The Evolution of Abuse Deterrent Drug Formulations: Testing Effectiveness from the Benchtop to the Real World

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What is the RADARS® System?

History
- 2006, Denver Health and Hospital Authority
  - Rocky Mountain Poison and Drug Center
  - Denver Public Hospital for 150 years
  - State sanctioned independent authority

Conflict of Interest Statement
- Most manufacturers of prescription opioids or stimulants subscribe to RADARS System.
- RADARS System is the property of Denver Health and Hospital Authority, a political subdivision of the State of Colorado.
- Subscribers receive information, but do not participate in developing the System, data collection, or analysis. They do not have access to the raw data.
- Employees are prohibited from personal financial relationships with any company.
How Do Abuse Deterrent Formulations Work?
Strategies for Abuse Deterrence

- **Physical/Chemical barriers** - physical form of an oral drug is less amenable to abuse.
- **Agonist/Antagonist combinations** - interfere with euphoria
- **Aversion agents** - unpleasant effect if dosage form is manipulated or a higher dosage is used.
- **Delivery System** depot/implants to reduce release (e.g. SR depot SQ injectable formulation).
- **Prodrug** lacks opioid activity until transformed (e.g. GI tract).
- **Combination** – Two or more methods combined
- **Holy Grail** - Overdose only releases therapeutic amount.
Pain Relief from Opioid

Person in Pain

Susceptible Pain Patient

Misuse

Abuse

Substance Abuser

Addiction, Poisoning, Overdose, Death
How Can We Prove an ADF Works?

  - High public health priority
  - Recognizes the value of opioid analgesics in pain treatment
- Premarketing Studies
  - Category 1 - Laboratory-based in vitro manipulation and extraction studies
  - Category 2 - Pharmacokinetic studies
  - Category 3 - Clinical abuse potential studies
- **Category 4 - Postmarketing Studies - Postmarketing data to assess the impact of an ADF on actual abuse.**

RADARS Examines Prescription Drug Abuse from Multiple Perspectives

- Poison Center Data
- Drug Diversion Program
- OTP and SKIP Substance Abuse Treatment
- College Student Survey
- StreetRx.com Illicit Market Price
- Web Monitoring
Oxycodone ADF – Reduced Use
Number of People Filling Prescriptions
RADARS System, Abuse and Diversion, 2009 - 2015
Oral and Non-oral Routes of Abuse Decrease after Oxycodone ADF - Poison Center Program
Nonmedical Use and Outcomes Associated with Oxycodone ER have Decreased, 2008 - 2015
Abuse Deterrent Formulation Reduces Street Price 2013 - 2014

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Limited Impact Unless Most Opioid Analgesics are Abuse Deterrent
Poison Center Program
Population Rate, 2009-2013

*Other opioids excluding ER oxycodone and ER oxymorphone
Battle of the ADFs

Niacin

Prodrug

Crush Resistance
Summary

- Product specific surveillance
- ADFs are not just for addicts!
- More drug = more abuse, but formulation can change relation

- Need ADFs for IR as well as ER
- Need new drug scheduling - formulation and not by API
- Need greater treatment capacity for opioid addiction

Addiction, Poisoning, Overdose, Death
Questions?