Bioelectronic Medicines

Using the Peripheral Nervous System to Treat Chronic Disease

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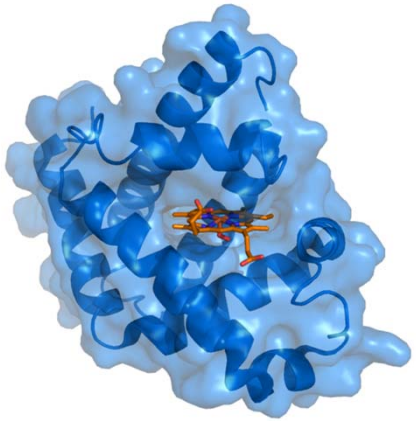
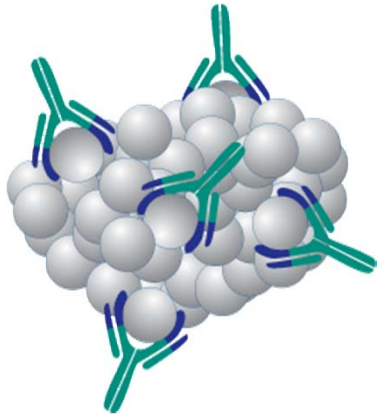
A treatment modality that leverage the nervous system

Signalling control



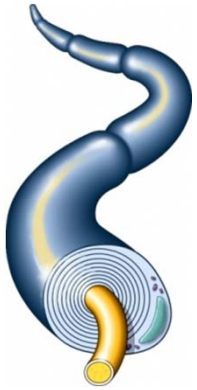
Small molecules leverage intra- and extra-cellular signalling cascades

Immune control



Vaccines and **antibody drugs** leverage the immune system

Neural control

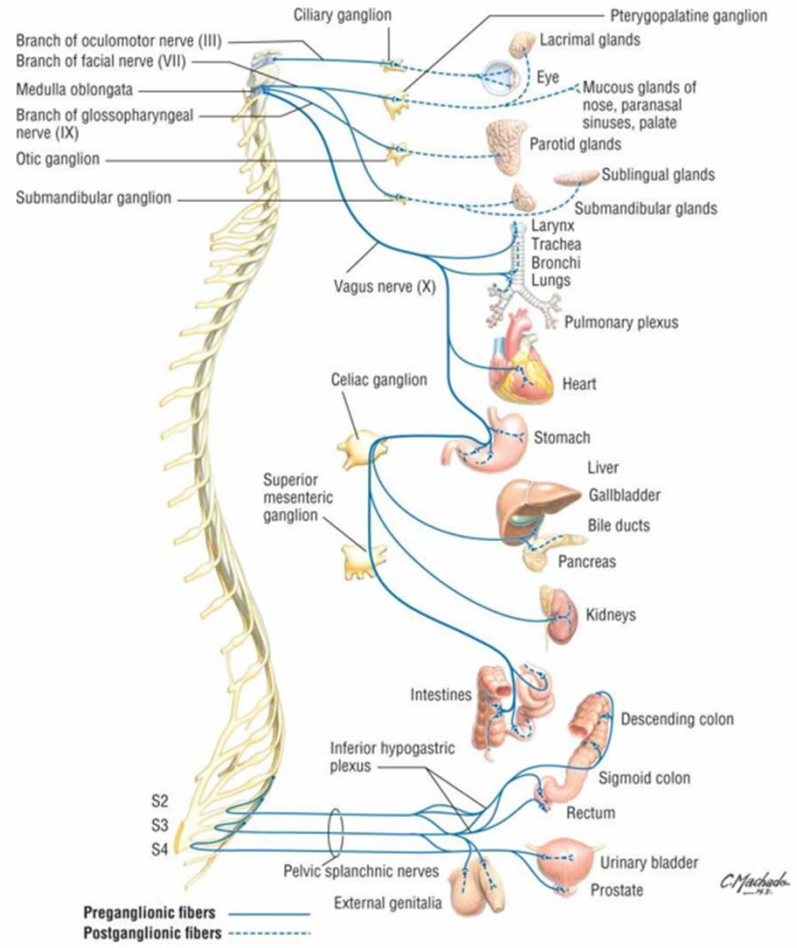


Bioelectronic medicines will leverage the nervous system

Image source: http://en.wikipedia.org/wiki/Ligand_(biochemistry); http://www.rndsystems.com/resources/images/6295.gif; http://www.empowher.com/media/reference/x-linked-adrenoleukodystrophy

Nerves exert control over virtually all our organs

Parasympathetic nervous system



Sympathetic nervous system

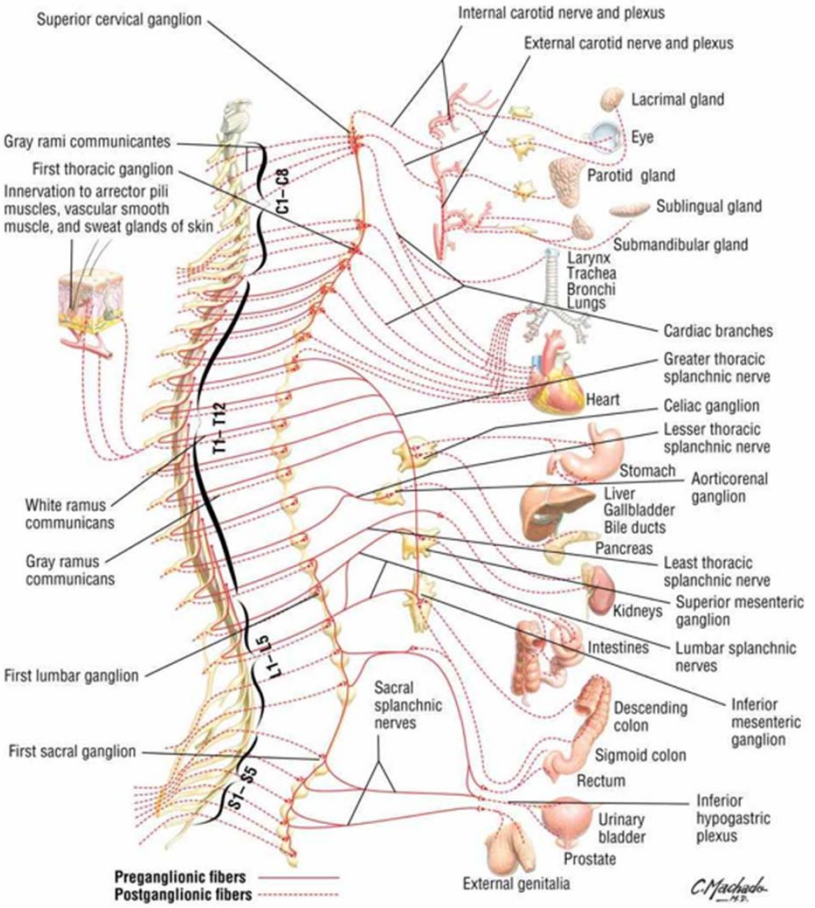


Image source: Atlas of Human Anatomy, 5th edition, Frank H Netter

A translational outlet for innovative neurotechnology

While brain research is…

- Arguably the biggest scientific challenge of our time
- Critical for understanding most neural circuits
- A centre stage for innovative technology development

Therapeutic precision tuning will start in the periphery

- Chronic diseases affecting billions
- Near-organ nerves with lower level of complexity
- More reliable animal models of disease
- Objective clinical endpoints
- Accessible intention points; low-risk surgery

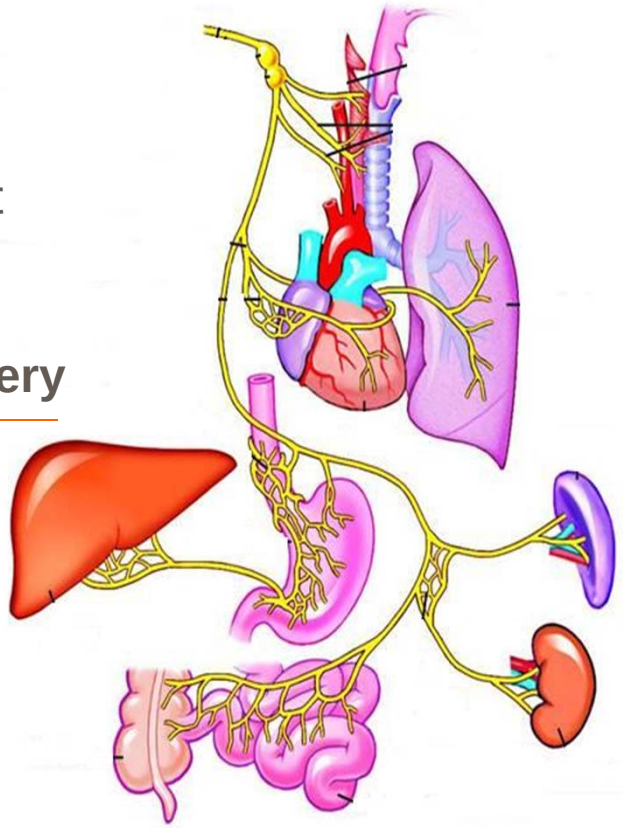
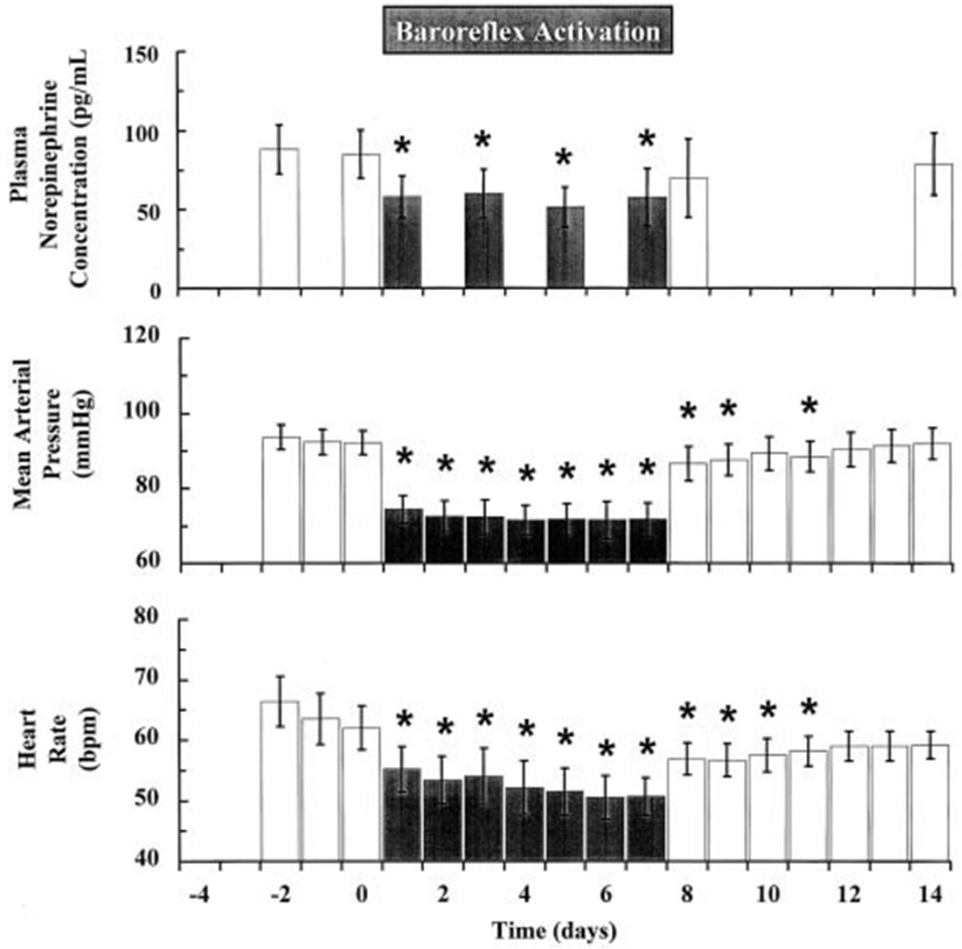
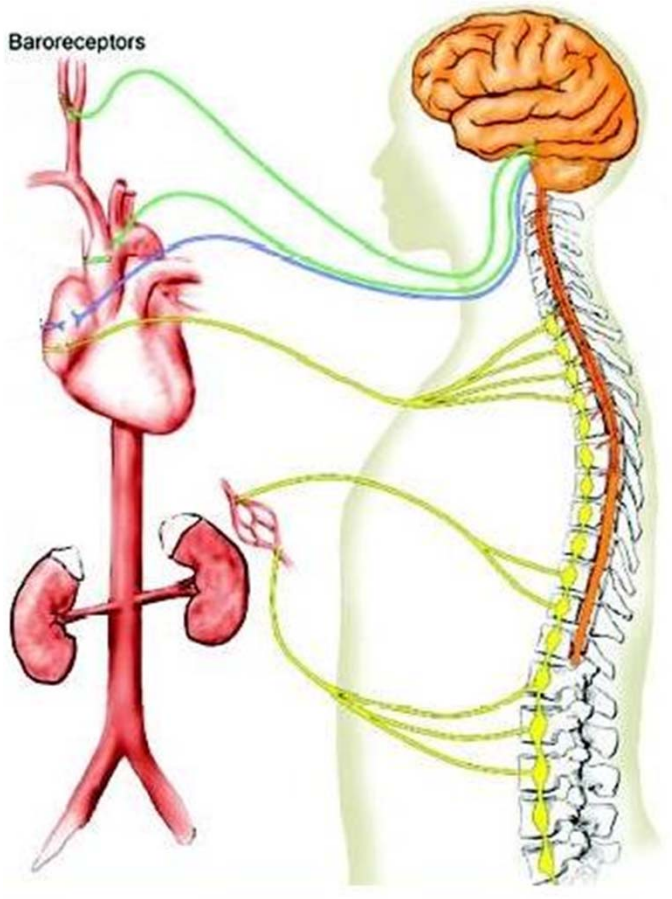


Image source: Mosby's Medical Dictionary, 8th edition

In hypertension baroreceptor stimulation reduces sympathetic outflow, heart rate and blood pressure

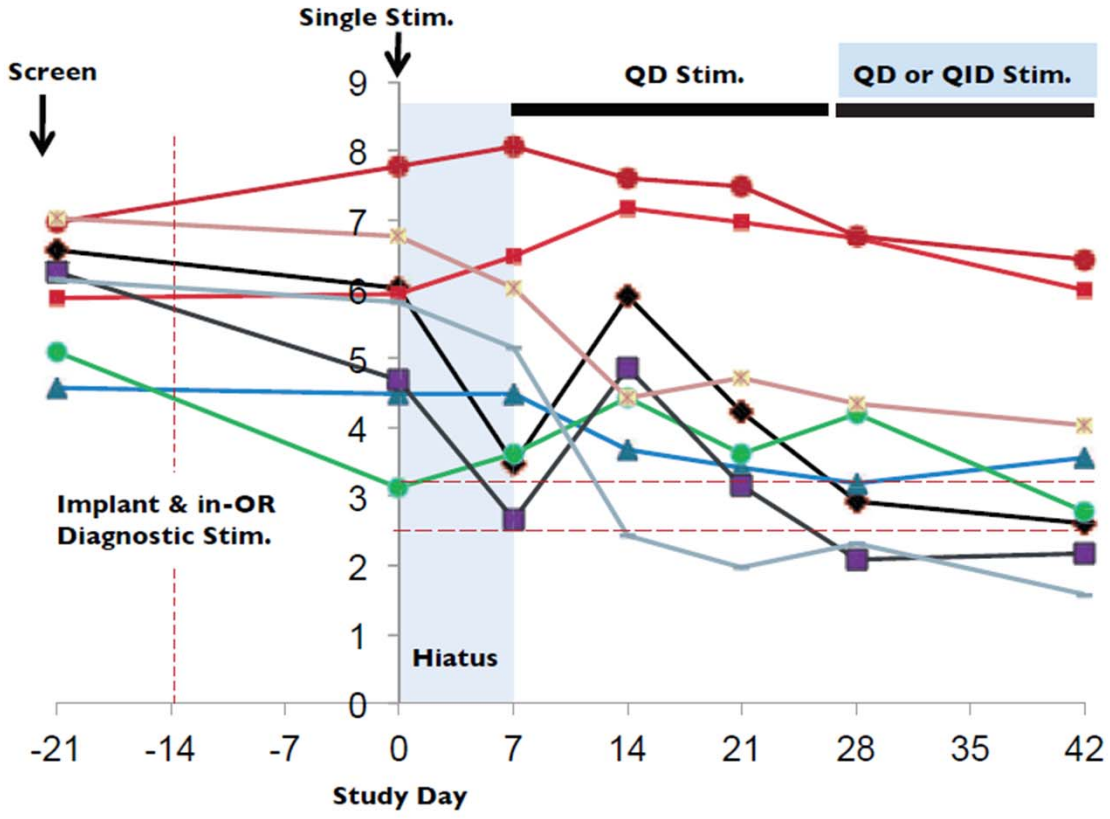


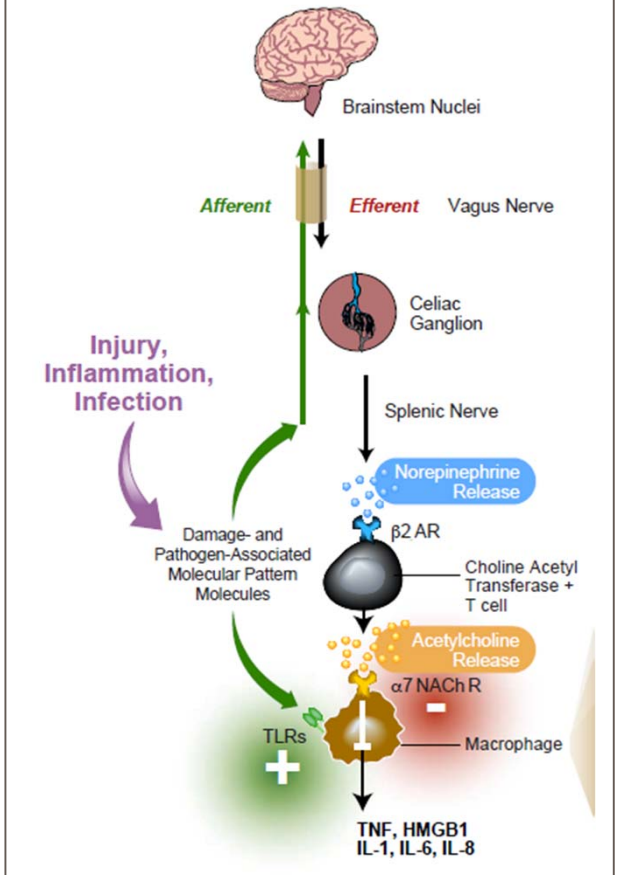


Source: Hypertension. 2004 Feb;43(2):306-11. ; Neurosurg Focus 2009, American Association of Neurological Surgeons

In rheumatoid arthritis, vagus nerve stimulation suppresses cytokine production

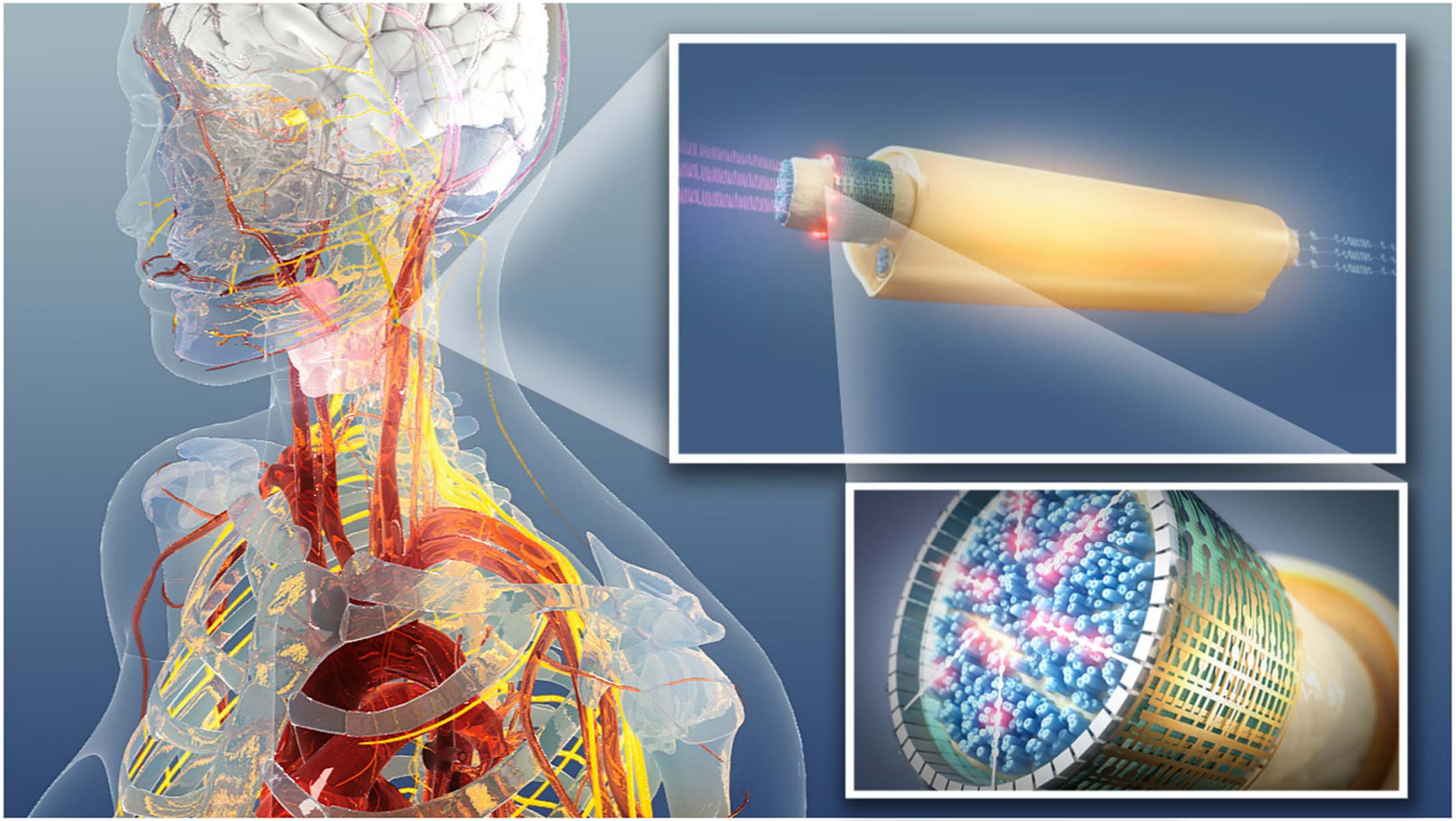
DAS28 in 8 RA patients that had failed on methotrexate after vagus nerve stimulation





Source: Koopman, F. A. *et al. Arthritis Rheum.* ***64 (suppl.), abstr. 451 (2012).***

A leap towards precision treatments



Exploratory research network for proof of principle for diseases and interfaces

Philosophy

- **Integrate** experts and technologies
- Test **hypotheses** central to future medicines
- Work as a **network**, helping to accelerate

33 projects	**4 continents**	**16 diseases (24 nerves)**
40 PIs (at 26 institutions)	**9 countries**	**13 interfaces**

Venture fund to nurture early manifestations of bioelectronic medicines and key platforms

ACTION POTENTIAL VENTURE CAPITAL

www.actionpotentialvc.com

Investment focus for $50m fund

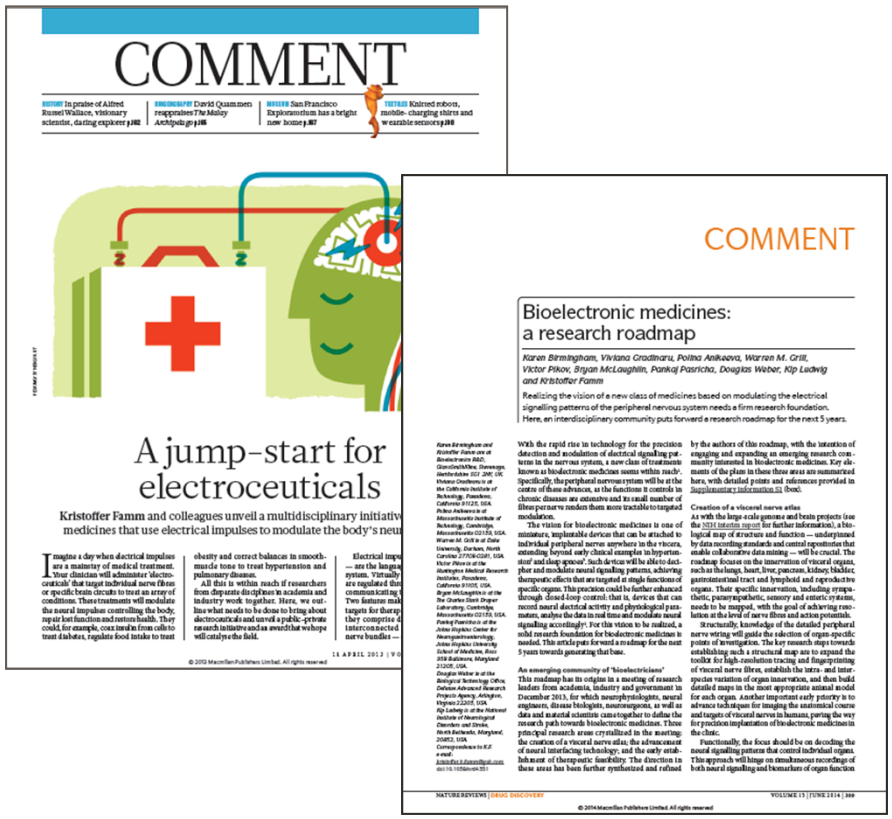
- Companies developing **bioelectronic medicines**
  - New start-ups
  - First-generation devices pioneering aspects of bioelectronic medicines

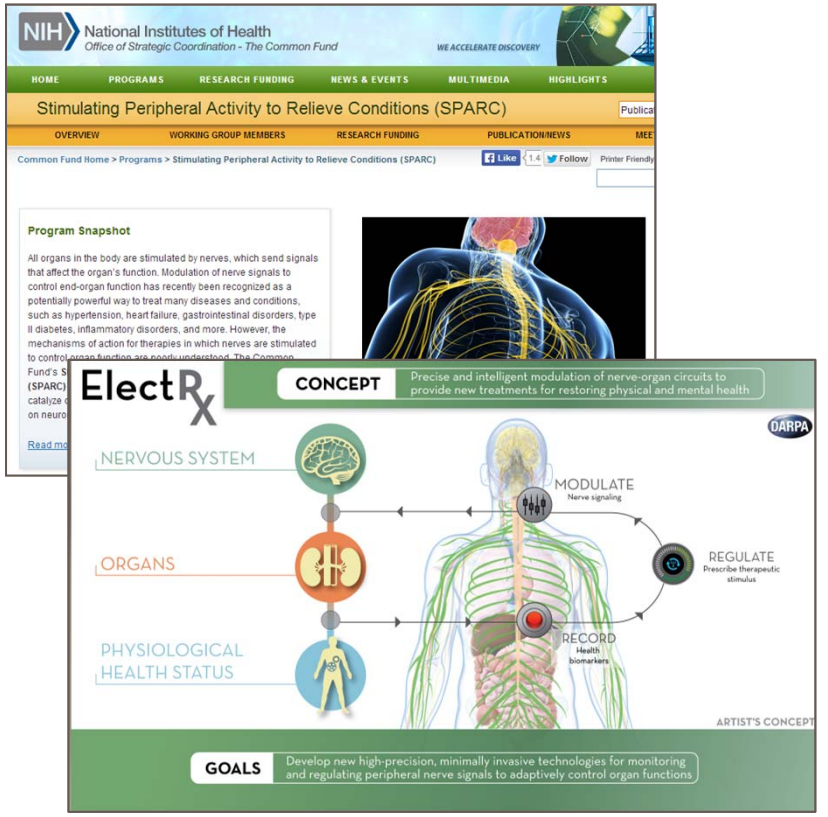
- Companies advancing **technology platforms** that will be critical components of bioelectronic medicines

• Energy • Material • Surgical

Image source: SetPoint Medical

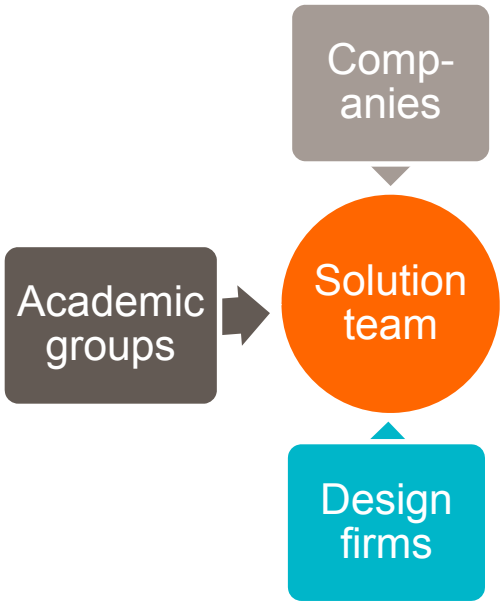
Road-mapping and coordination with the broader research community





Innovation challenge to remove a key research barrier

A miniaturised, implantable, wireless device that can chronically record, stimulate and block functionally-specific neural signals to and from a single visceral organ



1x + rat + 60d = $1m

organ-specific function	Implant, wireless, normal	stable, repro-ducible	First validated solution

http://www.bioelectronicmedicinesresearch.com

$5m Fund with up to $1.2m for teams trying to solve the challenge

BRAIN Initiative and PNS therapies linked by circuit mapping and innovative technologies

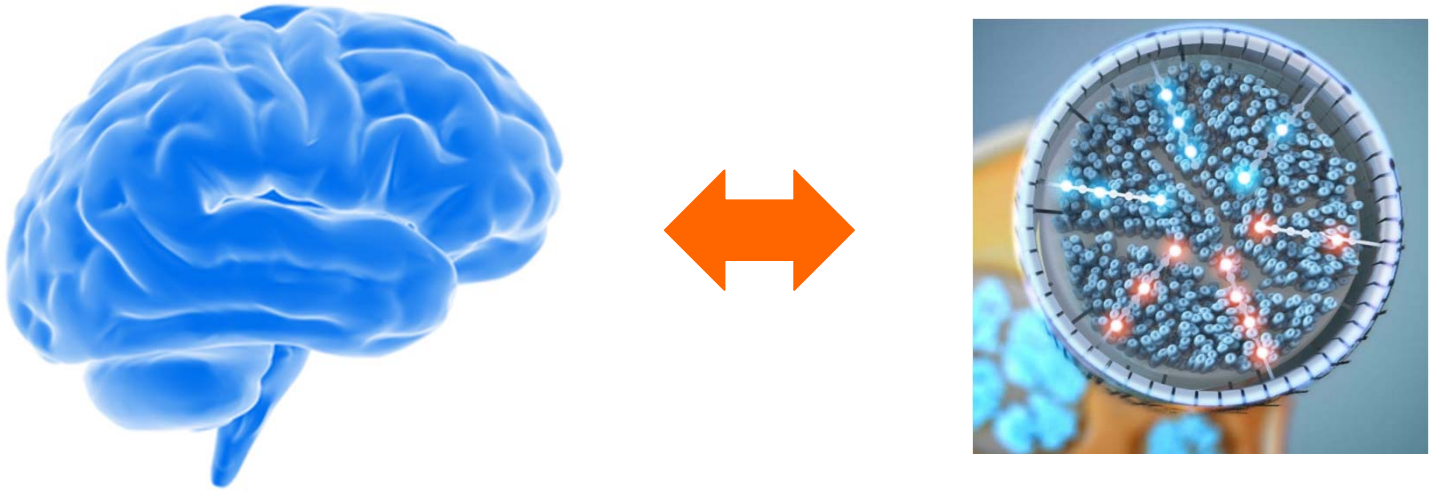


Image source: http://www.huffingtonpost.com/daniel-burrus/why-the-human-brain-initi_b_3103869.html


gsk
do more
feel better
live longer
Thank You