The Vanderbilt Center for Addiction Research (VCAR)

Danny Winder, PhD, Director
Addiction and the US

- Nearing $1 trillion/yr in financial burden

<table>
<thead>
<tr>
<th></th>
<th>Health Care</th>
<th>Overall</th>
<th>Year Estimate Based On</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>$168 billion</td>
<td>$300</td>
<td>2010</td>
</tr>
<tr>
<td>Alcohol</td>
<td>$27 billion</td>
<td>$249</td>
<td>2010</td>
</tr>
<tr>
<td>Illicit Drugs</td>
<td>$11 billion</td>
<td>$193</td>
<td>2007</td>
</tr>
<tr>
<td>Prescription Opioids</td>
<td>$26 billion</td>
<td>$78.5</td>
<td>2013</td>
</tr>
</tbody>
</table>

- Lung Cancer
- Heart Disease
- Cirrhosis
- Hepatitis
- HIV
- Vehicular Accidents
- Violence

NIDA

Vanderbilt Center for Addiction Research
Discovering new roads to recovery
The Opioid Crisis in TN

Opioid prescriptions per 1,000 population

Note: Excludes prescriptions from methadone opioid treatment programs and prescriptions reported from V.A. pharmacies.

E. Omohundro, PhD, 3/15/2017
Office of Research
Addiction is a Brain Disease
Technology Revolution in Neuroscience
Major Goals of VCAR:

- Determine key molecular mechanisms that contribute to the most pernicious aspects of addiction: uncontrolled behavior and drug/alcohol relapse
- Develop new strategies to treat addiction using the unparalleled drug development infrastructure at Vanderbilt
- Provide near-peer community engagement strategies to educate high- and middle-school aged students on the incredible nature of their brain as an organ, and how it is uniquely vulnerable to drugs of abuse at their age
Executive Advisory Board

Stephen Heckers, Psychiatry
David Sweatt, Pharmacology
Hilary Tindle, Medicine
Sachin Patel, Psychiatry
Membership:
44 faculty across 4 schools (Nursing, A&S, Medicine, Peabody)
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Genetically targeted NAc neuronal activity measurements during cocaine place conditioning

Calipari et al., *PNAS* (2016)
Immune-neuro interactions

Kleen and Holmes, *Nat Med*, 2010
TLR4 control of NAc plasticity and cocaine-related behaviors

Daniel T. Kashima, and Brad A. Grueter PNAS 2017;114:8865-8870
Chronic-Drinking Forced Abstinence (CDFA) model of affective disturbances in abstinence

Holleran, et al. 2016 NPP
### Emotions of the C57Bl/6J Mouse

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happy</td>
<td><img src="image" alt="Happy Mouse" /></td>
</tr>
<tr>
<td>Lonely</td>
<td><img src="image" alt="Lonely Mouse" /></td>
</tr>
<tr>
<td>Aggressive</td>
<td><img src="image" alt="Aggressive Mouse" /></td>
</tr>
<tr>
<td>Confused</td>
<td><img src="image" alt="Confused Mouse" /></td>
</tr>
<tr>
<td>Doubtful</td>
<td><img src="image" alt="Doubtful Mouse" /></td>
</tr>
<tr>
<td>Annoyed</td>
<td><img src="image" alt="Annoyed Mouse" /></td>
</tr>
<tr>
<td>Relieved</td>
<td><img src="image" alt="Relieved Mouse" /></td>
</tr>
<tr>
<td>Depressed</td>
<td><img src="image" alt="Depressed Mouse" /></td>
</tr>
<tr>
<td>Willful</td>
<td><img src="image" alt="Willful Mouse" /></td>
</tr>
<tr>
<td>Content</td>
<td><img src="image" alt="Content Mouse" /></td>
</tr>
<tr>
<td>Furious</td>
<td><img src="image" alt="Furious Mouse" /></td>
</tr>
<tr>
<td>Conceited</td>
<td><img src="image" alt="Conceited Mouse" /></td>
</tr>
<tr>
<td>Hungry</td>
<td><img src="image" alt="Hungry Mouse" /></td>
</tr>
<tr>
<td>Overjoyed</td>
<td><img src="image" alt="Overjoyed Mouse" /></td>
</tr>
<tr>
<td>Concerned</td>
<td><img src="image" alt="Concerned Mouse" /></td>
</tr>
<tr>
<td>Anxious</td>
<td><img src="image" alt="Anxious Mouse" /></td>
</tr>
<tr>
<td>Excited</td>
<td><img src="image" alt="Excited Mouse" /></td>
</tr>
<tr>
<td>Bored</td>
<td><img src="image" alt="Bored Mouse" /></td>
</tr>
</tbody>
</table>
Chronic-Drinking Forced Abstinence (CDFA) model of affective disturbances in abstinence

Holleran, et al. 2016 NPP
Functional and Structural Imaging of the Human BNST

Avery et al., *Neuroimage* 2014

Vanderbilt Center for Addiction Research

*Discovering new roads to recovery*
Functional and Structural Imaging of the Human BNST

Avery et al., *Neuropsychopharm* 2016
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Neonatal Abstinence Syndrome

Poor access to MAT
- Patients, providers, professional societies, and payers are uncertain about effectiveness and quality of outpatient MAT induction and so choice is constrained

Evidence needed
- Patients need decision support to consider options, providers need guidelines to be comfortable with an alternative, and payers need evidence to change coverage policies

Develop and share evidence
- Large, controlled study, driven by stakeholder needs, with strong dissemination plan, will equip patients, providers, and payers with needed evidence

A Comparative Analysis of Inpatient vs. Outpatient Buprenorphine Induction in Pregnancy

PIs: Sachin Patel, Reesha Sanghani

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VCAR Community Engagement

- Partner with the School of Science and Math at Vanderbilt (SSMV) to help high school seniors engage in near-peer addiction neuroscience education with area middle school students.
VCAR Community Engagement

- Your brain is “big”
- Your brain isn’t perfect
- Addiction/alcoholism and the brain
- How we study addiction
- Biomedical research as a career

- Partner with the School of Science and Math at Vanderbilt (SSMV) to help high school seniors engage in near-peer addiction neuroscience education with area middle school students.
VCAR Community Engagement

FIRST ANNUAL
Vanderbilt Center for Addiction Research
SCIENCE DAY

Tuesday
10.17.2017,
Belcourt Theater
8:30 a.m. - 12:10 p.m.
Symposium
Langford Lobby
12:10 p.m. - 3:30 p.m.
Potions/Reception

VCAR science day shines light on addiction's power

by Bill Snyder | Thursday, Oct. 19, 2017, 10:16 AM

Nashville Mayor Megan Barry spoke at Tuesday's Science Day at the Belcourt Theatre hosted by the Vanderbilt Center for Addiction Research. (photo by John Russell)
Iterative preclinical-clinical research leading to new therapies

Programmatic Funding/Development

Training

Recruiting

Vanderbilt Center for Addiction Research

Discovering new roads to recovery