

Video Article

Assessing burrowing, nest construction and hoarding in mice

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Abstract

Deterioration in the ability to perform "Activities of daily living" is an early sign of Alzheimer's disease (AD). Currently, preclinical behavioural screening of possible treatments for AD largely focuses on cognitive testing, which frequently demands expensive equipment and lots of experimenter time. If it were possible to characterise the "activities of daily living" of mice, this would form a new approach to preclinical screening. Fortuitously, several such assays have recently been developed at Oxford, and here the three most sensitive and well-characterised are presented. Burrowing was first developed in Oxford¹³; we were trying to develop a mouse hoarding paradigm and most published rodent paradigms required a distant food source to be connected to the home cage by a connecting passage. This would naturally involve modifying the home cage and making the other components. So I considered whether it would be possible to put the food source inside the cage. Trials were carried out, and it was found that if a container was placed on the floor it was emptied by the next morning. Also, the mice were performing digging ("burrowing") movements, not carrying the pellets in their mouths to a selected place as they would if hoarding⁶. However, mice proved reluctant to enter metal (i.e. mouse-resistant) containers. Eventually it was discovered that a length of plastic downpipe (as connected to guttering on houses) elevated slightly at one end to prevent accidental (non-deliberate) displacement of food pellets and sealed at the other end, was an efficient piece of apparatus. Experiments since then have shown that burrowing can detect prion (scrapie) disease at 10-12 weeks after injection of diseased brain homogenate, whereas clinical signs only appear at 22 weeks¹³. Food pellets are not an essential substrate for burrowing; mice will empty tubes filled with sand, gravel, even soiled bedding from their own cage. It appears to be a very rewarding activity for them. Moreover, they will empty a full tube even if an empty one is placed next to it⁸. Nesting also proved to be sensitive to prion disease around 10-12 weeks¹⁶. Several nesting protocols have been published. The present Oxford one simplifies the procedure and has a well-defined scoring system for nest quality⁵. A hoarding paradigm was later developed in which the mice, rather than hoarding back to the home cage, were adapted to living in the "home base" of the hoarding apparatus. This was connected to a tube made of wire mesh, the distal end of which contained the food source. Hoarding, like burrowing and nesting, is very sensitive to hippocampal lesions¹¹.

Disclosures

No conflicts of interest declared.