



Retrospective Study of Phencyclidine (PCP) Incidence in Cleveland, Ohio in Driving Under the Influence of Drugs (DUID) and Homicide Cases



Katherine A. Turner, BS^{2*}, Eric S. Lavins, BS¹, Rindi N. Rico, BS¹, Claire K. Naso-Kaspar, BS¹, Harold E. Schueler, PhD¹, Paula D. Wallace¹, Thomas P. Gilson, MD¹

¹Cuyahoga County Regional Forensic Science Laboratory, Toxicology Department, Cuyahoga County Medical Examiner's Office, Cleveland, OH.

²Department of Chemistry, Cleveland State University, Cleveland, OH.

Abstract

After attending this presentation, attendees will have a better understanding of the frequency and demographics of Phencyclidine (PCP) related cases seen at the Cuyahoga County Medical Examiner's Office (CCMEO) in Cleveland, Ohio from 2006-2014.

This presentation will impact the forensic community by informing forensic professionals about a subset of PCP positive DUID cases and homicides characterized by PCP use prior to death in the City of Cleveland.

Originally developed as a surgical anesthetic in the 1950s, PCP (1-(1-phenylcyclohexyl) piperidine) was effective due to its ability to enter patients into trance like or "dissociative" states. However, due to negative side effects, its use as an anesthetic was discontinued. Today, PCP is a Schedule II drug causing behavioral responses that range from hallucinations to disorientation, severe manic states, increased pain threshold and overall mimics symptoms of schizophrenia. Research has linked PCP use with generally violent and aggressive behavior, including self-injury, aggressiveness towards others and lack of driving competency. While the PCP abuse decades of the 1980's and 1990's have waned, Drug Abuse Warning Network (DAWN) data indicates an increase of PCP related emergency room visits by more than 400% between 2005 and 2011. Here we evaluate the incidence of PCP in Cuyahoga County in both antemortem DUID cases and postmortem cases seen at CCMEO.

The cases in which PCP was positively identified by toxicological analysis between 2006-2014, were gathered and analyzed by means of a statistical package included in CCMEO's Pathways[®] program. From here we analyzed both antemortem DUID and postmortem cases, in which a matrix, urine or blood was screened by ELISA or EMIT and then confirmed by GC/MS. Antemortem samples were submitted by local police departments for cases of DUID in which the suspect was pulled over for erratic driving. Postmortem cases involving PCP positive toxicology results were assessed for cause of death, decedent demographics, location of death and polysubstance abuse.

Out of the total PCP positive cases for the nine-year period, 68.50% were DUID cases and 31.50% were postmortem cases. Specifically, the incidence of PCP positive DUID cases has increased five-fold over the last nine years with 1.04% PCP positive cases in 2006 compared to 5.42% for 2014. Within these DUID cases the blood PCP concentration range was 0.01-0.18 mg/L with a median value of 0.05 mg/L. Polysubstance abuse occurred in 85.4% of the DUID cases. The most co-consumed drug of interest were cannabinoids (THC), present in 40.00% of the DUID cases followed by ethanol, 21.95% and cocaine, 12.68%.

Postmortem cases positive for PCP were analyzed for cause of death. Homicides made up 47.19% of the total postmortem PCP cases, followed by other causes of death such as overdoses from acute intoxication of PCP or from other drugs such as heroin, 17.98% and suicides, 12.36%. The most significant finding was the large number of homicides involving PCP positive decedents. Relative to the total homicide cases seen at CCMEO, on average PCP positive homicides make up 3.31% with a maximum of 6.99% in 2012 cases. Within the PCP positive homicides, 90.48% involved black males, 7.14% black females and 2.38% white males. 85.71% were single with a median age of 31 years old. 86.49% of these homicides occurred within the City of Cleveland, the other 13.51% in the suburbs. The blood PCP concentration range was 0.05-0.5 mg/L with a median value of 0.16 mg/L. Further toxicological analysis shows that 73.1% of the cases also tested positive for other drugs of interest. Ethanol was present in 53.66% of the homicide cases followed by THC, 46.34% and cocaine, 14.63%.

Post-evaluation of the circumstances of PCP incidence in Cuyahoga County, has revealed a subset of homicide decedents that involve urban black males in their early thirties that have consumed PCP along with other drugs such as marijuana and/or cocaine prior to death. PCP related DUID cases also rose in that nine-year period. While the relationship of PCP use and aggressive or reckless behavior is not well defined, this epidemiological study shows the association between PCP usage and violent crimes such as homicide and potentially dangerous driving. Perhaps this data can shed light PCP usage in Cuyahoga County, raising awareness about the association between PCP use, homicide incidence and DUIDs.

Introduction

- ❖ Phencyclidine
 - 1-(1-phenyl-cyclohexyl)piperidine
 - Angel dust
 - Animal tranquilizer
- ❖ Schedule II drug
 - High potential for abuse
 - May lead to severe psychological or physical dependence
- ❖ First developed as dissociative general anesthetic in the early 1950s
 - Discontinued in 1965
- ❖ Appeared as a street drug in the 1960s
- ❖ Grew into an epidemic in the 1970s
- ❖ Due to the availability of crack cocaine, PCP abuse waned only to resurge in the 1980s, localized to metropolitan areas such as Philadelphia, New York City, Detroit and Chicago
- ❖ The Drug Abuse Warning Network (DAWN) reports 400% increase in PCP related ED visits between 2005-2011
- ❖ PCP users reported the following feelings after use
 - Dissociation
 - Strength
 - Power
 - Invulnerability
 - Acute psychoses
- ❖ Research has linked PCP use with
 - Generally violent and aggressive behavior
 - Self-injury
 - Aggression towards others
 - Decreased coordination leading to driving incompetence
 - Driving on wrong side of the road
- ❖ PCP Effects Neurotransmitters
 - Increase release and inhibits the reuptake of catecholamines
 - Dopamine
 - Norepinephrine
 - Serotonin
 - Blocks NMDA receptors
 - Decrease nerve firing
 - Binds opioid receptors
 - Induces hallucination

Methods

Cases:

- ❖ All cases testing positive for PCP during 2006 to 2014 were identified through a Toxicology Database (Pathways[®]) at the Cuyahoga County Medical Examiner's Office, Cleveland, OH.
- ❖ PCP positive cases were subdivided into antemortem DUID cases and postmortem cases.
- ❖ All PCP positive cases accepted for this study were further analyzed to gather data on various demographics (i.e. gender, age, incidence location), cause and manner of death, trends in incidence, PCP blood concentrations and polysubstance abuse.

Toxicological Analyses:

- ❖ All cases were screened for PCP using either an ELISA (Blood) or EMIT (Urine).
- ❖ Positive PCP screens were confirmed by GC/MS.

Results

Table 1: Total PCP Positive Cases

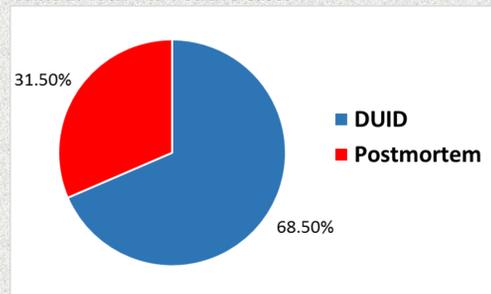


Table 2: DUID Cases Incidence Trend

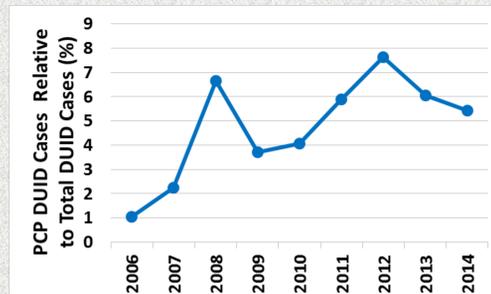


Table 3: Postmortem PCP Positive Cases Manner of Death

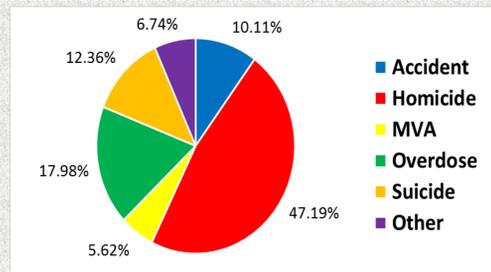


Table 4: Homicide Cases Incidence Trend

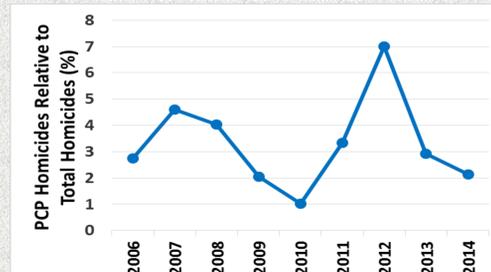


Table 5: Homicide Demographics

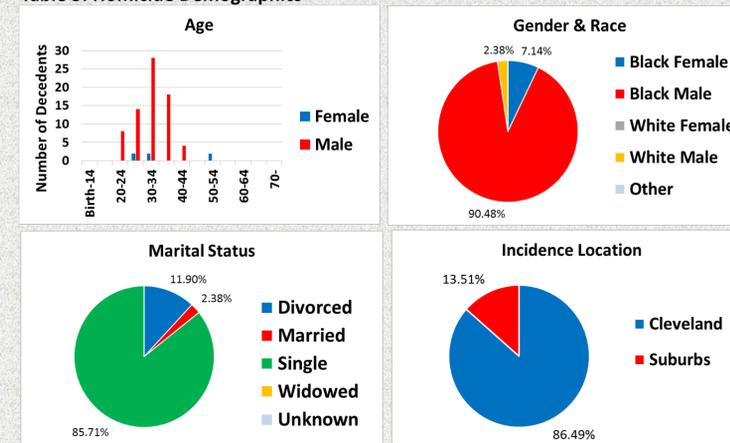
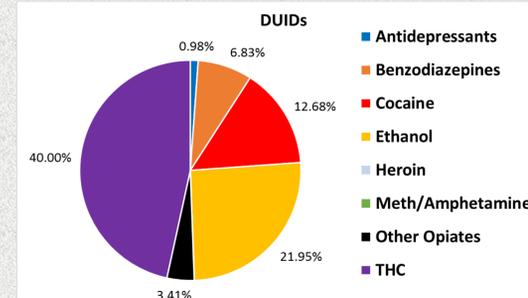
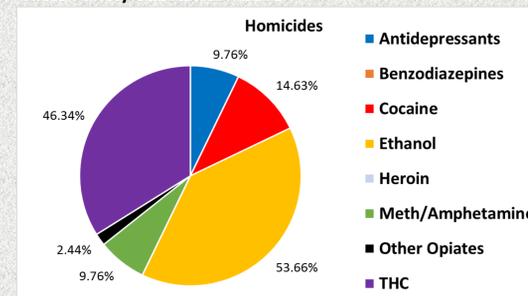


Table 6: PCP Blood Concentrations

	Range (ng/mL)	Median (ng/mL)	Average (ng/mL)
DUID	10-180	50	60
Homicides	50-500	160	190

Table 7: Poly-Substance Abuse



Conclusions

Evaluation of CCMEO cases involving PCP between 2006-2014 reveals:

- ❖ A significant subset of PCP positive homicide decedents
 - Involving urban black males in their early thirties
- ❖ Rise in PCP positive DUID cases
 - Five-fold over the last nine years
- ❖ Higher PCP blood concentrations in the homicides cases compared to DUID cases
 - Homicides with a median value of 0.16 mg/L
 - DUID with a median value of 0.05 mg/L
- ❖ Polysubstance abuse occurred in both antemortem and postmortem cases
 - Most abused drugs of interest were THC, ethanol and cocaine
- ❖ Results correlate with previous studies associating PCP use to violent and/or reckless behavior
- ❖ Hopefully, this study will shed light on PCP usage
 - Raising awareness to the public and law enforcement
 - Resulting in a safer Cuyahoga County

References

1. Brenner S. PCP toxicity. <http://emedicine.medscape.com/article/1010821-overview>. Updated 2014.
2. Crane CA, Easton CJ, FAU - Devine S, Devine S. The association between phencyclidine use and partner violence: An initial examination. - *J Addict Dis.* 2013;32(2):150-7. doi: 10.1080/10550887.2013.797279. (1545-0848)
3. Hoaken PN, Stewart SH. Drugs of abuse and the elicitation of human aggressive behavior. - *Addict Behav.* 2003 Dec;28(9):1533-54. (0306-4603 (Print); 0306-4603 (Linking)).
4. Koseki T, Nabeshima T. [Phencyclidine abuse, dependence, intoxication, and psychosis]. - *Nihon Rinsho.* 2010 Aug;68(8):1511-5. (0047-1852 (Print); 0047-1852 (Linking)).
5. Lowry PW, Hassig SE, FAU - Gunn RA, Gunn RA, FAU - Mathison JB, Mathison JB. Homicide victims in New Orleans: Recent trends. - *Am J Epidemiol.* 1988 Nov;128(5):1130-6. (0002-9262 (Print); 0002-9262 (Linking)).
6. Mozayani A. Phencyclidine-effects on human performance and behavior. 2003. - *Addict Behav.* 1989;14(4):465-72. (0306-4603 (Print); 0306-4603 (Linking)).
7. McCordle L, Fishbein DH. The self-reported effects of PCP on human aggression. - *Addict Behav.* 1989;14(4):465-72. (0306-4603 (Print); 0306-4603 (Linking)).
8. National Highway Traffic Safety Administration. Drugs and human performance FACT SHEETS-phencyclidine (PCP). 2006.
9. Poklis A, Graham M, FAU - Maginn D, et al. Phencyclidine and violent deaths in St. Louis, Missouri: A survey of medical examiners' cases from 1977 through 1986. - *Am J Drug Alcohol Abuse.* 1990;16(3-4):265-74. (0095-2990 (Print); 0095-2990 (Linking)).
10. Substance Abuse and Mental Health Services Administration (SAMHSA). The DAWN report: Emergency department visits involving phencyclidine (PCP). 2013. (Electronic); 1055-0887 (Linking).
11. Substance Abuse and Mental Health Services Administration (SAMHSA). PCP-related emergency department visits rose 400 percent over six years. 2013.

Acknowledgements

The authors would like to acknowledge the cooperation of the Cuyahoga County Medical Examiner's Office for providing the facilities for the work and the help from everyone in the Toxicology department at CCMEO especially Eric Lavins and Claire Kaspar and Kate Snyder from Photography for all their support.

