

# NEUWalk

## Neuro-prosthetic interface systems for restoring motor functions

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- Basic Project Information
- Consortium Composition
- NEUWalk Objectives
- SCI – Paraplegia: Current Situation
- Parkinson's Disease : Current Situation
- Spinal Cord Stimulation On SCI Rats
- System Layout For First Testing on SCI Human
- NEUWalk Building Blocks

- **Integrated European FP7 Project, GA258654**
- **Call FP7-ICT-2009-5 / Objective ICT-2009.3.9**  
{ Microsystems and Smart Miniaturised Systems, c) Application-specific microsystems and smart miniaturised systems, 1) Biomedical }
- **Duration:** 4 years
- **Start date:** June 1, 2010
- **Partners:** 8, 5(6) research partners, 3 SME's )
- **Total Budget:** 11.3 MEuro
- **Grant:** 8.8 MEuro



# Consortium Composition

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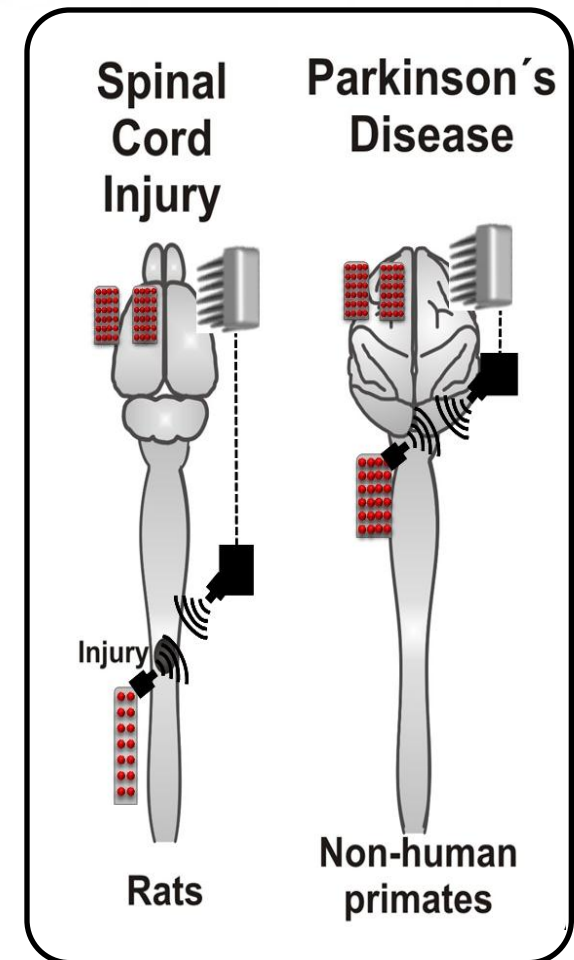
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# NEUWalk Major Objectives



- Development of a novel neurotechnology featuring brain controlled stimulation of the spinal cord to enable
  - **restoration of motor functions to individuals with severe spinal cord injury (SCI)**
  - **less risky, less invasive alleviation of Parkinson (PD) symptoms compared to DBS**
- Concept validation on rats (SCI) and on non-human primates (PD)
- First testing of the NEUWalk concept on human SCI patients with passive implant
- Realization of a cortico-spinal neuroprosthetic demonstrator system ready for further clinical validation of the NEUWalk concept





- So far, in severe cases of SCI, no rehabilitation possible
- Cost estimation for care giving over live time: 600.000 US\$ per patient
- Estimated cost for NEUWalk system: 40.000 – 45.000 Euro



- Huge number of cases
  - ca. 2% of > 60y in the industrial nations, (ageing population)

- Established therapies

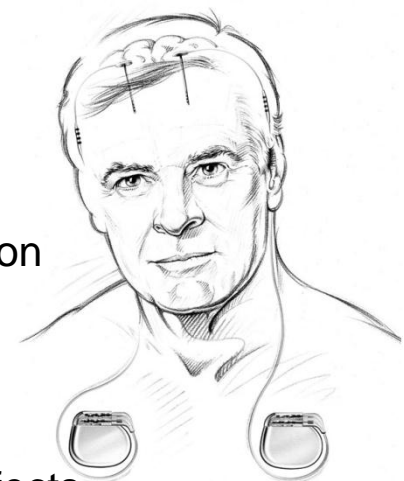
- Pharmaceutical treatment

- Approx cost: 4.800 –7.200 Euro p.a.
    - Strong side effects in advanced cases



- Deep Brain Stimulation (DBS) with electrodes chronically implanted in the deep brain

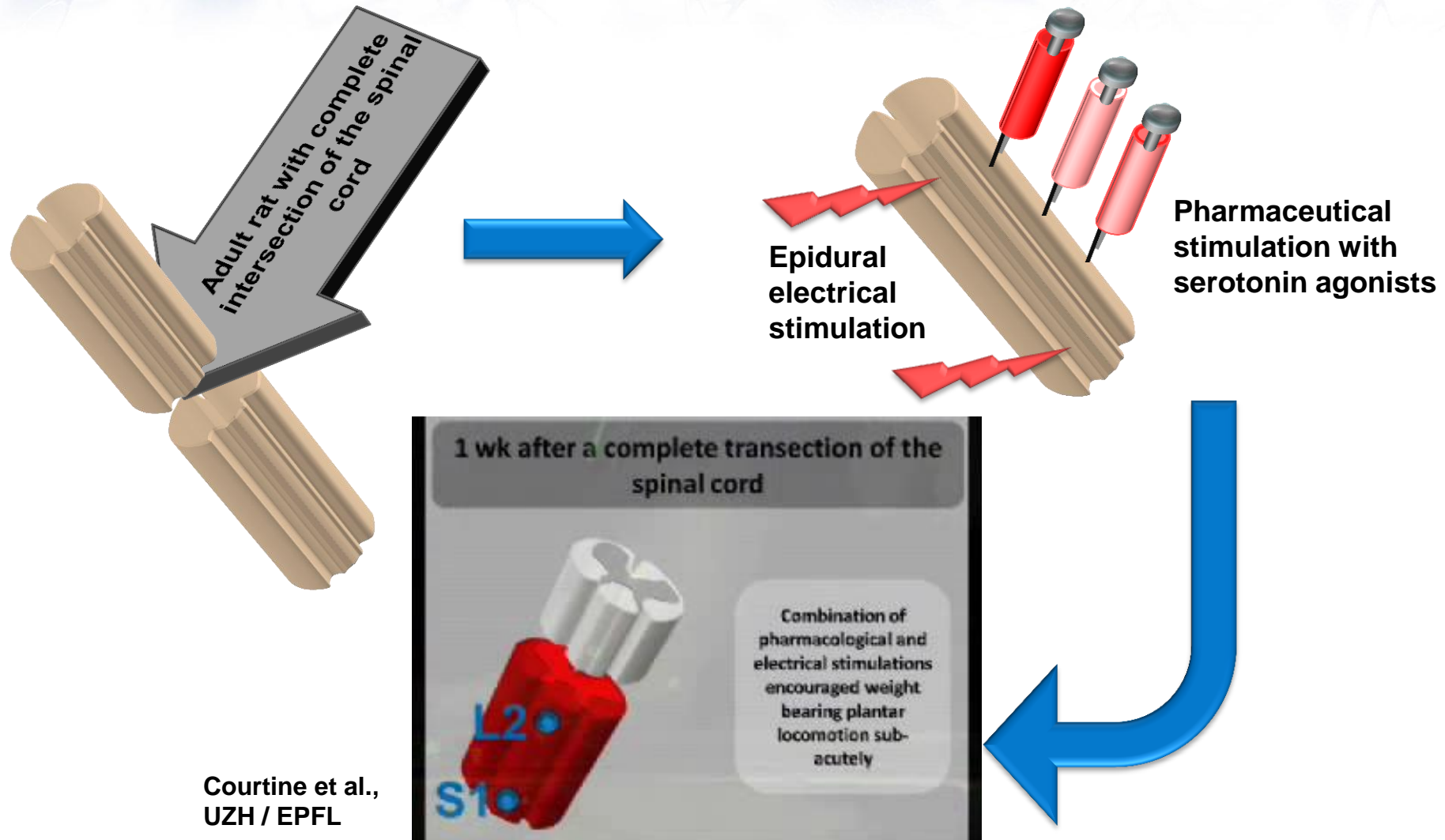
- Stakeholders: Medtronic, St. Jude Medical, Boston Scientific
    - About 50,000 – 75,000 implanted devices
    - Cost: 12.500 – 30.000 Euro
    - However, highly invasive, partially strong side effects



**Source:**  
**Medtronic**

© Medtronic, Inc. 2008

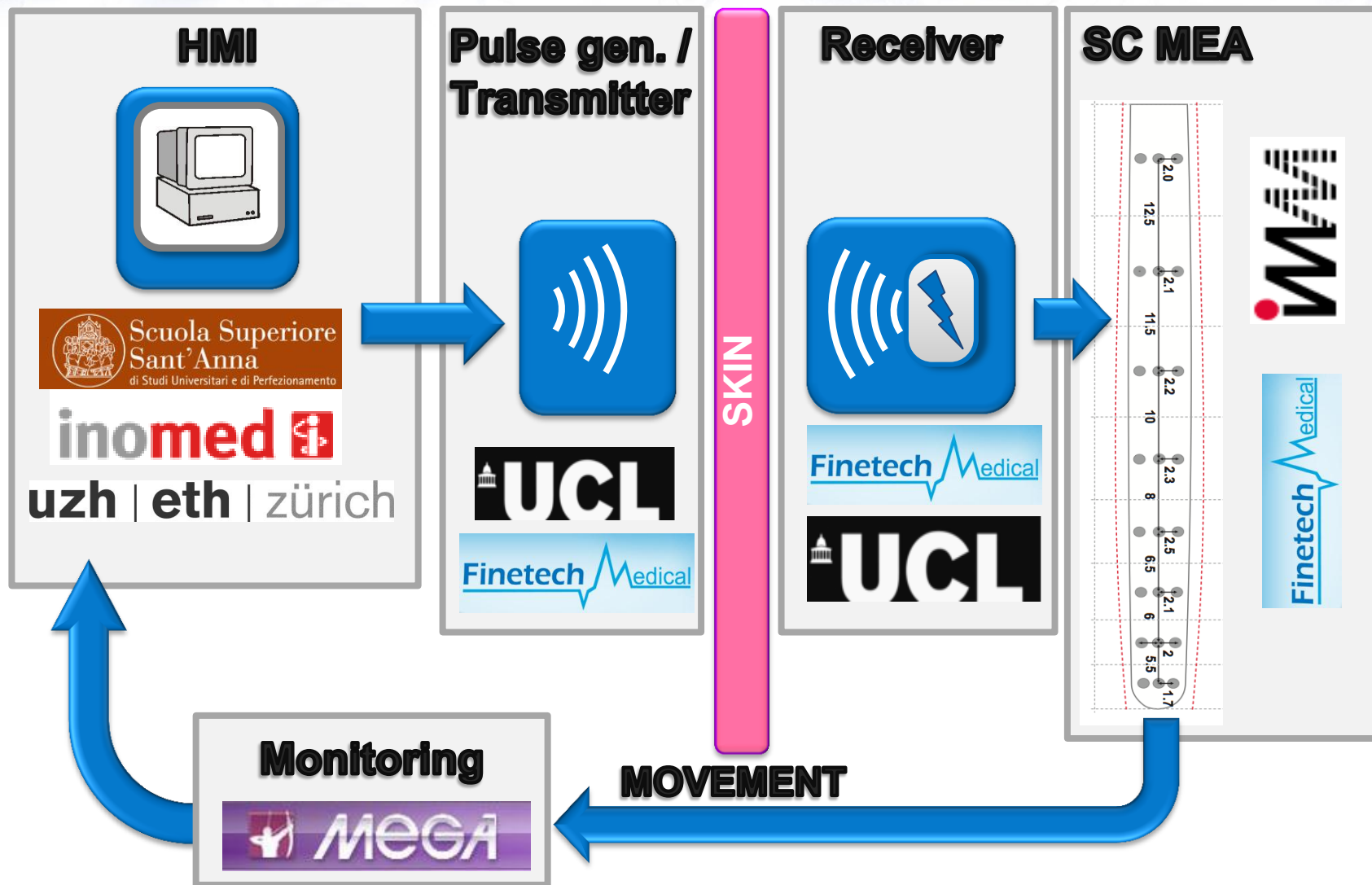
# Activation Of Motor Functions On SCI Rats By Spinal Cord Stimulation



Courtine et al.,  
UZH / EPFL



# System Layout For First Testing on SCI Human



..... that might be valuable for or adaptable to other R&D activities

## Animal models

- Rats with complete and incomplete SCI
- Parkinsonized monkeys

## Flexible Multisite-Electrode Arrays

- Chronically implantable
- Based e.g. on Au-Pt / Ag-PDMS / Pt-PDMS

## Wireless Neurostimulators

- Inductively coupled or wireless
- Dedicated ASIC designs

## Brain Decoding Algorithms

- Relationship between cortical signal signature and specific hind limb gait
- SC stimulation pattern to provoke specific gait

## Control Interfaces

- E.g. based on EMG monitoring, footswitches, accelerometers