Electroceuticals and Electrodiagnostics

Roger Whittaker (IoN)
Patrick Degenaar (EEE)
The healthcare need

- Increasing prevalence of chronic diseases
- Poor compliance with oral medications
- Side effects with polypharmacy
- Lack of efficacy of current drugs
- Correct treatment is predicated on correct diagnosis
Electroceuticals (bioelectronic medicine)

Electroceuticals deliver electrical impulses targeting the neural circuits that regulate the body’s organs and functions.

To treat disease, an electroceutical homes in on discrete components of the nervous system, such as individual neurons in a specific circuit.

The electroceutical restores health by modulating the action potentials that flow through these neurons.
Advantages and challenges

- Relatively cheap to develop
- Controllability
- Fewer side effects
- Guaranteed compliance
- Tuneable to an individual patient
- Animal models
- Surgical implantation
- Neural interface
- Decoding neural signals
- Power and data transfer
- Longevity of devices
- Safety aspects
Neuroprosthetics @ Newcastle

- Epilepsy brain prosthesis
- Visual prosthesis
- Spinal cord injury
- Hand/Leg bionics

Electrodiagnostics
- Multi-EMG recording

Stimulate → Record → Process

Closed loop neural interfaces!!

URLs:
- http://www.cando.ac.uk
- http://www.optoneuro.eu
Injectable electronic systems

Surgical neuroprosthetics

Injectable bioelectronics

CANDO & Visual prosthesis

11.5 mm

2.1 mm

2.1 mm

2.1 mm

11.5 mm
Can we start thinking applying classical methods of control to the human body?