycle cage changes (e.g., spot-changes) as needed for excessive soiling. Identifying a bedding material that decreases the need for spot-changes would provide a cleaner environment for animals, decrease animal stress associated with more frequent handling, and decrease personnel time. Additionally, bedding material free of phytoestrogens would help prevent potential confounding factors in data collection for sensitive studies.

MATERIALS AND METHODS

Mice in two breeding rooms (each room containing approximately 450 cages per room of mixed strain breeding mice) were placed on 1/4" pelleted cellulose bedding for 4-6 weeks (Fig. 4), followed by a return to standard 1/4" pelleted corn-cob bedding for 2-4 weeks (Fig. 2). All cages were on IVC racks, and contained an EnviroPak nesting/enrichment material. The total number of cages spot-changed (cages that required changing during the non-change-out week), as well as total number of new litters and deceased pups were tallied daily in each room by a single animal care attendant. Data was compiled over the course of the study and compared statistically to detect meaningful differences between bedding types. Significance was determined by a p value of <0.01. Bedding requiring a cage change (Fig.1 & Fig 3).

Fig. 1

—Corn Cob—

Fig. 2

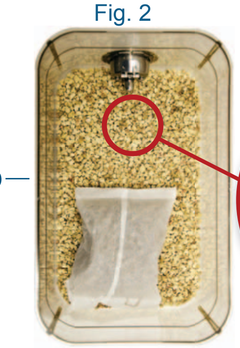


Fig. 3

—Cellulose—

Fig. 4

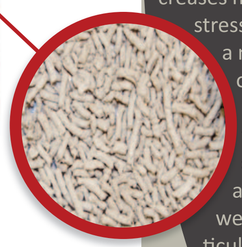
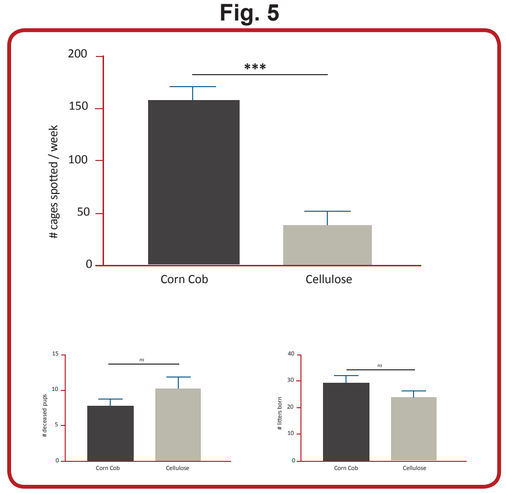


Fig. 5



RESULTS

Mice were maintained on corn-cob bedding for a total of 6 weeks (3 weeks changeout, 3 weeks spot-change), and cellulose bedding for a total of 10 weeks (5 weeks changeout, 5 weeks spot-change). Over the course of the study, cages containing corn cob bedding required nearly three times as many spot changes compared to those maintained on pelleted cellulose (mean number corn cob cages spot changed = 149 vs. mean number pelleted cellulose cages spot changed = 48.8, $p < 0.01$). We found no difference in pup death (mean 7.67 pups in corn cob bedded cages vs. 10.6 pups in pelleted cellulose cages, $p > 0.05$) or the number of new litters born (mean 29.3/week on corncob vs. 25/week on pelleted cellulose, $p > 0.05$). In our study, pelleted cellulose bedding greatly decreased the number of cages that required changing on non-change out weeks and did not affect breeding measures (Fig.5).

DISCUSSION

This study was designed to determine the feasibility of utilizing a pelleted cellulose-based bedding material for our institutions breeding animals. Our results show that the cleanliness of cellulose-bedding is far superior to pelleted corn-cob. The 3-fold decrease in spot changes not only decreases materials used, but also decreases personnel time and animal stress associated with more frequent handling. Though there was a mild, non-significant decrease in the reproductive values, it is our belief that as the animals acclimate to their new bedding material, the reproductive values would increase. Preference testing was not performed with this project, but caregiver observations indicated animals were nesting more frequently and interacting with the bedding more naturally. In the future, we would like to further investigate animal preference for a particular material and quantify the effect on breeding productivity.

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