



MARKET CHALLENGES

Spinal cord traumas and rachis pathologies constitute a **major cause of mortality and handicap**. Their incidence is 28 000 new cases a year in Europe and 12 000 in the USA. In France, we count 1 200 cases a year of vertebra-medullary traumas.

Besides, spinal cord lesions may cause motor and sensory deficits (such as paralysis). These deficits change with time as the spinal cord tries to heal itself, involving ill-known physiologic and neurochemical mechanisms. How extensive these deficits are and how good the rehabilitation is strongly depend on which anatomic paths have been altered inside the spinal cord. It is therefore **crucial to perform a full characterization of the spinal cord after a spinal lesion and to evaluate quantitatively the functionality of spinal neurons**.

Yet, current techniques – such as electrophysiological techniques (SSEP, MEP, ENG), echo-doppler or MRI - are insufficient to do that. Furthermore, these solutions suffer other limitations: patient immobilization, injection of contrast agents, spatial or temporal resolution problems, etc.



INNOVATIVE SOLUTIONS

The innovative tool allows **continuous ambulatory collection of electrophysiological and metabolic parameters in a simultaneous way**, at the spinal cord level.

The patented device can be readily set up on the vertebral column in order to measure spinal cord activity. The multimodal approach used allows to establish the rate of oxygenation and the measure of the spinal cord electric activity.

Once operational, the neural activity can be sent to an external receptor for data processing, thus permitting the realization of a **functional and anatomical mapping of the spinal cord**.

Moreover, an auxiliary device in contact with a functional tissue can be activated with remote control in order to make a chemical or electrical stimulation.



SUGGESTED APPLICATIONS

Veterinary and human medical applications:

- **Intraoperative use:** not implanted device
 - **Monitoring** of the spinal cord during surgical operations to ensure that the spinal cord is not altered
- **Use requiring an implantation:**
 - **Pharmacology:** evaluation of new therapeutic solutions (eg: survival rate of implanted stem cells, gene therapy, classic pharmacology)
 - Aid to the **definition of a therapeutic strategy:** quantification of treatments efficiency
 - Monitoring the evolution of the spinal cord and **diagnosis assistance**

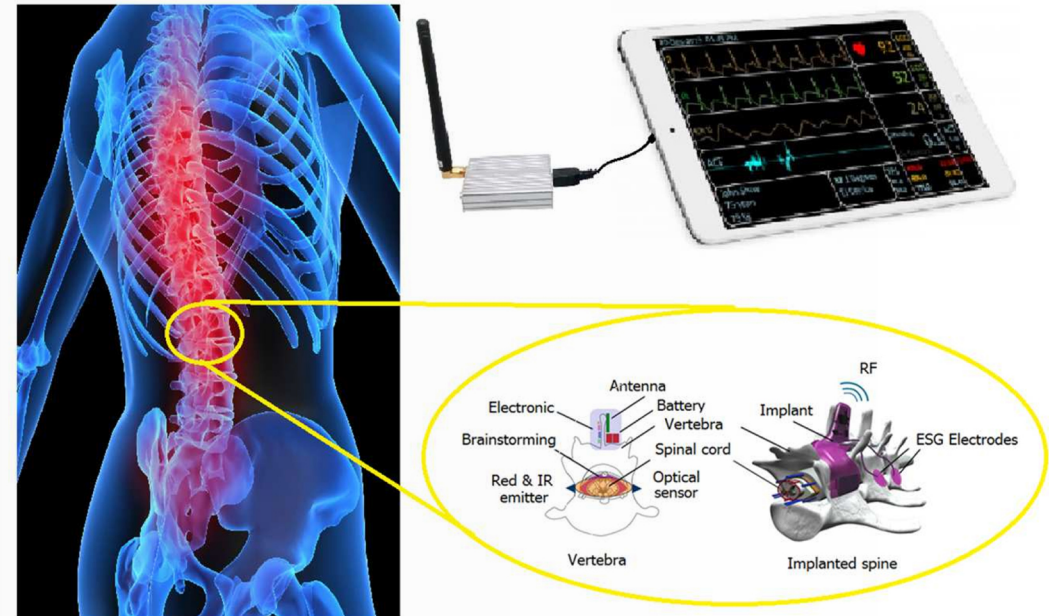


DEVELOPMENT STATUS

A wired prototype was realized and tested *in vivo* on 6 cats, allowing to validate the proof of concept.

In 2013, first experiments on the big animal were realized on FBM porcine model.

A wireless and implantable device for human patients is under development.



Source : SMART Labex, Spinalcom project



COMPETITIVE ADVANTAGES

- **Less sensitive to the spinal cord movements**
- **Complementary information with MRI** (better temporal resolution)
- **Simultaneous measurements of physiologic and neurochemical mechanisms**
- **Continuous activity monitoring** (implantable device)