The Challenge of Pain

• Prevalence in U.S.
  – Chronic Pain: ~100 million
  – Diabetes: 26 million
  – Coronary Heart Disease: 16 million
  – Cancer: 12 million
  – Stroke: 7 million

• Cost: > $600 billion

• Problems with Current Analgesics
  – Opioids: tolerance, dependence
  – NSAIDs: limited efficacy, GI, renal, bleeding
  – COXIBs: MI, stroke
  – Acetaminophen: ~50% acute liver failures

*Institute of Medicine, 2010*
Pain Analysis of 38 studies on >1,000,000

• 21–19% rate of opioid misuse
• 8–12% rate of opioid addiction
CURRENT T1-LEVEL PAIN RESEARCH

Preclinical Burn Studies

Clinical/Molecular Burn Studies

Periphery

Spinal Cord

TRPV1

BL Veh Log MEAN (log s/s)
Conclusions:

"Pilates exercise offers greater improvements in pain and functional ability compared to usual care of physical activity."


Effects of a home exercise programme on shoulder pain and functional status in construction workers

P M Ludewig, J D Borstad

Occup Environ Med 60:841, 2003
Enhanced pain modulation among triathletes: A possible explanation for their exceptional capabilities

Nirit Geva, Ruth Defrin

Fig. 4. Ratings of tonic nociceptive stimuli with time in triathletes and controls. Perceived pain was significantly lower in triathletes than in controls at all 3 time points (*P < .01, **P < .001). The increase in perceived pain with time was similar for both groups. Values denote mean ± SD. VAS = visual analog scale.

Exercise therapy normalizes BDNF upregulation and glial hyperactivity in a mouse model of neuropathic pain

Cayo Almeida, Alme DeMaman, Riccardo Rusua, Flaviane Cadet, Maria Ida Ravanelli, André L. Queiroz, Thais A. Souza, Sonia Zanon, Leonardo R. Silveira, Guilherme Lucas

Pain 154:2317, 2013

Pain 156:504, 2015
The diagram illustrates the process of translational research, connecting bench research to patients and practice, and finally to public health. The stages are labeled as T1, T2, T3, and T4, with each representing a different phase of research and translation: Phase 1 & 2 clinical trials, dissemination research, implementation research, and population-level outcomes research, respectively.

- **Bench** includes basic science research, animal models, and preclinical studies.
- **Bedside** involves human clinical research and controlled clinical trials.
- **Patients** focuses on clinical practice, precision medicine, and phase 3 & 4 clinical trials.
- **Practice** deals with practice-based research and survey research.
- **Public Health** concerns disease prevention, population-level outcome studies, and health policy.

The stages are interconnected, showing how research progresses from basic science to clinical practice, and then to public health.