Phencyclidine:
Dust, Dippers, & Death

Eucen Fu
Los Angeles County
Department of Coroner
18 June 2004
CAT Summer 2004
Objectives

- Basic Understanding of PCP
- Our Method of Analysis
- Our Results
- Interesting Cases
History

- First Synthesized in 1926
- Properties not investigated until 1956 by Parke-Davis
- Animals exhibited anesthetic properties
- Therapeutic index for humans was 5x greater than existing anesthetics
History

- England Patent 836,083
- U.S. Patent 3,097,136
- Serynl – anesthetic in humans
- Post Surgery – Adverse Reactions
History

- 1963 – Discontinued for human use
- Sernylan used as large animal veterinarian tranquilizer until 1979
- Popular street drug “Peace Pill” in S.F. in 1967+
- PCP last legally manufactured in the U.S. 1979
- Canada still uses PCP as an animal tranquilizer?
1-(1-phenylcyclohexyl)-piperidine

- MW: 243.38
- C\textsubscript{17}H\textsubscript{25}N
- pKa = 8.5
- Schedule II
PCP vs. Ketamine

Ketamine similar to PCP
Dissociative Anesthetic
Human and Animal Anesthetic
Schedule III

\[ \text{Ketamine: } C_{17}H_{25}N \]

\[ \text{PCP: } C_{13}H_{16}CINO \]
1-(1-phenylcyclohexyl)-piperidine

- $T_{1/2} = 7-46$ hours (21 hrs)
- $V_d = 5.3-7.5$ L/Kg
- Lipophilic
- Dissociative Anesthetic
- Not classified as Hallucinogen
## Nicknames

<table>
<thead>
<tr>
<th>Nickname</th>
<th>Nickname</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angel dust</td>
<td>Dips</td>
</tr>
<tr>
<td>Elephant</td>
<td>Hog</td>
</tr>
<tr>
<td>Embalming Fluid</td>
<td>Formaldehyde</td>
</tr>
<tr>
<td>Ozone</td>
<td>Rocket fuel</td>
</tr>
<tr>
<td>Super kools</td>
<td>TicTac</td>
</tr>
<tr>
<td>Tranq</td>
<td>Wet</td>
</tr>
<tr>
<td>Sernylan</td>
<td>Sernyl</td>
</tr>
<tr>
<td>Animal Tranquilizer</td>
<td>THC</td>
</tr>
</tbody>
</table>
What does it look like?

Bitter, Oily Liquid

White Crystalline Powder
How synthesized?

- Reagents include:
  - Piperidine, Cyclohexanone, Water,
  - Sodium Meta Bisulfite, Bromo Benzene,
  - Magnesium Turnings, HCl,
  - Sodium Cyanide, Ether

- Grignard Reaction in a well ventilated area
**Tidbits**

- PCC precursor most likely to show up in final product unless another cleanup step
- Usually salt form if solid
- Mostly sold as liquid

(1) PCP, CI-395, Phencyclidine

(2) PCC
Routes of Administration

- Primarily Smoking (1-3 mg)
- Insufflation (1-3 mg)
- Ingestion (2-6 mg)
- IV (1-3 mg)
Routes of Administration

- Initially IV when used as anesthetic
- Then orally as “Peace Pill”
- Nowadays it’s mostly smoked:
  - PCP Crystals sprinkled on MJ
  - MJ Cigarettes dipped in PCP
  - Liquid PCP sprinkled over parsley/mint and then rolled
Dosage

- **Oral**
  - Bioavailability 50-90%
  - 1 mg 2.7-2.9 ng/ml 1.5 hr

- **Smoking**
  - Effects w/in first few minutes
  - 40% of PCP Inhaled, 30% as PC
  - Peak plasma [ ] 5-20 mins
Dosage and Effects

- Avg. high lasts 4-6 hours
- Come down 6-24 hours

- 1-5 mg  Euphoria/numbness (alcohol)
- 5-10 mg  Excited/confused, repetitive motor movements, fever
- >20 mg  Coma/death, respiratory depression
Mechanism of Action

- PCP effects a number of neurotransmitter systems:
  - dopaminergic agonist effects
  - nicotinic and muscarinic cholinergic systems
  - $N$-methyl-$D$-aspartate (NMDA) antagonist effects
  - and noradrenergic and serotonergic neurotransmission

- It exhibits stimulant, depressant, hallucinogenic, and analgesic properties
Pharmacodynamics

Rappolt et al. came up with 3 categories

I: Mild impairment/confusion

II: Deeper psychiatric disturbances and spasms

III: Coma
**Pharmacodynamics**

<table>
<thead>
<tr>
<th>Stage</th>
<th>PCP Level ng/ml</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>&lt;100</td>
<td>4-8 hrs</td>
</tr>
<tr>
<td>II</td>
<td>100-300</td>
<td>Several Hours</td>
</tr>
<tr>
<td>III</td>
<td>&gt;300</td>
<td>12-24 hrs</td>
</tr>
</tbody>
</table>

10 days
Pharmacokinetics

- No controlled pharmacokinetic studies using psychoactive doses have been performed. But abuse has permitted estimation.

- There does not appear a direct correlation between blood PCP concentration and behavior.
Pharmacokinetics

- Liver metabolism – oxidative hydroxylation
- 2 inactive metabolites
- Avg. 77% of IV dose found in urine/feces after 10 days
- Renal clearance of PCP depends heavily on urine pH
DRE Physical Observations

- Horizontal gaze nystagmus
- Vertical gaze nystagmus
- Lack of convergence present
- Pupil size normal
- Reaction to light normal
- Pulse rate elevated
- Blood pressure elevated
- Body temperature elevated
DRE Physical Observations

- Rigid muscles
- Cyclic behavior
- Sudden turn to violence
- Lack of response to painful stimuli
- Blank stare
- Sweating
- Incomplete or delayed verbal responses
Tolerance, Dependence and Withdrawal Effects:

- Tolerance may develop.
- Possibly psychological addicting.
- No physical dependency in humans.
- Upon abrupt discontinuation, physical distress, lack of energy, and depression are reported.
- Long periods of use may lead to memory loss, difficulties with speech and thinking, depression, and weight loss.
OD Treatment

- OD - No antidote
  - Possible 5-10 mg diazepam (IV)
  - Haloperidal or chlorpromazine - Psychosis
  - Monitor airway vs respiratory arrest
  - Body temperature > 105°F
  - Hypertension in 50% cases
  - Violent behavior
Methods of Analysis

- Screening techniques
  RIA, EMIT, ELISA, TLC, etc.

- Confirmation
  SPE vs Liq./Liq.
  GC/MS, GC/NPD, GC/MS/MS, LC/MS, etc.
ELISA Screening

- Immunalysis PCP Direct ELISA Kit
- Tecan Minilyser

- 100 ul sample size diluted 1/10 up to 1 ml

- 2.5 ng/ml = PCP cut off
Extraction Method

- 3-ml sample size
- D₅- Phencyclidine (IS)
- Zinc Sulfate to precipitate
- UCT – DAU SPE columns
- Rinse with Sodium Acetate Buffer, Acetic Acid, MeOH
- Elute w/ Dichloromethane :
  Isopropanol :Trimethylamine
- Reconstitute w/ Ethyl Acetate
Instrument Info.

- Agilent GC/MS 6890/5973
- HP-5 Capillary Col. 15m x 0.25mm x 0.25 μm
- Injector Temp 260°C
- Detector Temp 300°C
- 180°C to 200°C @ 10°C/min
- 200°C to 300°C for burnout
5ng/ml of PCP
+ 67 ng/ml of D5 PCP
Los Angeles County - Department of Coroner - Toxicology

- Analysis: PHENCYCLIDINE ANALYSIS BY GC/MS
- Data File: C:\MSDCHEM\1DATA\PCP\PCP5-14B\9201002.D
- Acq Method: PCP
- Sample Name: 5 NG/ML PCP ANALYSIS BY GC/MS
- Misc Info: 3 ML SPE
- Operator: J. LINTEMOOT
- Acq Date: 14 May 2004 10:23
- Instrument: Trainspot
- Quant Meth: PCP.M
- ALS Bottle #: 92

<table>
<thead>
<tr>
<th>Compound</th>
<th>Q1 Ratio(%) (Acceptable)</th>
<th>Q2 Ratio(%) (Acceptable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D5-PCP</td>
<td>248.0amu 17.4 (15.3-22.9)</td>
<td>191.0amu 10.8 (8.2-12.2)</td>
</tr>
<tr>
<td>PCP</td>
<td>243.0amu 21.6 (19.3-26.9)</td>
<td>186.0amu 25.3 (17.4-26.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compound</th>
<th>Num</th>
<th>Type</th>
<th>R.T. (Acceptable)</th>
<th>Quant Ion</th>
<th>Area</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>D5-PCP</td>
<td>1</td>
<td>istd</td>
<td>2.04 (1.79-2.29)</td>
<td>205.0amu</td>
<td>805942</td>
<td>66.660 NG/ML</td>
</tr>
<tr>
<td>PCP</td>
<td>2</td>
<td></td>
<td>2.05 (1.54-2.54)</td>
<td>200.0amu</td>
<td>58756</td>
<td>5.413 NG/ML</td>
</tr>
</tbody>
</table>
Fatal PCP Levels

- 17 deaths due to acc/intentional ingestion (Baselt 6th ed.)

<table>
<thead>
<tr>
<th></th>
<th>Blood</th>
<th>Liver</th>
<th>Urine</th>
<th>Gastric</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ug/ml</td>
<td>ug/g</td>
<td>ug/ml</td>
<td>mg</td>
</tr>
<tr>
<td><strong>Avg</strong></td>
<td>4.8</td>
<td>23</td>
<td>35</td>
<td>155</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>(0.3 – 25)</td>
<td>(.9-170)</td>
<td>(0.4-120)</td>
<td>(0-840)</td>
</tr>
</tbody>
</table>
### LA Coroner
PCP Summary 2000-2001

<table>
<thead>
<tr>
<th>Mode of Death</th>
<th>No. of Cases</th>
<th>Range</th>
<th>Average</th>
<th>Range</th>
<th>Average (# of Cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homicide</td>
<td>85 *</td>
<td>17-56</td>
<td>29</td>
<td>3.1-870</td>
<td>129 (68)</td>
</tr>
<tr>
<td>Accident</td>
<td>38</td>
<td>0-52</td>
<td>37</td>
<td>1.8-1,070</td>
<td>251 (32)</td>
</tr>
<tr>
<td>Suicide</td>
<td>4</td>
<td>21-30</td>
<td>24</td>
<td>13-498</td>
<td>225 (4)</td>
</tr>
<tr>
<td>Natural</td>
<td>4</td>
<td>35-49</td>
<td>41</td>
<td>38-59</td>
<td>31 (2)</td>
</tr>
<tr>
<td>Undetermined</td>
<td>3</td>
<td>23-44</td>
<td>35</td>
<td>37-84</td>
<td>61 (2)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>134</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: 79 of 85 homicides were due to aGunshot Wound.*

Year 2000: 5,040 Cases received for Toxicological analysis
Year 2001: 5,392 Cases received for Toxicological analysis

Confirmed Positive PCP rate: 134/10,432 or 1.3%
Confirm PCP rate: 104/5,167 or 2.0%
Note: 54 of 57 homicides were due to a GSW
## LA Coroner
## PCP Summary 2003

**Confirmed Positive PCP rate:** 74/5058 or **1.4%**

Note: 40 of 42 homicides were due to a GSW

### Mode of Death

<table>
<thead>
<tr>
<th>Mode of Death</th>
<th>No. of Cases</th>
<th>Age Range</th>
<th>Age Average</th>
<th>Central Blood PCP Levels (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homicide</td>
<td>42</td>
<td>13-58</td>
<td>27</td>
<td>2.9-734</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accident</td>
<td>26</td>
<td>23-53</td>
<td>42</td>
<td>5.5-799</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suicide</td>
<td>4</td>
<td>27-59</td>
<td>41</td>
<td>65-838</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undetermined</td>
<td>2</td>
<td>33-37</td>
<td>35</td>
<td>106-197</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>74</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- Confirmed Positive PCP rate: 74/5058 or **1.4%**
- **Note:** 40 of 42 homicides were due to a GSW
<table>
<thead>
<tr>
<th>Year</th>
<th>Total PCP screens</th>
<th>Positive Samples</th>
<th>% Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>4498</td>
<td>156</td>
<td>3.5</td>
</tr>
<tr>
<td>1999</td>
<td>3435</td>
<td>139</td>
<td>4.0</td>
</tr>
<tr>
<td>2000</td>
<td>2317</td>
<td>133</td>
<td>5.7</td>
</tr>
<tr>
<td>2001</td>
<td>1785</td>
<td>93</td>
<td>5.2</td>
</tr>
<tr>
<td>2002</td>
<td>1895</td>
<td>111</td>
<td>5.9</td>
</tr>
<tr>
<td>2003</td>
<td>2325</td>
<td>92</td>
<td>4.0</td>
</tr>
</tbody>
</table>
# DUI Levels

<table>
<thead>
<tr>
<th></th>
<th>Pearce 1976</th>
<th>Kunsman et al. 1997</th>
<th>LAPD unpublished</th>
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</thead>
<tbody>
<tr>
<td>Range</td>
<td>7 - 240</td>
<td>12 - 118</td>
<td>10 - 118</td>
</tr>
<tr>
<td>Avg.</td>
<td>75</td>
<td>51</td>
<td>58</td>
</tr>
<tr>
<td>Subjects</td>
<td>26</td>
<td>56</td>
<td>28</td>
</tr>
</tbody>
</table>
Case #1 – It ain’t water

- 37 y/o Af. Amer. Male – well nourished
- 171 lbs 71 inches

- 1400 hrs - Friends over for a drink
- 1900 hrs – Wife asked friends to leave
- 0100 hrs – Dec. drove out with friends to smoke
Case #1 – It ain’t water

- 0600 hrs – Friends drag Dec. into house to perform CPR
- Pronounced at Antelope Valley Hospital
- Autopsy
  - Limited
  - Hospital case
- Toxicology
  - Pending H-screen
Case #1 – It ain’t water

- 20 y/o Hx of Alcohol & Drug Abuse
- Supposedly drank 10 40 oz. Malt Liquor (Old English 1800) and a bottle of gin
- Friends saying “Brother Rude, he drank some ‘water’”
Case #1 – It ain’t water

<table>
<thead>
<tr>
<th></th>
<th>PCP</th>
<th>EtOH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ng/ml</td>
<td>g%</td>
</tr>
<tr>
<td>Heart Blood</td>
<td>3,620</td>
<td>0.18</td>
</tr>
<tr>
<td>Femoral Blood</td>
<td>5,900</td>
<td>0.19</td>
</tr>
</tbody>
</table>
Case #1 – It ain’t water

- Mode = Accident
- CoD = Toxicity from Ethanol & PCP
Case #2 - Age don’t matter!

- 78 y/o Hispanic Male
- 150 lbs  65 inches
- Found unresponsive over a vehicle
- Pronounced at Whittier Hospital
Case #2-Age don’t matter!

- Hx of IVDA for heroin
- OD’d on heroin in his early 70’s
- Autopsy
  - Limited
  - Hospital case
- Toxicology
  - Pending
Case #2-Age don’t matter!

<table>
<thead>
<tr>
<th></th>
<th>PCP ng/ml</th>
<th>Amp. ug/ml</th>
<th>Meth. ug/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Blood</td>
<td>ND</td>
<td>0.03</td>
<td>0.55</td>
</tr>
<tr>
<td>Urine</td>
<td>8.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Case #2-Age don’t matter!

- Mode = Accident

- CoD = Atherosclerotic cardiovascular disease
Case #3 – Flunking Lab

- 45 y/o & 36 y/o Af. Amer Males
- 231 lbs 248 lbs
- 72 inches 73 inches
Case #3 – Flunking Lab

- Overcome by fumes in evening
- Hosed down
- Dropped off at hospital
- Pronounced dead
Case #3 – Flunking Lab

- Autopsy
  - Slightly sweet aromatic odor
  - Feeling dizzy

- Toxicology
  - Pending C-screens & Volatiles - Ether
Case #3 – Flunking Lab

- Both decedents had ethyl ether in their blood
- Both had PCP
- Case Hx suggested PCP synthesis gone bad
- Looked for cyanide
### Case #3 – Flunking Lab

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>PCP (ng/ml)</th>
<th>EtOH (g%)</th>
<th>Ethyl Ether</th>
<th>Cyanide (ug/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart</td>
<td>5.5</td>
<td>0.12</td>
<td>+</td>
<td>1.7</td>
</tr>
<tr>
<td>Femoral</td>
<td>0.09</td>
<td>+</td>
<td>QNS</td>
<td></td>
</tr>
<tr>
<td>Vitreous</td>
<td>+&lt;5.0</td>
<td></td>
<td></td>
<td>ND</td>
</tr>
<tr>
<td>Urine</td>
<td>+&lt;5.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

45 y/o

**Case #3**

- **Patient Age:** 45 y/o
- **Substance:** PCP, Etoh, Ethyl Ether, Cyanide
- **Results:**
  - Heart: PCP 5.5 ng/ml, Ethanol 0.12 g%, Ethyl Ether +, Cyanide 1.7 ug/ml
  - Femoral: PCP 0.09 ng/ml, Ethanol +, Ethyl Ether +, Cyanide QNS
  - Vitreous: PCP +<5.0 ng/ml, Ethanol, Ethyl Ether, Cyanide ND
  - Urine: PCP +<5.0 ng/ml, Ethanol, Ethyl Ether, Cyanide
# Case #3 – Flunking Lab

**36 y/o**

<table>
<thead>
<tr>
<th></th>
<th>PCP</th>
<th>Etoh</th>
<th>Ethyl Ether</th>
<th>Cyanide</th>
<th>Coc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ng/ml</td>
<td>g%</td>
<td>ug/ml</td>
<td>ug/ml</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart</td>
<td>72</td>
<td>0.12</td>
<td>+</td>
<td>2.7</td>
<td>0.11</td>
</tr>
<tr>
<td>Femoral</td>
<td>0.2</td>
<td>+</td>
<td>3.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Case #3 – Flunking Lab

- Mode = Accidental Deaths

- CoD = Cyanide Toxicity
Case #4: “Hannibal”

- Gruesome Homicide of a 21 y/o Af. Amer. Female
- The Cast:
  - Antron “Big Lurch” Singleton
  - Tynisha Ysais
  - Thomas Moore
  - Alisa Allen
  - “Doc”
# Forensic Medical Report: Sexual Assault Suspect Examination

**State of California**
**Office of Criminal Justice Planning**

**OCJP 950**

**Confidential Document**

## A. General Information
- **Name of Medical Facility:**
- **Name of Patient:**
- **Patient ID Number:**
- **Address:**
- **City:**
- **County:**
- **State:**
- **Telephone:**
- **DOB:**
- **Gender:**
- **Ethnicity:**
- **Date/time of arrival:**
- **Date/time of discharge:**

## B. Authorization
- **Jurisdiction:**
- **Agency:**
- **Inmate ID:**
- **Telephone:**
- **Date:**
- **Time:**
- **Name:**
- **Security Officer Signature:**

## C. Medical History
1. **Any recent 90 days anal/genital injuries, surgical procedures, or medical treatment that did affect the interpretation of current physical findings?**
   - **Yes**
   - **No**
   - **If yes, describe:**
2. **Any other medical condition(s) that may affect the interpretation of current physical findings?**
   - **Yes**
   - **No**
   - **If yes, describe:**

## D. Recent Hygiene Information
- **Unshaved:**
- **Dentures:**
- **Genital or body waxes:**
  - **If yes, describe:**
- **Oral/ganglion:**

## E. General Physical Examination
1. **Blood Pressure:**
2. **Pulse:**
3. **Respiration:**
4. **Temperature:**
5. **Height:**
6. **Weight:**
7. **Hair Color:**
8. **Eye Color:**
   - **Right-handed**
   - **Left-handed**

## Distribution of OCJP 950
- **Original - Law Enforcement**
- **Copy within evidence kit - Crime Lab**
- **Copy - Medical Facility Records**

---

**SCA:**

---
Victim’s Results

- Assaulted with multiple instruments
- Major trauma to the face and torso
- Lungs were eaten
- Spermatozoa was detected but not profiled from female sexual assault kit

PCP

- Heart Blood 6.2 ng/ml
Defendant’s Results

Arrested 4/10/02 ~1300 hrs

PCP
ng/ml

Sampled 4/11/02 1115 hrs Blood 10

Samples 4/11/02 2245 hrs Urine 26
The Ruling

June 25, 2003

- Two-week trial, the five-man, seven-woman jury found Antron Singleton, 26, guilty of first-degree murder and guilty of aggravated mayhem and also found true the special circumstance of inflicting torture on the victim.
Sanity?

July 1, 2003

- Compton Superior Court judge issued a directed verdict of **sane**
- Under state law passed in 1993-94 (Section 25.5 of the California Penal Code), a defendant may not use a defense of not guilty by reason of insanity if the mental illness is caused by drug addiction or drug abuse.
Conclusions

- Involved in violent/traumatic deaths
- Mechanism of action not well understood
- PCP is still an abused drug
Acknowledgements

- Dr. Paul Gliniecki
- Drew Josfan
- Todd Swanton
- Coroner – Lab Personnel
References

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