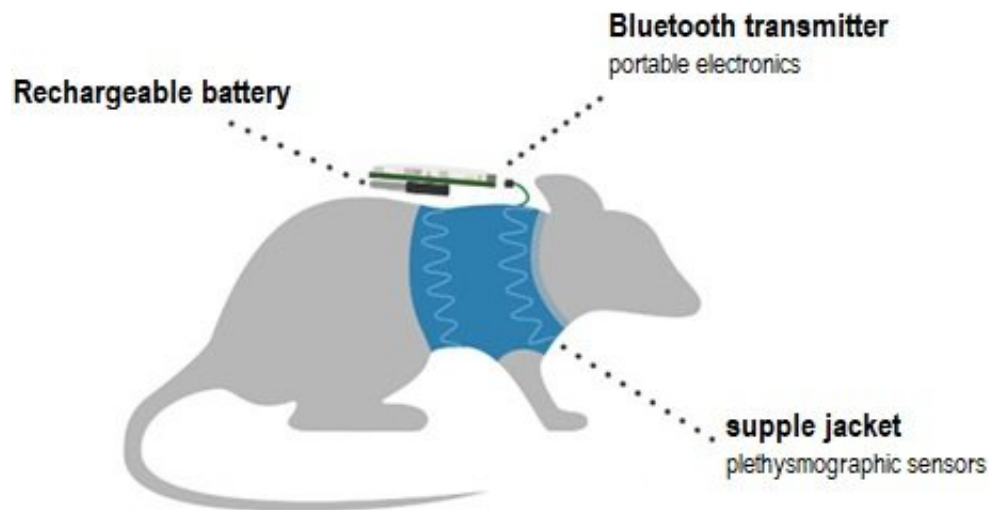


Jacket for cardiorespiratory monitoring of laboratory animals

June 15 2018



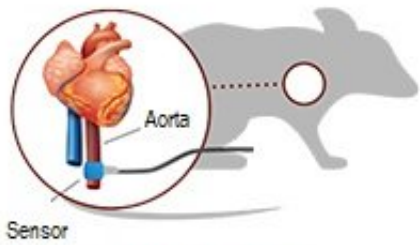
Credit: Etisense

To meet their objective of offering connected devices for the physiological monitoring of laboratory animals without recourse to anesthesia or surgery, researchers from the TIMC-IMAG laboratory (CNRS / Université Grenoble Alpes / Grenoble INP / VetAgro Sup) have developed a jacket that measures rodent cardiac and respiratory activity. This patented tool soon to be released by Etisense, a TIMC-IMAG spin-off company, paves the way for enhancing the quality of research data and advancing animal welfare.

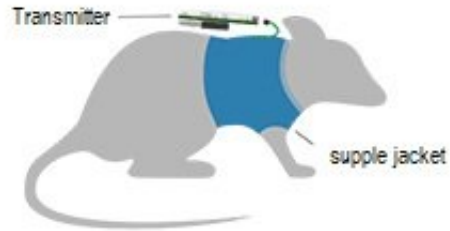
The well-being of research animals is a topic of growing concern to society and researchers themselves. Yet until now a highly invasive preliminary surgical procedure was necessary for cardiorespiratory physiological monitoring of conscious animals. In addition to furthering [animal welfare](#), successful noninvasive respiratory and cardiac monitoring offers two advantages to researchers: (1) animals wearing the jacket can move more freely about, which expands experimental design possibilities, and (2) bias introduced by the effects of stress, anesthesia, and surgery is eliminated. Using the jacket saves money too, through simplification of experimental procedures no longer requiring surgery or anesthesia.

The jacket applies "virtual flowmeter" technology. It measures variations in thoracic volume at ultrahigh resolution, tracking both the flow of air between the rib cage and the outside environment and the flow of blood between the rib cage and the rest of the animal's body. Sensor signal processing is central to this approach. In small [animals](#) like rats, heart rates are much higher than in humans and signal amplitudes are too small, which makes their analysis even more difficult. To overcome these obstacles, the TIMC-IMAG team developed mathematical tools and technology for deriving standard physiological measurements previously only obtainable with sensors positioned around the aorta during a surgical operation.

Aligned with the 3R principles of ethical research, this innovation has been validated with rats and is now under development by the start-up Etisense, a TIMC-IMAG spin-off company. The company's goal is to release their first product for rodents, Decro, in the third quarter of 2019. The researchers plan to later market versions of their [jacket](#) for guinea pigs, miniature pigs, dogs, and primates.

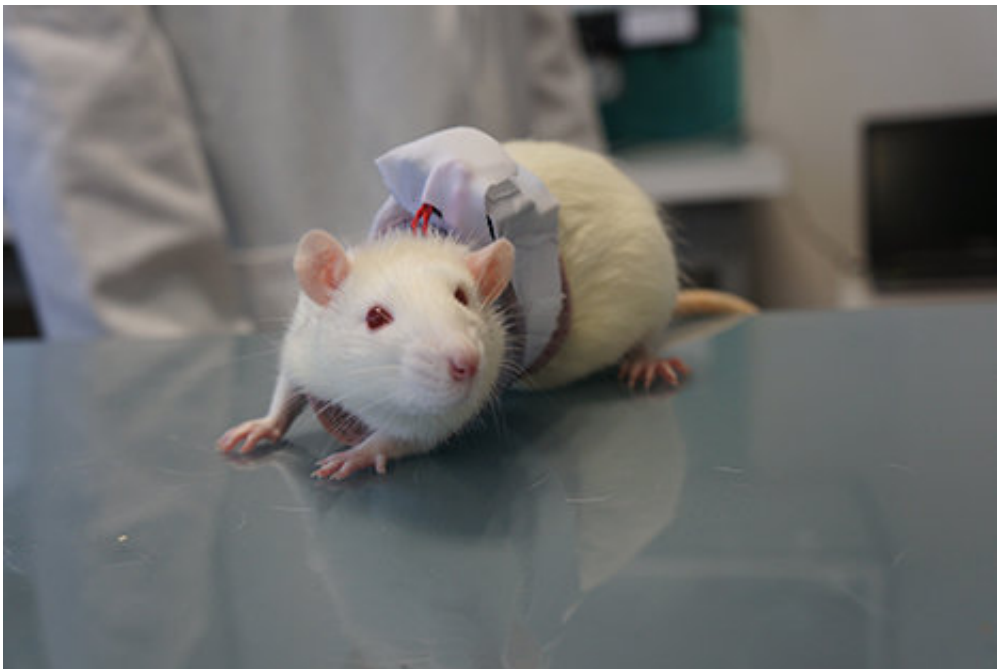


(A) Implanted flowmeter:
Implanted flow sensor surrounding aorta



(B) Virtual flowmeter:
Plethysmographic (i.e., for measurement of volumes) jacket measuring cardiac frequency and flow

Credit: Etisense



Credit: Etisense



Credit: Etisense

Provided by CNRS

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