



Chemical Agents of Opportunity for Terrorism: TICs & TIMs

The Clinical Neurotoxicology
of Chemical Terrorism

Training Support Package

Chemical Agents of Opportunity for Terrorism:
TICs & TIMs

Goals and Objectives

- Recognize toxic syndromes that effect the nervous system
 - Sedation
 - Convulsions
 - Hallucinations
- Know unique clinical effects of toxins that cause sedation syndromes
- List examples of agents of opportunity for each syndrome
- Know initial treatment strategy

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Chemical Agents of Opportunity for Terrorism:
TICs & TIMs

Central Nervous System

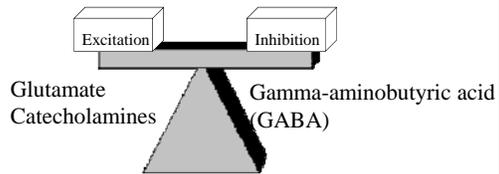
- The CNS is immensely complex
 - Great target for terrorism
- The CNS is central to both our function and our thinking



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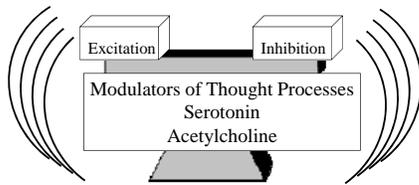
The Balance of the Brain

- The brain is a fine balance of excitatory and inhibitory influences
 - Slight alterations in either direction are significant



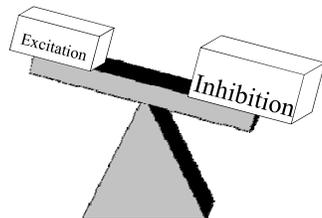
The Balance of the Brain

- In addition, other neurotransmitters influence our mood, our ability to think, remember, etc.



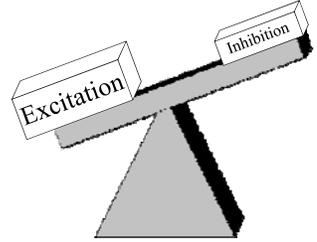
Clinical Syndromes of the CNS

Too much inhibition = Sedation/coma



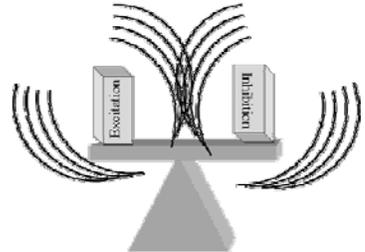
Clinical Syndromes of the CNS

Too much stimulation = Convulsions

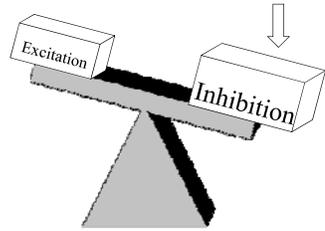


Clinical Syndromes of the CNS

Altered Modulation of Thoughts = Hallucinations



Clinical Syndrome: Sedation



Ethanol Intoxication: A Prototype for Calmatives

- Dose-Response
 - The more you drink, the drunker you get
 - 1 beer: buzz
 - 2 beers: intoxicated
 - 6 beers: uncoordinated, slurred speech,
 - Disinhibited
 - 24 beers: coma, respiratory arrest

Case Study: Moscow Theatre Hostage Crisis (2002)



Case Study: Moscow Theatre Hostage Crisis (2002)



Inhaled Calmatives/Sedatives

- Aerosolized drugs
 - GABAergic agents
 - Benzodiazepine (e.g. diazepam)
 - Barbiturate (e.g. pentobarbital)
 - Opioids
- Volatile agents
 - Hydrocarbons

Calmatives/Sedatives

- Suspect whenever clinical picture presents with predominant CNS depression
 - All produce dose dependent sedation
- Major complication: **RESPIRATORY DEPRESSION**
 - Respiratory depressant effects vary
- Specific Toxic Syndrome: CNS depression, pinpoint pupils, and respiratory depression = Opioid

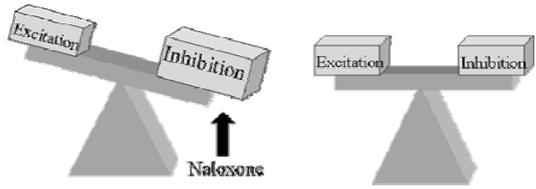
Rapid Recognition leads to Urgent Intervention



Miosis
CNS Depression
Respiratory Depression



Treatment strategy



Management of Calmative / Sedative Poisoning

- Supportive care
- Antidotes for several are available
 - Of limited utility



Audience Response

What is the most important treatment for patients who have respiratory depression?

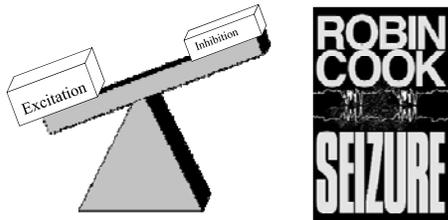
1. Artificial ventilation
2. Chest compressions
3. Naloxone
4. Oxygen

What is the most important treatment for patients who have respiratory depression?

1. Artificial ventilation
2. Chest compressions
3. Naloxone
4. Oxygen
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

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Clinical Syndrome: Convulsions

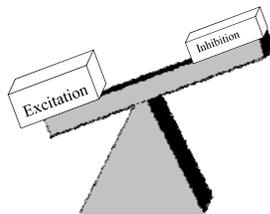


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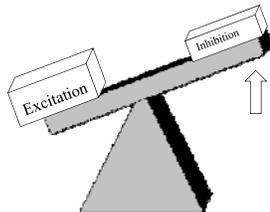
Convulsions

- The brain is a fine balance of excitatory and inhibitory influences
 - Slight alterations in either direction are significant
- “Inhibition of inhibition” is the most common cause of drug induced seizure



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Inhibition of inhibition



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MMWR 2003;52:1992-1994

Poisoning by an Illegally Imported Chinese Rodenticide Containing Tetramethylene Disulfotetramine — New York City, 2002

Illegally imported foreign products can result in domestic exposures to unusual toxic chemicals, and health-care providers might not be able to provide appropriate therapy because the chemical ingredients might not be listed or recognized even after translation of the product label. This report describes the first known case in the United States of exposure to a Chinese rodenticide containing the toxic tetramethylenedisulfotetramine (TETS), a convulsant poison. The report of this investigation highlights the need to promote public poisoning through increased public education, awareness, and action to prevent the importation of illegal toxic chemicals.

On May 15, 2002, a previously healthy female infant aged 15 months living with her family in New York City was found by her parents to be playing with a white rodenticide powder that they had brought from China and applied in the corner of their kitchen. About 15 minutes, the child had generalized seizures and was taken to an emergency department. Her initial blood glucose level was 168 mg/dL (normal range 80–120 mg/dL). Despite aggressive therapy with lorazepam, phenobarbital, and pyridoxine, she had intractable clinical and seizure activity for 4 hours and required intubation.

FIGURE. Package of Chinese rodenticide implicated in the poisoning of a female infant aged 15 months — New York City, 2002



Photo/New York City Poison Control Center

THE NEW YORK TIMES INTERNATIONAL WEDNESDAY, SEPTEMBER 4, 2002

Man Admits Poisoning Food in Rival's Shop, Killing 38 in China

By ERIK SCHWARTZ
MILWAUKEE, Sept. 3 — A 36-year-old man admitted to poisoning food in a rival's shop in Shanghai, a move that led to the deaths of 38 people, police authorities said, and sending hundreds more to the hospital.

The man, whose name was not disclosed, was arrested after the poisoning on Sept. 15. China's Criminal Investigator General said the man had admitted to poisoning 38 people and that the poisoning had occurred in a shop in Shanghai.

The man said he had started a shop in Shanghai, but was forced to close it because of financial problems. He said he had started a rival shop in the same area, and he had poisoned the food in the rival shop to drive it out of business.

The man was arrested on Sept. 15. He was charged with poisoning and murder. He is being held in custody in Shanghai.

The man's name was not disclosed. He is being held in custody in Shanghai.





Tetramine

- Du-shu-qiang (“very strong poison”)
- Used as a rodenticide in China
 - Banned in 1984
- Like many substances used as rodenticides, tetramine is highly toxic to humans



Rat Poison

61 students felled by rat poison in central China

www.21century.com.cn 2008-09-28 11:21:03

BEIJING, Sept. 28 (Xinhua) -- Dozens of elementary school students and teachers in Hunan Province were hospitalized after ingesting rat poison with their school breakfasts in an apparent deliberate mass poisoning, state media said Sunday.

Sixty-one students from the Changshu Township Center Elementary School were in a hospital in the city of Yueyang, 23 of them in critical condition, said a city spokesman.

Investigators believe poison was deliberately placed in school food but don't have any suspects yet, said the spokesman.

All 317 students and staff who ate breakfast at the school on September 23 were sent to hospitals for checkups after their classmates and colleagues began vomiting and fainting, the Beijing Times newspaper said. People who ate the breakfast complained of head and stomach aches, it said.

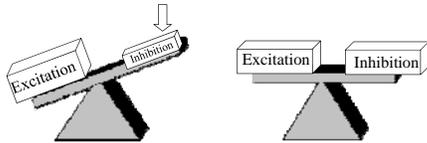


Some Chemical Causes of Convulsions

- Organophosphate & Carbamate Insecticides
- Nicotine
- Hydrazines
- Camphor
- Organochlorines
- Strychnine

Convulsions: Management

- Benzodiazepines
- Barbiturates, propofol
- Pyridoxine
 - Empiric dose, 5 gms (70 mg/kg)



“Playing with Our Mind”

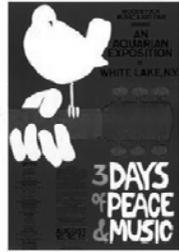


Hallucinogens

- Alter modulation of thought processes
 - Serotonergic
 - Sympathomimetic
 - Anticholinergic
 - Anesthetic (PCP and ketamine)

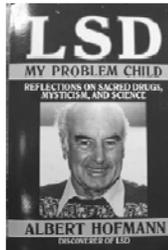
Serotonergic Hallucinogens

- LSD
- Tryptamines (DMT,
- 5-MeO-DMT, psilocybin)
- Ololiuqui (morning glory seeds)



Serotonergic Hallucinogens

- 1968 - The Yippies (Youth International Party)
- Threatened to “space-out” or “turn on” the delegates to the Democratic National Convention in Chicago, and everyone else in Chicago as well, by dumping LSD into Lake Michigan.



Anticholinergic Hallucinogens

Atropine, Scopolamine and Hyoscyamine



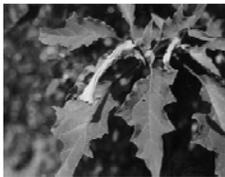
Clinical Effects

- Mad as a hatter
 - Red as a beet
 - Dry as a bone
 - Hot as Hare
 - Blind as a bat
 - Full as a flask
- (Also decreased GI motility)



Modern History

- 1676: a group of men led by Captain John Smith were sent to Jamestown, Virginia to quell the Bacon rebellion.
- Gathered the plant now known as "Jamestown weed" (or Jimsonweed), *Datura stramonium*, for a salad.



Bacon Rebellion

1676, Bacon Rebellion:

The soldiers presented a "very pleasant comedy, for they turned natural fools upon it for several days: one would blow a feather in the air; another would dart straws at it with much fury; and another, stark naked, was sitting up in a corner like a monkey, grinning and making mows at them..... A thousand such simple tricks they played, and after 11 days returned themselves again, not remembering anything that had passed."

Robert Beverly, The History and Present State of Virginia (1705)

Concluding Thoughts

- The CNS is a unique target organ for terrorism
- Limited number of acute clinical consequences
- Management is generally symptomatic although “antidotes” may be available for certain agents.



Questions?
