Neuroscience of Psychoactive Substance Use and Dependence
Joint Publication of PAHO and OAS/CICAD

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1. INTRODUCTION

- Psychoactive substances and their sociolegal status
- Global trends in alcohol, tobacco and other drug use and burden
- Adverse effects of psychoactive substances and their mechanisms of action
- Substance dependence in relation to neuroscience
### MAIN RISK FACTORS FOR THE BURDEN OF DISEASE IN THE AMERICAS

<table>
<thead>
<tr>
<th>High Mortality</th>
<th>Low Mortality</th>
<th>Very Low Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>5.5%</td>
<td>Alcohol</td>
</tr>
<tr>
<td>Low birth weight</td>
<td>5.3%</td>
<td>Alcohol</td>
</tr>
<tr>
<td>Unsafe sex</td>
<td>4.8%</td>
<td>Overweight</td>
</tr>
<tr>
<td>Unsafe water/sanitation</td>
<td>4.3%</td>
<td>Tobacco</td>
</tr>
<tr>
<td>Overweight</td>
<td>2.4%</td>
<td>Blood Pressure</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>2.2%</td>
<td>Unsafe sex</td>
</tr>
<tr>
<td>Iron Deficiency</td>
<td>1.9%</td>
<td>Lead exposure</td>
</tr>
<tr>
<td>Indoor smoke(fuels)</td>
<td>1.9%</td>
<td>Low fruit/veg intake</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>1.1%</td>
<td>Unsafe water/sanitation</td>
</tr>
<tr>
<td>Low fruit/veg intake</td>
<td>0.8%</td>
<td>Physical inactivity</td>
</tr>
<tr>
<td>Tobacco</td>
<td>13.3%</td>
<td>Alcohol</td>
</tr>
<tr>
<td>Low Mortality</td>
<td>Tobacco</td>
<td>Overweight</td>
</tr>
<tr>
<td>Overweight</td>
<td>4.2%</td>
<td>Blood pressure</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>4.0%</td>
<td>Cholesterol</td>
</tr>
<tr>
<td>Tobacco</td>
<td>3.7%</td>
<td>Low fruit/veg intake</td>
</tr>
<tr>
<td>Overweight</td>
<td>2.3%</td>
<td>Physical inactivity</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>2.1%</td>
<td>Illicit Drugs</td>
</tr>
<tr>
<td>Tobacco</td>
<td>13.3%</td>
<td>Low fruit/veg intake</td>
</tr>
<tr>
<td>Low Mortality</td>
<td>Tobacco</td>
<td>Unsafe sex</td>
</tr>
<tr>
<td>Overweight</td>
<td>4.2%</td>
<td>Iron deficiency</td>
</tr>
</tbody>
</table>

### 3. BIOBEHAVIOURAL PROCESSES UNDERLYING DEPENDENCE

Relevance of Reward Functioning to Motivation and Dependence Processes

- **Conditioning**
- **Sensitization**
- **Tolerance**
- **Directing Behavioral Preference**
- **Reward**
- **Approach/Exploration**
DRUG REWARD ALONE DOES NOT EXPLAIN DRUG DEPENDENCE

- Positive sensations can explain use
- Most people try, but most do not become dependent
- How does compulsive use and drug seeking occur?
- What explains the inability to control or to stop use?

Mesolimbic dopamine pathway

MECHANISMS RELATING PSYCHOACTIVE SUBSTANCE USE TO HEALTH AND SOCIAL PROBLEMS

Form & patterns of substance use
Amount of substance use

Toxic and other biochemical effects
Intoxication
Dependence

Chronic Disease
Accidents/injuries (Acute Disease)
Acute Social problems
Chronic Social Problems

4. PSYCHOPHARMACOLOGY OF DEPENDENCE FOR DIFFERENT DRUG CLASSES
   - Alcohol
   - Tobacco
   - Cannabinoids
   - Amphetamines
   - Volatile solvents
   - Sedatives and hypnotics
   - Opioids
   - Cocaine (hydrochloride and crack)
   - Ecstasy
   - Hallucinogens

5. GENETIC BASIS OF SUBSTANCE DEPENDENCE
   - Family, twin and adoption studies
   - Social and cultural aspects
   - Risk and protective factors
6. CONCURRENT DISORDERS

- Theories to explain comorbidity
- Schizophrenia and depression

7. ETHICAL ISSUES

- Ethical principles in human biomedical research and animal research
- Emerging ethical issues in neuroscience research

8. CONCLUSIONS AND IMPLICATIONS FOR PUBLIC HEALTH POLICY

- All psychoactive substances can be harmful to health.
- Experimentation does not necessarily lead to dependence.
- Harm to society is not only caused by individuals with substance dependence.
8. CONCLUSIONS (CONT.)

• Substance dependence is a complex disorder with biological mechanisms affecting the brain and its capacity to control substance use.

• Substance dependence is not a failure of will or of strength of character but a medical disorder that could affect anyone.

8. CONCLUSIONS (CONT.)

• Treatment is cost-effective; it saves lives, thereby improving health and reducing costs on society.

• Investments in neuroscience research must continue and expand to include the social sciences, prevention, treatment, and policy research.
Thank you very much!!!

On behalf of PAHO, I would like to thank you for the attention and the opportunity to present this book. I would also like to thank CICAD/OAS for their financial support to publish this book in Spanish.