



Veterans Health Administration

# Research & Development

Improving Veterans' Lives [www.research.va.gov](http://www.research.va.gov)

## *Turning Hope into Reality*

*2009 VA Research Week*

*April 29, 2009*



# Neuropathic and Phantom Pain

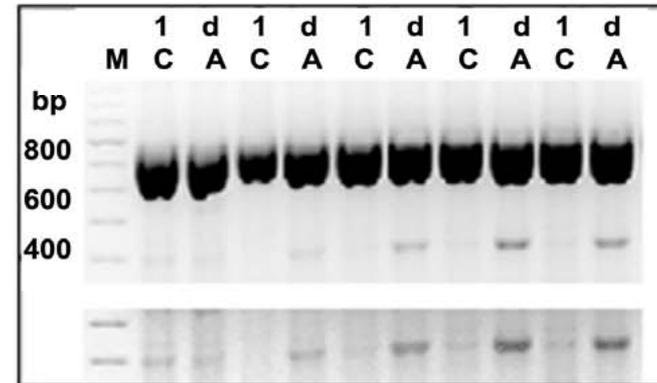
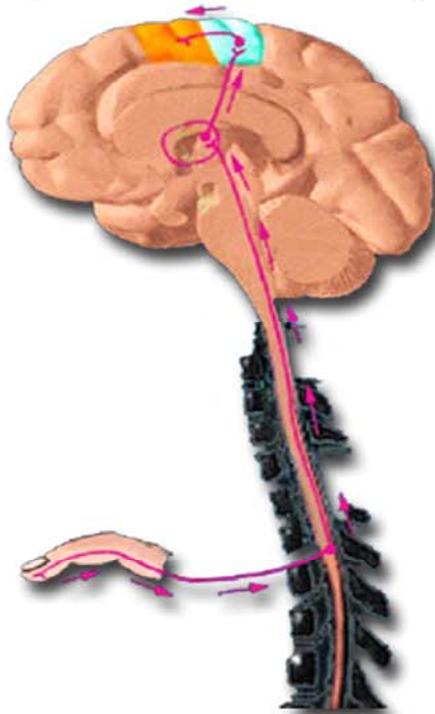
*Stephen G. Waxman, MD, PhD*  
*West Haven, CT*



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## A Clinical Challenge for Veterans and Others

**Peripheral Nerve Injury**  
**Traumatic Limb Amputation**  
**Spinal Cord Injury**



**Locating abnormal genes helps  
identify therapeutic targets  
relevant to common disorders**

# Neuropathic and Phantom Pain

*Stephen G. Waxman, MD, PhD*  
*West Haven, CT*



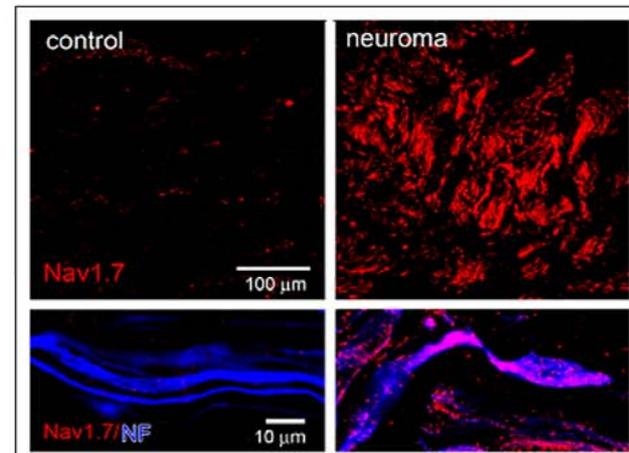
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## The “Man on Fire” Syndrome



- ▶ Severe burning pain, triggered by mild warmth.
- ▶ < 50 families, scattered around the world.
- ▶ Cause: Mutations in a single gene that encodes sodium channel Nav1.7.

**Nav1.7 is over-produced in injured nerve fibers after nerve injury and traumatic limb amputation.**



# Neuropathic and Phantom Pain

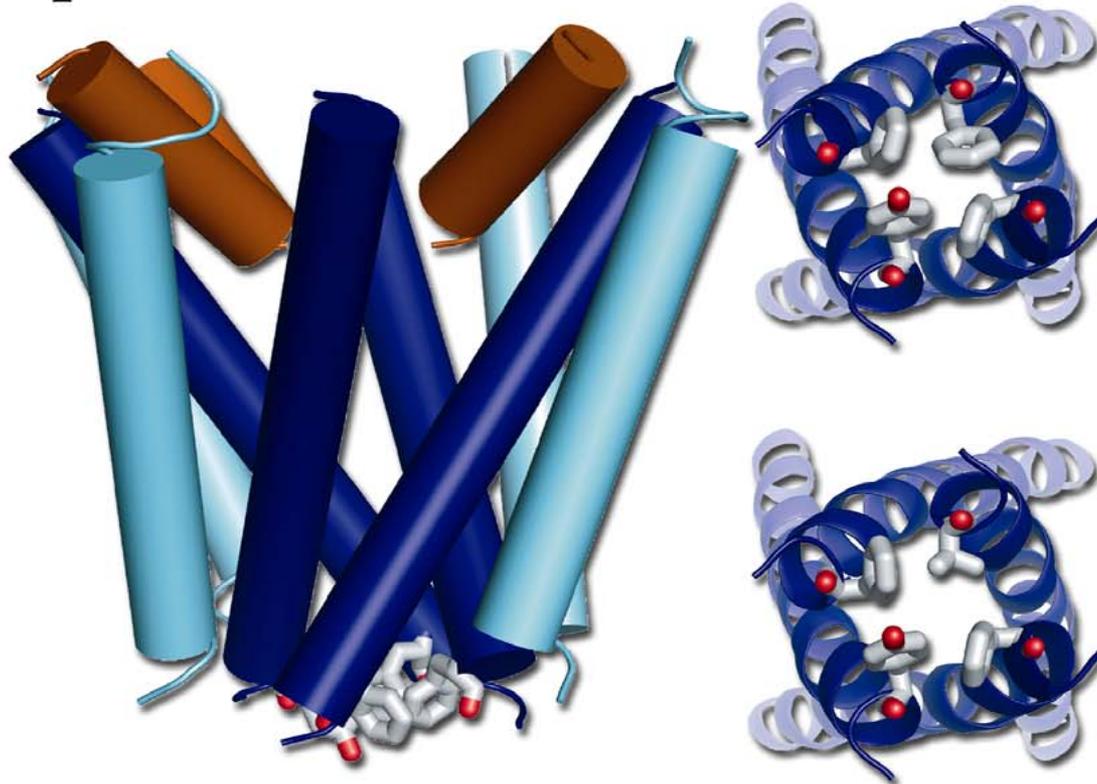
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## Molecular Modeling and Genomics

VA Research and Development uses information from probing the genome to develop “personalized” therapies for pain.



# Cooperative Studies

*Peter Peduzzi, PhD  
West Haven, CT*



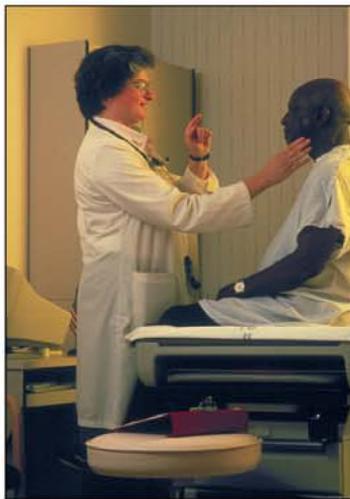
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## Advancing the Health of Veterans and the Nation

The VA Cooperative Studies Program is a national clinical research program within the VA Office of Research and Development. Its mission is to advance the health and care of Veterans and the nation through collaborative research studies that produce innovative and effective solutions to national health care problems.



VA Cooperative Studies Program has completed 175 research studies in virtually all disease areas. Many have been landmark studies that have improved the health care of Veterans and changed clinical practice.

# Cooperative Studies

*Peter Peduzzi, PhD  
West Haven, CT*



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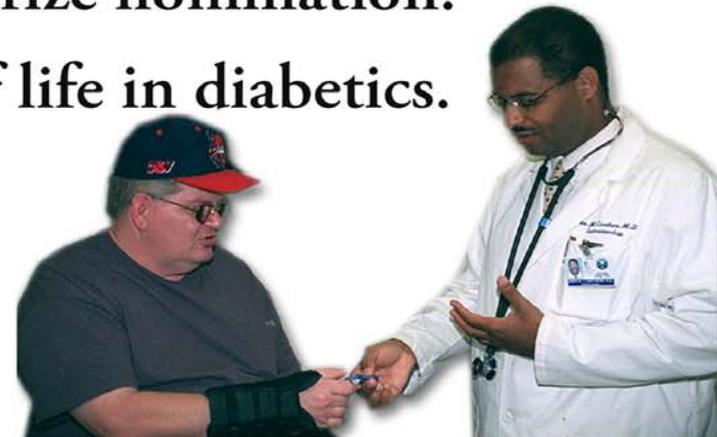
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## VA's Legacy of Landmark Studies to Improve Veterans' Lives

### First studies in the world to show:

- ▶ Heart bypass surgery helps people with very bad hearts live longer.
- ▶ Warfarin (coumadin) prevents stroke.
- ▶ Aspirin prevents heart attacks and death.
- ▶ Anti-hypertensive drugs are effective in controlling high blood pressure. Led to a Nobel Prize nomination.
- ▶ Insulin pump improves the quality of life in diabetics.
- ▶ A vaccine prevents shingles.

A VA clinician discusses treatment progress with a Veteran research participant.



# Cooperative Studies

*Peter Peduzzi, PhD  
West Haven, CT*



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## VA Comparative Effectiveness Studies Break New Ground

### Recent VA Cooperative Studies:

▶ *Heart angioplasty*

Angioplasty does not reduce the chances of dying or of having a heart attack more than giving heart drugs and lifestyle changes.

▶ *Acute kidney failure*

Giving more dialysis does not reduce the chance of dying or allow the kidneys to recover their ability to function any faster.

▶ *Stroke rehabilitation study findings due early 2010*

Robots have the potential to improve the quality of life in Veterans who have suffered a stroke and offer a less costly way to treat a large number of Veterans.



# Comparative Effectiveness Research

*Joel Kupersmith, MD*

*VA Chief Research and Development Officer*



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## VA Comparative Effectiveness Studies Leading the Way

VA's Office of Research and Development is a leader in studying comparative effectiveness. These head-to-head trials compare therapies to see how they stack up against each other.



Integral program features makes VA Research uniquely poised to conduct comparative effectiveness research:

- ▶ Position within a national health care system with an integrated electronic record;
- ▶ Ability to conduct large national clinical trials through such programs as the Cooperative Studies Program;
- ▶ Evidence-Based Synthesis Program, to prepare syntheses of the literature on health care topics important to Veterans and broadly distributes reports throughout VA; and
- ▶ Quality Enhancement Research Initiative (QUERI), whose mission is to translate research findings into better patient care.

By clarifying the relative benefits of different therapies in defined groups of people, comparative effectiveness research represents an important step toward personalizing care—that is, tailoring therapies to a specific patient's circumstances.



## Current State-of-the-Art Prosthetic Hands

Developing new prosthetic technology is important because:

- ▶ Currently available upper limb prosthetics have limited capabilities.
- ▶ Upper limb amputees constitute a significant percentage of new military amputees.
- ▶ The majority of these amputees will separate from active duty and enroll in VA health care.
- ▶ The VA will provide lifetime prosthetic care for Veterans with amputations.



# VA Studies: Advanced Prosthetics

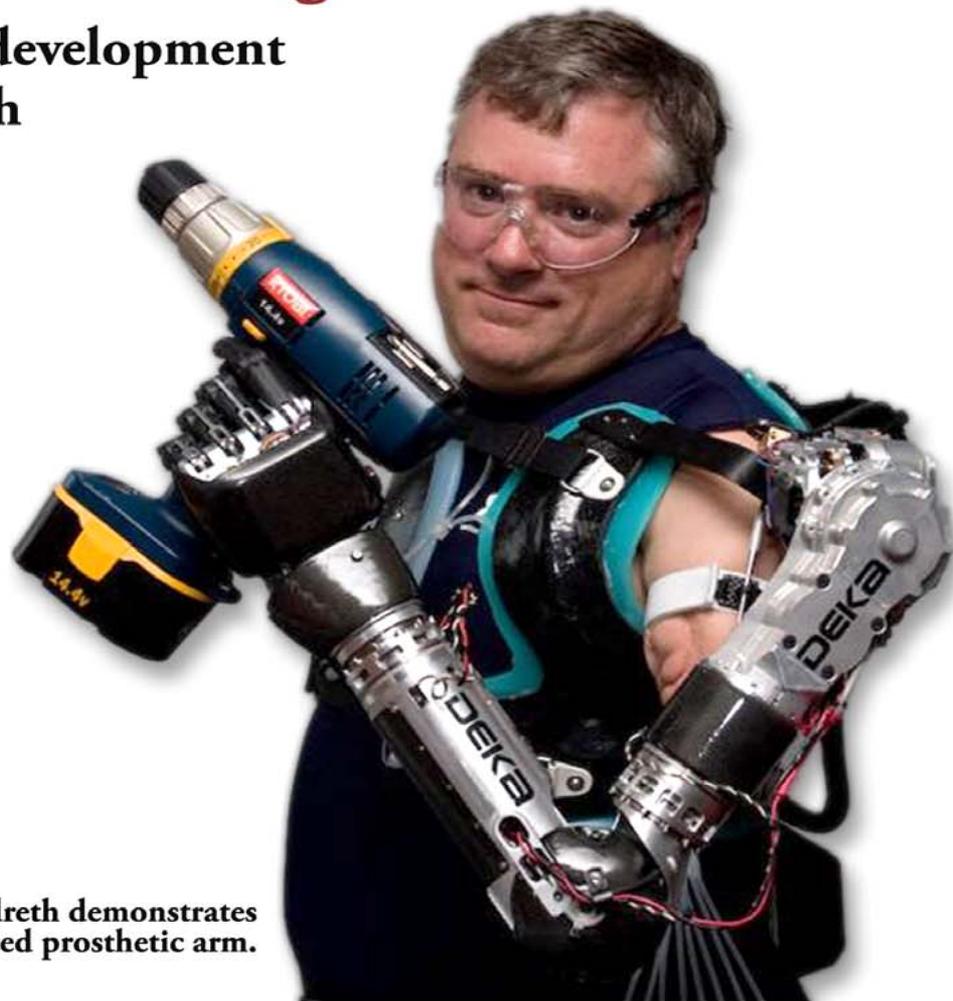
*Linda Resnik, PT, PhD, OCS*  
*Providence, RI*



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## Revolutionizing Prosthetics Program

A major investment in technology development to advance the care of Veterans with upper limb amputations.



Chuck Hildreth demonstrates the advanced prosthetic arm.



# DSO

DEFENSE SCIENCES OFFICE



## Revolutionizing Prosthetics

**COL Geoffrey Ling, M.D., Ph.D.**  
**Program Manager**

## Revolutionizing Prosthetics

Exploit/advance state of the art technologies: actuation, mechanical power distribution, energy storage, biotic/abiotic interfaces, sensors, computation, and **neural control**

To

Provide fully integrated limb replacements that enable victims of upper body limb loss to perform arm and hand tasks with near-natural strength and dexterity

### State of the Art: Utah arm



2 pound active lift

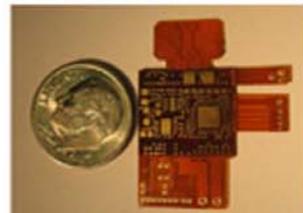
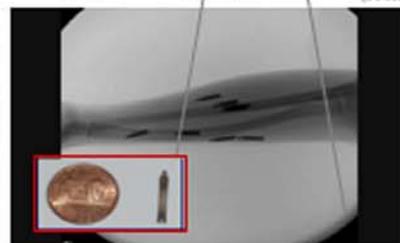
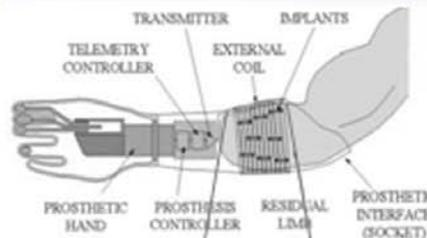
Myoelectric or "shrug" control with a standard harness and socket interface

Mechanically Superior

Neurally Integrated

- Closed loop nervous system integration
- Degrees-of-freedom allow natural range-of-motion
- Tactile & force receptors provide feedback
- Human-like endurance and actuation





### *Clinical Development Strap-and-Go*

- 6 patients, >500 hours of use to date
- Next steps
  - >10 clinical trials
  - >4 patient home trials
  - Testing
  - Design 3<sup>rd</sup> Gen Arm
  - 2011- submit to FDA

### *Clinical Development Neural*

- >30 patients with targeted motor reinnervation (TMR) surgery to facilitate arm control; 4 used arm in clinical setting
- Walter Reed and Brooke Army Medical Centers evaluate patients for TMR and have performed 3 surgeries at each facility to date
- Successful wireless cortical and peripheral nerve signal decoding experiments
- 2010 – FDA submission; initiate trials for direct brain controlled device

***Continued support to 2-year VA Optimization Study***

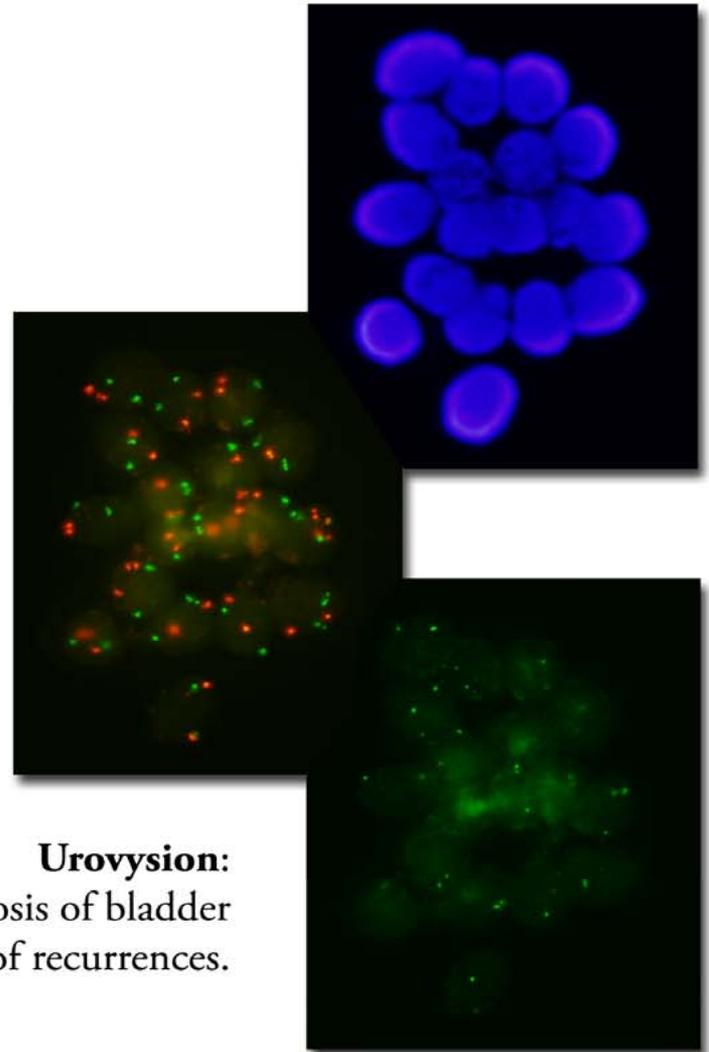




## What is Genomic Medicine?

### DNA & RNA Testing:

- ▶ Personalized Medicine
- ▶ An Accepted Standard of Care
- ▶ Applications:
  - Sensitivity to Adverse Drug Reactions
  - Inherited Diseases & Syndromes
  - Cancer Diagnosis
  - Infectious Disease



### **Urovysion:**

A sensitive method for diagnosis of bladder cancer and early detection of recurrences.

# Clinical & Research Genomics

*Jack H. Lichy, MD, PhD*

*Washington, D.C.*



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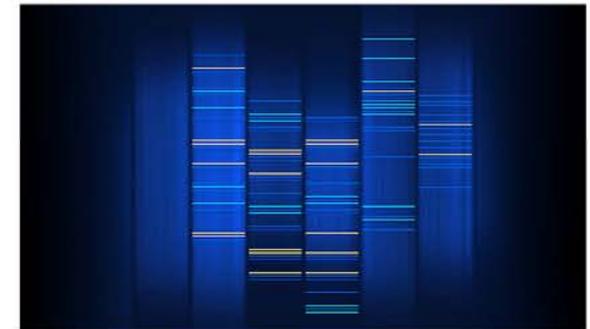
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## Benefits to Veterans

- ▶ Tests already in use to support cancer diagnostics, clotting risk, Warfarin sensitivity.
- ▶ Reduced costs for clinical tests.
- ▶ Fewer days in the hospital.
- ▶ Fewer serious adverse drug reactions.
- ▶ More effective cancer treatments.
- ▶ Disease prevention: knowing the risk.

### **The Concept:**

The same technologies used for clinically required DNA testing are made available to support research in a single core laboratory facility.



# Career Development Program

*Joel Kupersmith, MD*

*VA Chief Research and Development Officer*



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## Road to a Career as a VA Investigator

VA Researchers have a long history of scientific achievements that benefit Veterans and all Americans. VA Research also fosters the development of researchers and clinicians and attracts them to work in the VA health care system.



### Application Process

- ▶ **Career Development Award (CDA) 1:** Targeted toward post-doctoral clinician and non-clinician researchers.
- ▶ **CDA 2:** Targeted toward highly promising clinicians and non-clinicians to develop into independent VA researchers.
- ▶ **CD Transition Award:** Supports clinicians become independently funded VA researchers.
- ▶ **CD Enhancement Award:** Open to VA researchers, this award provides up to six months salary support for educational leave to learn new research skills.

# Career Development Program

*Ronald Wiley, MD, PhD*  
*Nashville, TN*



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## Road to a Career as a VA Investigator - A Personal Journey

VA's Career Development Program was established to provide mentoring for junior researchers so they can learn from renowned experienced VA researchers and become senior investigators.



### Application Process

- ▶ VA Career Development and Merit Review grants exist to support research by MDs.
- ▶ Merit Review grants for 27 years have supported development of the field of Molecular Neurosurgery.
- ▶ Senior Career Development Award supported advanced training in animal pain research which resulted in entirely new therapeutic approaches to studying and relieving chronic pain.

# Turning Hope into Reality

## VA Research Participants Speak Out



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“Everybody I see I tell them I hope you’re a Veteran because they have the best health programs. I got my life back.”

*David Evans Jr., VA Research Participant*

“It’s a great opportunity to increase your well-being. (The research) gave me a much better outlook for the future.”

*Sandra Bourget, VA Research Participant*

“We have encouraged others to participate. We’ve told a lot of people about VA research.”

*Penny Goree, Wife of VA Research Participant*

