MEDICAL CANNABIS FOR NEUROLOGICAL DISEASES

July 15TH, 2017

ANDREW MEDVEDOVSKY, M.D.
Board Certified Neurologist & Pain Medicine Specialist
Director New Jersey Alternative Medicine
GOALS AND OBJECTIVES

• Overview of medical cannabis
• Discuss benefits of medical cannabis
• Discuss how cannabis can help neurological diseases
• Avoid Political Debates
BRIEF BIOGRAPHY

- Completed Neurology Residency and Pain Medicine Fellowship at Virginia Commonwealth University
- Board Certified in Neurology & Pain Medicine
- Joined Pain Practice in 2013
- Started Medical Marijuana Program in July 2015
- Over 2000 Happy Patients
WHY IS CANNABIS IMPORTANT FOR YOU TO KNOW ABOUT?

• Evolving field
• Becoming mainstream
• Patients will be asking
• Legal reasons
NURSES IN PATIENT CARE:
Evolving Industry

Cannabis Nurses Magazine

Oncology Edition

Oncology and Early Palliation: The Role of Cannabis

Treating Children with Cannabis

Cannabis and Cancer

Medical Cannabis: The Healing Power of Knowledge

Cannabis vs Cancer

Safety & Testing

More Than "Just a Nurse"

Medical Marijuana

Know what your putting in your body

The Birth of ACNA

Meet: Mary Lynn Mathre

Safety First: What you should know about cannabis, products and your health
WHY I STARTED THE PROGRAM?

- Patients kept asking
- Public awareness about marijuana
- Reduce use of opioids and addictive medications
- Expand my treatment options
QUALIFYING CONDITIONS

- Intractable Skeletal Muscular Spasticity
- Multiple sclerosis
- Muscular Dystrophy
- Inflammatory Bowel Disease (Crohn’s)
- Intractable Epilepsy
- Glaucoma
- Terminal Cancer
- AIDS
- PTSD
- ALS
One of the oldest medicines in existence

Used for centuries to treat 100's of ailments

Schedule 1 and federally illegal

HISTORY OF CANNABIS

A Brief History of...

Marijuana Law

1619
1st N. American marijuana law forces farmers to grow hemp
Jamestown Colony, Virginia

1850
Cannabis extract widely recommended & sold over-the-counter in Western pharmacies

1915-1927
Influx of Mexican immigrants into the US

1929-1936
Recreational marijuana use spreads among minorities...

"Reefer makes Darkies think they're as good as white men"

Harry J. Anslinger

1937
Anslinger proposes Marihuana Tax Act to Congress and testifies:

"Marijuana is the most violent drug in the history of mankind"

Act passes...

Marijuana is Prohibited
• 1850 - Marijuana Added to US Pharmacopeia
• 1900 - Cannabis Used for Asthma, Bronchitis, and Loss of Appetite in South Asia
• 1918 - US Pharmaceutical Farms Grow 60,000 Pounds of Cannabis Annually
• 1936 - *Reefer Madness* Film Cautions Against Marijuana
• 1942 - Marijuana Removed from US Pharmacopeia
ANYTHING IN COMMON?
WHAT DO THESE PEOPLE HAVE IN COMMON?
In 1976, a federal judge ruled that the Food and Drug Administration must provide Robert Randall with marijuana. President George H.W. Bush's stopped accepting new patients in 1992. Comes from the University of Mississippi.
**HOW SAFE IS MARIJUANA?**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Annual Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>400,000</td>
</tr>
<tr>
<td>Alcohol</td>
<td>100,000</td>
</tr>
<tr>
<td>All Legal Drugs</td>
<td>20,000</td>
</tr>
<tr>
<td>All Illegal Drugs</td>
<td>15,000</td>
</tr>
<tr>
<td>Caffeine</td>
<td>2,000</td>
</tr>
<tr>
<td>Aspirin</td>
<td>500</td>
</tr>
<tr>
<td>Marijuana</td>
<td>0</td>
</tr>
</tbody>
</table>
SO WHAT IS THE PROBLEM?

- Cultural Paradigm
- Misunderstanding
- Lack of education
- Inaccurate representation
PART II: CANNABIS SCIENCE
RAPHAEL MECHOULAM

• In 1964 DISCOVERED THC: Isolated Δ⁹-tetrahydrocannabinol
• Endocannabinoid system discovered in 1990s
NEW JERSEY
ALTERNATIVE MEDICINE
The Human Endocannabinoid System

CBN is known to “fit” like lock and key into a network of existing receptors. The Endocannabinoid System exists to receive cannabinoids produced inside the body called “Anandamine” and “2-Arachidonyl-glycerol.” Stimulating the ECS with plant-based cannabinoids restores balance and helps maintain symptoms.

CB1 receptors are concentrated in the brain and central nervous system but also sparsely populates other parts of the human body.

Receptors are found on cell surfaces.

CBD does not directly “fit” CB1 or CB2 receptors but has powerful indirect effects still being studied.

CB2 receptors are mostly in the peripheral organs especially cells associated with the immune system.
ENDOCANNABINOIDS → NEUROMODULATORs

- **2-Arachidonylglycerol (2-AG)**
  - Active on CB1 & CB2
  - Mimetic CBD
- **Anandamide**
  - Mimics THC
  - Activate CB1 receptor
  - ECBs are produced in the cell membranes and tissues of the body
  - THC mimics natural ECBs
Concentrations of CB₁ receptors

- **Basal Ganglia**¹
  - Movement
- **Cerebellum**¹
  - Movement
- **Cerebral Cortex**¹
  - Higher cognitive function
- **Hypothalamus**²
  - Appetite
- **Hippocampus**¹
  - Learning, memory, stress
- **Medulla**³,⁴
  - Nausea/vomiting, chemoreceptor trigger zone (CTZ)
- **Spinal Cord**¹
  - Peripheral sensation including pain

References:
CANNABIDIOL (CBD)

- Modulates activity without directly binding to CB1
- Mediates pain perception and inflammation
- Activate serotonin receptor → exerting anti-depressant effects
- Blocks the psychoactive action of THC
- CBD decreases bone reabsorption and cancer cell proliferation
ULTIMATE GOAL: MAINTAIN HOMEOSTASIS

- Maintenance of a stable internal environment despite fluctuations in the external environment
- Cannabinoids promote homeostasis at every level of biological life

Balance is the Key to Life
HYPOTHALAMUS

- HUNGER
- THIRST
- BODY TEMPERATURE
- SEXUAL ACTIVITY
- AROUSAL
- BLOOD PRESSURE
- HEART RATE
- CIRCADIAN RHYTHM
- SLEEP
- HORMONE REGULATION
• Has anyone ever heard of **OREXINERGIC PROJECTION SYSTEM**?
  • There are approximately 70,000 orexin producing neurons in the human brain that project from the lateral hypothalamus to neurons and brain regions that modulate various functions.
  • **CB1 are CO-LOCALIZED on OREXIN projection neurons**
• Deal with memory and experience
• ECB are key mechanism by which memories of aversive experiences are encoded and extinguished → Treat **PTSD**
NEUROLOGICAL DISEASES

- Depletion
- Deficiency
- Dysregulation
- Destruction
GLUTAMATE & EXCITOTOXICITY

- Glutamate: Excitatory neurotransmitter
- Leads to the activation of Ca\(^{2+}\) permeable NMDA receptors
- Excess calcium in the cytosol causes cell death
- Spinal cord injury, Stroke, MS, ALS, PD, Alcoholism, Epilepsy, Hypoglycemia
PARKINSON’S ON A CELLULAR LEVEL

DESTRUCTION & DEPLETION
"I SMOKED POT IN HIGH SCHOOL AND WAS PARANOID"
ALS (LOU GEHRIG)

- 10% familial
- Genetic defect in superoxide dismutase: Increased oxidative stress for motor neurons, leading to cell death
- Elevated levels of Glutamate
- Animal studies
  - 9-THC before and after onset of ALS
  - Blocking CB1 receptors extended lifespan of mice with ALS.
MULTIPLE SCLEROSIS

- Reduces pain, muscle spasticity, depression, fatigue, and incontinence
- May inhibit disease progression
- European countries are more progressive in cannabis research and support

DESTRUCTION & DYSREGULATION
Multiple Sclerosis Disease-Modifying Drugs
Prices Per Box and Per Year, Increases Since September 2010

<table>
<thead>
<tr>
<th>Drug</th>
<th>Per Box March 2011</th>
<th>Per Year March 2011</th>
<th>Per Box Sept 2010</th>
<th>Per Year Sept 2010</th>
<th>Price Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copaxone</td>
<td>$3,828</td>
<td>$45,140</td>
<td>$3,403</td>
<td>$39,928</td>
<td>+ 12.5%</td>
</tr>
<tr>
<td>Rebif</td>
<td>$3,097</td>
<td>$39,980</td>
<td>$2,854</td>
<td>$36,825</td>
<td>+ 8.5%</td>
</tr>
<tr>
<td>Avonex</td>
<td>$2,860</td>
<td>$36,860</td>
<td>$2,680</td>
<td>$34,667</td>
<td>+ 6.7%</td>
</tr>
<tr>
<td>Betaseron</td>
<td>$2,950</td>
<td>$34,980</td>
<td>$2,950</td>
<td>$34,980</td>
<td>+ 0.0%</td>
</tr>
<tr>
<td>Gilenya</td>
<td></td>
<td>$3,800</td>
<td></td>
<td>$48,600</td>
<td></td>
</tr>
</tbody>
</table>

Note: Several medications require 13 boxes to supply one year’s worth of treatment.
WHAT DO THESE HAVE IN COMMON?

DYSREGULATION
WHAT DO THESE HAVE IN COMMON?

• MIGRAINE HEADACHES
• FIBROMYALGIA
• IRRITABLE BOWEL SYNDROME
MANY DIFFERENT STRAINS

Periodic Table of MARIJUANA STRAINS

<table>
<thead>
<tr>
<th>H 1</th>
<th>He 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.34% THC</td>
<td>24.36% THC</td>
</tr>
<tr>
<td>Li 3</td>
<td>Be 4</td>
</tr>
<tr>
<td>4.5% THC</td>
<td>6.47% THC</td>
</tr>
<tr>
<td>Na 11</td>
<td>Mg 12</td>
</tr>
<tr>
<td>16.8% THC</td>
<td>14.7% THC</td>
</tr>
<tr>
<td>K 19</td>
<td>Ca 20</td>
</tr>
<tr>
<td>24.54% THC</td>
<td>18.4% THC</td>
</tr>
<tr>
<td>Sc 21</td>
<td>Ti 22</td>
</tr>
<tr>
<td>24.8% THC</td>
<td>22.3% THC</td>
</tr>
<tr>
<td>V 23</td>
<td>Cr 24</td>
</tr>
<tr>
<td>16.0% THC</td>
<td>18.0% THC</td>
</tr>
<tr>
<td>Mn 25</td>
<td>Fe 26</td>
</tr>
<tr>
<td>18.0% THC</td>
<td>30.3% THC</td>
</tr>
<tr>
<td>Cu 27</td>
<td>Zn 28</td>
</tr>
<tr>
<td>Cherry</td>
<td>Diesel</td>
</tr>
<tr>
<td>29% THC</td>
<td>28% THC</td>
</tr>
<tr>
<td>Sn 41</td>
<td>Sb 42</td>
</tr>
<tr>
<td>Morning Star</td>
<td>Tahoe OG</td>
</tr>
<tr>
<td>16.5% THC</td>
<td>19.2% THC</td>
</tr>
<tr>
<td>Zr 43</td>
<td>Nb 44</td>
</tr>
<tr>
<td>Terpenes</td>
<td>Terpenes</td>
</tr>
<tr>
<td>15.5% THC</td>
<td>19.2% THC</td>
</tr>
<tr>
<td>Mo 45</td>
<td>Tc 46</td>
</tr>
<tr>
<td>Redwood Kush</td>
<td>Purple Russian</td>
</tr>
<tr>
<td>14.4% THC</td>
<td>17.7% THC</td>
</tr>
<tr>
<td>Ru 47</td>
<td>Rh 48</td>
</tr>
<tr>
<td>Big Bud</td>
<td>Chemdawg</td>
</tr>
<tr>
<td>14.4% THC</td>
<td>17.7% THC</td>
</tr>
<tr>
<td>Pd 49</td>
<td>Ag 50</td>
</tr>
<tr>
<td>Big Bud</td>
<td>Snowcap</td>
</tr>
<tr>
<td>11.0% THC</td>
<td>16.6% THC</td>
</tr>
<tr>
<td>Cd 51</td>
<td>In 52</td>
</tr>
<tr>
<td>Shiloh's Killer</td>
<td>Tropical</td>
</tr>
<tr>
<td>13.4% THC</td>
<td>16.6% THC</td>
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<tr>
<td>Sn 53</td>
<td>Sb 54</td>
</tr>
<tr>
<td>Purple Kush</td>
<td>Sister</td>
</tr>
<tr>
<td>16.6% THC</td>
<td>16.6% THC</td>
</tr>
<tr>
<td>Tl 55</td>
<td>Pb 56</td>
</tr>
<tr>
<td>Mexican Haze</td>
<td>LA 55</td>
</tr>
<tr>
<td>19.0% THC</td>
<td>20.0% THC</td>
</tr>
<tr>
<td>Cs 57</td>
<td>Ba 58</td>
</tr>
<tr>
<td>Cheesy Kush</td>
<td>Washi</td>
</tr>
<tr>
<td>14.2% THC</td>
<td>13.5% THC</td>
</tr>
<tr>
<td>Fr 59</td>
<td>Rl 60</td>
</tr>
<tr>
<td>Tuna PIC</td>
<td>Unknown</td>
</tr>
<tr>
<td>15.6% THC</td>
<td>16.3% THC</td>
</tr>
<tr>
<td>Fr 61</td>
<td>Tuna PIC</td>
</tr>
<tr>
<td>15.6% THC</td>
<td>16.3% THC</td>
</tr>
</tbody>
</table>

NEW JERSEY
ALTERNATIVE MEDICINE
TERPENES AND TRICHROMES
SMELLS AND FLAVORS

- A-PINENE
  - Anti-inflammatory
  - Bronchodilator
  - Aids memory
  - Anti-bacterial
  - Also found in pine needles

- LINALOOL
  - Anesthetic
  - Anti-convulsant
  - Analgesic
  - Anti-anxiety
  - Also found in lavender

- BETA CARYOPHYLLENE
  - Anti-inflammatory
  - Analgesic
  - Protects cells lining the digestive tract
  - Also found in black pepper

- MYRCENE
  - Contributes to sedative effect of strong indicas
  - Sleep aid
  - Muscle relaxant
  - Also found in hops

- LIMONENE
  - Treats acid reflux
  - Anti-anxiety
  - Antidepressant
  - Also found in citrus
TRIVIA QUESTION?

• Why can’t you overdose on cannabis?

In order to prove that marijuana use kills brain cells, Dr. Heath strapped Rhesus monkeys into a chair and pumped them with the equivalent of 63 Colombian strength joints in “five minutes, through gas masks,” losing no smoke.

Three to five minutes of oxygen deprivation causes brain damage—“dead brain cells.”
STAY FOCUSED...MORE TO COME
PART II: OPIOID EPIDEMIC
CAN MEDICAL CANNABIS
FOCUS ON CHRONIC PAIN

IMPROVING ONE LIFE AT A TIME
Impact Of Chronic Pain On Healthcare

311 Million People—US Population
100 Million have Chronic Pain
$650 billion—Treatment & Lost Productivity
1 Pain Specialist per 33,000 Patients

GOOD NEWS? JOB SECURITY
VICIOUS PAIN CYCLE

Pain is the key factor that creates the vicious cycle:
- Change of posture
- Poor mobility
- Less activity
- Insomnia
- Stress
- Relationship breakdown
- Financial difficulty
- Negative mood
- Weight gain

The cycle starts with pain and leads to various other factors that perpetuate the cycle.
HOW ARE THESE PROBLEMS TREATED?
The US constitutes 4.6% of the world population

But consumes 80% of the world production of opioids
Global Hydrocodone Supply

99%  

1%
National Overdose Deaths
Number of Deaths from Prescription Opioid Pain Relievers

Source: National Center for Health Statistics, CDC Wonder
<table>
<thead>
<tr>
<th>CEO Name</th>
<th>Company</th>
<th>Total Compensation</th>
<th>Daily Compensation</th>
</tr>
</thead>
<tbody>
<tr>
<td>John C. Martin</td>
<td>Gilead Sciences</td>
<td>$98.4 million</td>
<td>$377,132 per day</td>
</tr>
<tr>
<td>Ian C. Read</td>
<td>Pfizer</td>
<td>$23.4 million</td>
<td>$89,539 per day</td>
</tr>
<tr>
<td>John C. Lechleiter</td>
<td>Eli Lilly</td>
<td>$20.9 million</td>
<td>$80,035 per day</td>
</tr>
<tr>
<td>Richard A. Gonzalez</td>
<td>AbbVie</td>
<td>$25.0 million</td>
<td>$95,757 per day</td>
</tr>
<tr>
<td>Robert A. Bradway</td>
<td>Amgen</td>
<td>$34.1 million</td>
<td>$130,550 per day</td>
</tr>
<tr>
<td>Kenneth Frazier</td>
<td>Merck</td>
<td>$33.8 million</td>
<td>$129,515 per day</td>
</tr>
</tbody>
</table>

Median earnings of full-time wage and salary workers in 2016: $43,264

Annual CEO compensation includes salary, non-equity incentive pay, other compensation, and value of stock options exercised and stock awards that vested. In addition, these CEOs were given stock and option awards totaling $63.7 million (in aggregate) this year, which will provide value in future years.
<table>
<thead>
<tr>
<th>CEO Name, Company</th>
<th>Total Compensation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joseph Swedish, WellPoint</td>
<td>$17.0 million</td>
</tr>
<tr>
<td></td>
<td>($49,853 per day)</td>
</tr>
<tr>
<td>Michael Neidorff, Centene</td>
<td>$14.5 million</td>
</tr>
<tr>
<td></td>
<td>($42,560 per day)</td>
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<tr>
<td>Stephen Hemsley, UnitedHealth</td>
<td>$12.1 million</td>
</tr>
<tr>
<td></td>
<td>($35,484 per day)</td>
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<tr>
<td>Mark Bertolini, Aetna</td>
<td>$30.7 million</td>
</tr>
<tr>
<td></td>
<td>($90,029 per day)</td>
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<tr>
<td>David Cordani, Cigna</td>
<td>$13.5 million</td>
</tr>
<tr>
<td></td>
<td>($39,589 per day)</td>
</tr>
<tr>
<td>Bruce Broussard, Humana</td>
<td>$8.8 million</td>
</tr>
<tr>
<td></td>
<td>($25,807 per day)</td>
</tr>
</tbody>
</table>
THERE HAS TO BE AN ALTERNATIVE TREATMENT OPTION!

ANDREW MEDVEDOVSKY, M.D.
BENEFITS OF CANNABIS

- Side effect profile
- Health benefits
- Dependency and addiction
- Polypharmacy & drug interactions
- Improve sleep, energy, pain relief, anxiety, depression.
HOW DOES THIS HELP MY PATIENTS?
YOU DON’T NEED TO PRESCRIBE…..
JUST EDUCATE THE PATIENT

• INPATIENT
  • Patients re-admitted with chronic pain, IBS flare up
  • Can recommend to consult with Medical Cannabis Clinic

• OUTPATIENT
  • Outpatient Cancer Center
  • Patients on opioids, Benzodiazepines, sleep aids, ETC
    • Safer alternative

• EMERGENCY ROOM
  • Frequent flyers coming in with chronic conditions
  • New CDC guidelines limit prescription of opioids

• PALLIATIVE CARE
  • Appetite, sleep, mood, and well being
METHODS OF CONSUMPTION

- Smoking
- Vaping
- Eating
- Topical
CANNABIS SIDE EFFECTS

• Possible Interactions
  • Coumadin
  • SSRIs
  • Tricyclics

• Sedation
• Palpitations
• Dizzy
• Hyperemesis?
OUR SUCCESS STORIES
THANK YOU FOR LISTENING