The IntelliCage as high-throughput behavioral screening tool: spontaneous behavioral profiles of strains, brain lesions and mutants

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Traditional behavioral tests for mice are inefficient. They involve isolation, exposure to unfamiliar apparatus, and repeated handling. Resulting stress responses introduce artifacts and make testing unreliable. Automated assessment of behavior in the homecage may eliminate many of these problems. The IntelliCage collects individual data from socially housed RFID tagged mice and thus also eliminates isolation stress and enables parallel testing of large numbers of mice. While many specialized protocols have been developed for IntelliCage to test learning and memory, attention, impulsivity and emotional responses, all mice begin testing with some days of free adaptation. Spontaneous corner visits, nosepoking patterns and licking activity are already monitored 24/24h during this phase. We have collected data on 50 behavioral parameters of >800 mice. Subsequent factor analysis extracted 12 orthogonal factors accounting for 81% of total variance. Comparison of factor scores of C57BL/6, DBA/2, BALB/c and 129S2 mice revealed a unique profile for each strain. Analysis of mice with hippocampal, prefrontal and striatal lesions also yielded unique profiles for each condition. Monitoring of mutant mice with known deficits in hippocampus-dependent tests produced profiles very similar to those of hippocampal lesions. Thus, already the monitoring of spontaneous behavior during a few days of free adaptation to IntelliCage permits high throughput prescreening of mutant mice. On the other hand, our data indicate that tight control of genetic background remains essential also if behavioral testing occurs in the home cage. Supp. FP7 Consortium EUROSPIN.