



# Applying digital measures to assess dose-dependent effects of a neuroactive compound in mice

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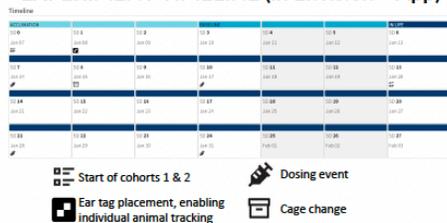
## INTRODUCTION

- Traditional behavioral assessments are manual, subjective, and variable, while digital home-cage monitoring provides continuous, objective, and non-invasive measures of animal behavior and physiology.
- The JAX Envision™ platform delivers quantitative, high-sensitivity data that enhance pharmacology and toxicology studies by detecting drug-related effects with improved precision.
- Envision Activity Suite and Respiratory Rate measures offer dynamic, temporal insights into exposure-response relationships, effect duration, and mechanistic understanding, supporting deeper, clinically relevant interpretations of drug effects.

## METHODS

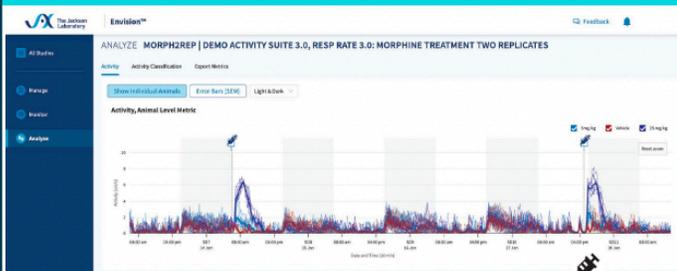
- Eleven-week-old C57Bl/6J mice were housed 3 per cage on Aspen blend in the Allentown Discovery™ IVC cages (15.6 × 12.8 × 32.1 cm, with an interior floor area of 500 cm<sup>2</sup>).
- Drug treatment:
  - Each mouse was treated with 5 mg/kg or 25 mg/kg morphine or vehicle at the beginning of the light cycle and monitored using the Envision platform.
  - Following a washout period, mice were given the same treatment but at the beginning of the dark cycle.

### EXPERIMENT TIMELINE (in Envision™ App)



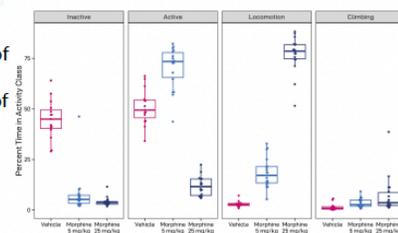
- The study design configured in Envision included continuous digital measurement of:
  - activity (cm/s)
  - time (s) in active, inactive, climbing, and locomotory states
  - distance travelled in locomotor activity bouts (cm)
  - respiratory rate (breaths/min)

## RESULTS

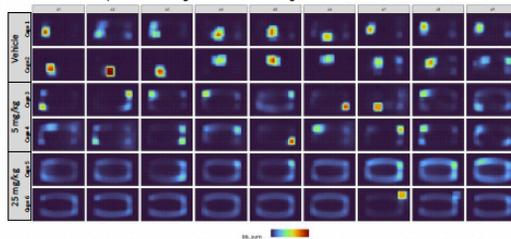


Dose-dependent increases in activity (cm/s) were seen following morphine administration, as shown in the Envision software screenshot showing Activity (cm/s) for individual animals in each treatment group.

- The system effectively classified animal behavior into distinct categories of activity: active, inactive, locomoting, and climbing.
- Mice administered 25 mg/kg exhibited locomotor behavior for a median of 78.6% of the three-hour post-dose period, compared to 17.1% for the 5 mg/kg dose and 2.8% for the vehicle group.
- Mice treated with 5 mg/kg morphine spent significantly more time active than locomoting, in contrast to both the vehicle and the 25 mg/kg treatment groups.

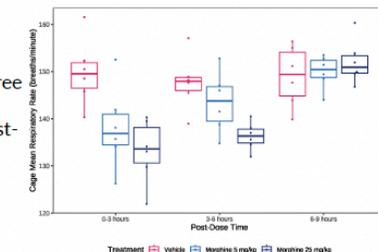


Positional Heat Maps: Sum of Bounding Boxes for 3 Hours After Light Dose



A dose-dependent repetitive thigmotaxic circling behavior was seen following morphine treatment, as shown in the heat map (top two rows are vehicle treated mice, the middle 2 rows are 5 mg/kg, and bottom two rows 25 mg/kg).

- Significant decreases in respiratory rate were observed within the first three hours following treatment at both doses.
- In the 25 mg/kg group, these reductions were sustained for 3-6 hours post-dose.
- All groups demonstrated a return to baseline respiratory rates within 6-9 hours.



## CONCLUSIONS

- Digital home-cage monitoring using Envision successfully detected dose-dependent behavioral and physiological effects of morphine in mice.
- Locomotor activity and respiratory rate showed clear, quantifiable changes corresponding to morphine dose and time post-administration.
- The study confirms that computer vision-based digital phenotyping provides sensitive, continuous, and objective data, improving behavioral characterization in preclinical research.

- These findings highlight the potential of Envision™ to enhance drug discovery, refine dosing insights, and accelerate translational outcomes through automated, high-resolution monitoring.

## ACKNOWLEDGEMENTS

The Digital In Vivo Alliance (DIVA) is a collaboration of pharmaceutical industry and academic scientists with a shared interest in the validation and application of AI-enabled in vivo digital measures. For more information, visit DIVA.bio.

