INTRODUCTION
Newborn mice and rats are a suitable model for pediatric research from prematurity to adolescence: they resemble preterm human infants regarding neurodevelopmental characteristics, and mutant models of pediatric diseases are available at an increasing proportion.
To study these animals early in their life is essential: i) in case of early death of the model, ii) to avoid the effect of functional recovery, iii) to understand the ontogeny of the pathology at early stages of development.
They also provide suitable models for developing new therapeutic strategies for paediatric diseases, in line with US and EC regulations.
However, studies in newborn mice and rats face major difficulties due to the small size of the pups and their sensory and motor immaturity.

MONITORING OF VITAL FUNCTIONS: PhysioPUPS
We have developed and patented a phenotyping device for non-invasive measurement of breathing patterns, electrocardiogram (ECG), body temperature, gross body movements, and ultrasonic vocalizations. Four animals can be tested simultaneously, starting at birth, under controlled conditions of temperature and gas composition. These phenotyping methods are suitable for high throughput screening. PhysioPUPS has no equivalent worldwide.

APPLICATIONS
- Mouse models of genetic pediatric diseases (Ondine’s curse, Prader-Willi, neuromuscular disorders…)
- Neonatal resuscitation outcome
- Preclinical study of developmental toxicity (ciprofloxacin)
- Preclinical study of neuroprotective drugs efficacy (melatonin)

RECENT PUBLICATIONS
- Systemic inflammation disrupts the development of white matter. Fournier et al. J Neurol. 2017

CONCLUSION
PhenoPups opens the way of monitoring vital functions, running sensorimotor development studies and evaluating learning and memory during development. Overall, this approach allows rapid and convenient monitoring of physiological and behavioural parameters in neonatal rodent pups using a battery of noninvasive tests. The present platform for newborn rodent phenotyping has proven successful to develop neuroprotective strategy against brain injury of prematurity (melatonin), to test the safety of antibiotics used in neonates, and to characterize a large variety of genetically engineered mice.

MEMORYPUPS
Preference is scored as the time spent over each odor during a test preference.

SENSORIMOTOR DEVELOPMENT: NeoGAIT
This testing module allows the evaluation of several markers of gait development (pelvic lift, pivoting, locomotion) using an original system based on image acquisition and processing while the pup is moving freely on a plate. Image processing of the animals contacts on the plate provides locomotion and coordination indices. Measured variables are distance, speed, orientation, and time duration and nature of the points of contact.

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