Chapter 6

Phencyclidine and Ketamine Intoxication: A Study of Four Populations of Recreational Users

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The time is 1926. In his laboratories at the University of Chicago psychologist Heinrich Kluver is just beginning the first experimental studies of the hallucinogen mesacaline. Derived from the peyote cactus which had been used by indigenous Indians throughout the New World for thousands of years, mescaline had only recently been isolated and synthesized, and was rapidly capturing the attention of researchers in Germany. But before this "classic" hallucinogen was fully investigated, other newer ones were being developed. Elsewhere in Germany, Kotz and Merkel (1926) had just reported the chemical groundwork for the preparation of a new compound, phencyclidine.

The time is 1959. Chen and his colleagues at the Research Laboratories of Parke, Davis and Company in Detroit have just "discovered" phencyclidine and observed its anesthetic effectiveness in animals. That announcement added one more drug to the rapidly growing list of psychoactive compounds, both natural and synthetic, which affect behavior. Yet science was just beginning to dwelop techniques for studying the effects of drugs on behavior. That year witnessed the publication of a new journal, Psychopharmacologia, officially announcing the pursuit.

It is now 1978. With such an evolutionary, albeit natural, lag between the emergence of a new drug and its scientific investigation, it is not surprising that today, a generation after phencyclidine's discovery, those people born when the drug was first developed are using and exploring its psychoactive properties while scientific investigations still lag behind. Nonetheless, reports fromuserswho first experiment with and experience the drug effects (the street drug users) provide a rational basis for the questions which researchers must ultimately attempt to ask and answer. Kluver's original studies of mescaline were based upon and guided by reports from people using the drug at that time. Similarly, present day studies of phencyclidine and its derivatives may be helped by examination of the patterns of use and intoxicationin contemporary nonmedical users. It is in this spirit that the following studies with phencyclidine and its derivative ketamine were conducted.

Phencyclidine and ketamine are chemical compounds known as aryl-cyclohexylamines. While many psychoactive drugs can be easily classified as either stimulants, depressants, or hallucinogens, the arylcyclohexylamines defy convenient classifications as they appear to have mixed excitatory, sedative, cataleptoid-anesthetic, and hallucinatory properties. The major questions concerning the use of these compounds by man are: (1) Why do humans initiate use of arylcyclohexylamines? (2) Why is such use maintained? and (3) What are the consequences of such continued use? These questions are addressed in this chapter. It will be presently seen that the psychological intoxication resulting from aryl-cyclohexylamines is a primary reason for their continued use. The nature and extent of thisintoxicationin several groups of contemporary users Will also be explored. Furthermore, it will be shown that the phenomenology of intoxication with these compounds warrants their classification as true hallucinogens.

I. PHENCYCLIDINE

STREET DISCOVERY AND INITIAL USE

Phencyclidine (PCP) or 1-(1-phenylcyclohexyl) piperidine hydro-chloride was first reported in the context of nonmedical street use in the Haight-Ashbury district of San Francisco in 1967. At that time the drug was marketed as the PeaCe Pill or PCP (an abbreviation of the complete chemical name). While the Haight-Ashbury Free Medical Clinic reported that "use of the drug.... virtually ceased" by early 1968, it has remained consistently available under a wide variety of names. Such names include Hog, Angel Dust, Dust, Crystal, Crystal Joints, CJ, KJ, Peace, Peace Weed, Supergrass, Superweed, Rocket Fuel, Elephant Tran-quilizer, Horse Tranks, Sheets, Seams, Surfer, Snorts, Scuffle, Cadillac, Cyclones, Sana, Mist, and Goon (cf. Perry 1975). Other more recent common names include Amoeba, Angel Hair, DOA (dead on arrival), Killer Weed, and Synthetic Marihuana (Young et al. 1977). This author has also doctumented the terms Lovely, Lovely High, and Super Kools. PCP is also the most prevalent drug in misrepre-sented street drugs (Perry 1977) and has recently appeared under the names THC, psilocybin, mescaline, and other hallucinogens Which are rarely available in pure form on the illicit market.

Cases of adverse reactions, unpleasant subjective experiences, poisoning, and prolonged psychoses are well known (e.g., Liden, Lovejoy, and Costello 1975; Rainey and Crowder 1975) and have probably attenuated some street use since 1971. However, the low costof PCP and its ease of production have contributed to its reappearance on the street (Burns and Lerner 1976). Indeed, one gram of PCP can make more than 24 "street joints" and doses as low as 3 mg are behaviorally effective. PCP's subjective effects include distortions in body image, hallucinations and dissociation. There can also be a preoccupation with death or death-related thoughts (meditatio mortis) and this has been

the basis for numerous criminal defenses of diminished capacity (see "Phencyclidine, Criminal Behavior, and the Defense of Diminished Capacity," this volume). The prolonged and fluctuating effects are believed to be due to PCP's affinity for adipose tissue, its slow release from such tissue, and its subsequent selective uptake by brain tissue (Bums and Lerner 1976). Some adverse reactions are believed to be caused by related compounds TCP (1-(1-2-thienylcyclohexyl) piperidine) , and PCC (1-piperidinocyclohexanecarbonitrile), often produced in illicit syntheses. Related compounds such as PHP, which is 1-(1-phenylcyclohexyl) pyrrolidine, may also contribute to adverse reactions.

Nonetheless, users initially experiment with the drug primarily out of a curiosity about it and a desire to experience the anticipated drug effects of tranquilization, dissociation, and hallucinations. More often than not, initial use of PCP comes about as a result of users self-administering what they believe to be THC, psilocybin, or some other alleged drug. In these latter instances, PCP is often combined with LSD.

MAINTENANCE OF USE

The street users' initial encounters with PCP would have brought them into contact with both the unpleasant and pleasant effects of the drug. Independent of adverse reactions and even "schizophrenomimetic" or "psychotomimetic" effects, many users found the drug to have highly reinforcing properties. Indeed, the preclinical animal literature is rich with examples of PCP's powerfully psychoactive and reinforcing effects (Balster and Chait 1976), and PCP represents one of the only hallucinogens that monkeys will reliably self-administer. While it is difficult to determine the unique properties that reward such animal behavior, the euphoria, inebriation, and hallucinatory effects are undoubtedly responsible for maintaining PCP use in man. The effects can be interpreted as a state of intoxication with high reinforcement potential. While many nonpharmacological factors (e.g., easy and inexpensive illicit synthesis) may affect man's use of a drug such as PCP, psychological intoxication appears to be the primary reinforcing effect.

These PCP intoxications can vary greatly among users. Pollard, Uhr, and Stern (1965) examined the effects of 10 mg (p.o.) in a modified sensory deprivation situation. One of their college student subjects described a typical experience marked by a preoccupation with abnormal bodily sensations, lack of visual imagery, and marked feelings of depersonalization:

> I feel like I can't think anything even. And I can't express myself even if I can think because it's hard for me to talk. My lips are numb. It's so uncomfortable. My perception is very bad. Nothing is clear . . . . My mind is just a complete blank....I have such a strange feeling. I can't explain it. Like I'm still asleep, yet I'm not asleep. I'm awake (pp. 89-90).

Other subjects in this study described these sensations as "I feel dissociated with the world" (p. 131) and "I feel dead" (p. 134). Luby and co-workers (1959) administered 1 mg/kg, i.v., to normal subjects who reported body image changes, estrangement, disorganization of thought, negativism and hostility, drowsiness and apathy, hypnagogic states, feelings of inebriation, and repetitive motor behavior.

These authors described the hypnagogic states as resembling pseudohallucinations wherein subjects "reported feeling as though they were in some specific setting and were able to describe it in detail. While the reports typically had reference to past events, they were expressed as though the experiences were taking place at the moment. The lack of time-boundedness was reminiscent of dreaming. As in dreams, multiple shifts occurred in the settings experienced by the subjects, sometimes in rapid succession" (p. 366). Sometimes the subjects reported euphoria and feelings of inebriation: "When it occurred, the subjects would often smile vacuously and compare their feelings to those resulting from several Martinis" (p. 366).

Most users have difficulty in describing this intoxication and simply report a state of oblivion and fantasy. Perry (1975) summarizes some of the psychological effects of this state:

> The high continues for 4-6 hours, during which time the user often becomes very talkative, having sincere and sympathetic conversations, usually with others similarly intoxicated. This gradually develops into a state of mild depression as the high wears off; the person is irritable, feels isolated and sometimes paranoid. These users generally require 24-48 hours to completely return to what they consider normal (p.2).

Many users find the experience a positive one and emphasize the rewarding aspects of the same symptoms that other users cite as negative. Consider the following account provided by one of the author's respondents:

> Immediately after smoking the Dust (PCP) I started experiencing the effects. All my troubles seemed to go away. I felt a little drunk and had some trouble walking around the apartment. Objects appeared either very far away or very close and I couldn't really judge distance at all. This reminded me a lot of Acid (LSD). I closed my eyes for a while but didn't see much more than a few colored geometric patterns. Not nearly as trippy as other psychedelics, but it was clearly a psychedelic. I liked being apart from things, and felt outside my body for most of the trip. That was fun. Before I smoked I had been troubled about some exams coming up and felt I wasn't really prepared. All that anxiety vanished with the

> Dust. I even looked at my books and work but couldn't get excited about it. I felt at peace. It was a good feeling. When I started coming down, I felt sad that I was leaving such a lovely place. I think I even cried. I hadn't done that in years. But most of all, I remember the peace and tranquility. Everything was good. I want to be there always. That's why I like to call Dust PPP - Perpetual Peaceful Place.

Recent studies of phencyclidine users are beginning to uncover an increased occurrence of these pleasurable and positive effects among those who continually self-administer the drug. For example, Walters (1978) has studied a group of multiple drug users in Philadelphia, primarily intranasal PCP users, and found that PCP use is rarely involved with PCP-related emergencies or clinical crises:

> Our respondent population is small, somewhat transient and currently just under 50 youths ranging in age from 14 to 24 years, divided about evenly between males and females. Of these, 34 have some history of PCP use, with 15 of them using it between five and 10 times per week. Finally their histories of PCP use range from between one and seven years, with three years' use being average. Yet by far, most of the drug-using youths with whom we have had contact are not dulled, depressive, anomic bundles of pathology described in the literature and the media. Rather, they are bright, level-headed and stable and eager and willing to experience life, including drugs that are a part of that life (p. 9).

Stickgold (1977) has recently commented on the emergence of PCP as a drug of choice among may users. He describes this population of users:

> Those who are today using PCP, tend to come from a different place, both socio-economically and in their drug-taking behavior. Rather than the middle class seekers of the new sensate worlds to explore, PCP is, today, becoming the drug of choice of the lower class oppressed minority group member seeking an escape from persecution. In the past s/he has found this escape in other depressant drugs such as heroin and barbiturates. Today PCP not only provides that escape, but also produces a degree of increased awareness that is different enough to be interesting, and mild enough not to be too frightening (p. 2).

CONSEQUENCES OF CONTINUED USE

Despite the obvious negative effects, and the apparent attractiveness of the positive effects, the consequences of continued

phencyclidine use are still largely unknown. The rather prolonged recovery time from acute intoxication, sometimes lasting as long as 15 days (Burns and Lerner 1976), confuses the issue of long-term effects. In addition, the persistent psychoses seen in a very small number of cases (Burns and Lerner 1976; Fauman et al. 1976) may represent either a psychopharmacological effect from the drug or an individual sensitivity to it. Nonetheless, most investigators agree that these psychiatric sequelae of continued phencyclidine use can be serious and represent classic schizophrenic symptoms. With still other chronic users, there is both preclinical (e.g., Balster and Chait 1976) and clinical (e.g., Burns and Lerner 1976) evidence to suggest tolerance to the psychological effects of phencyclidine requiring use of increasing doses. Psychological dependence, albeit not physical addiction, appears prominent among long-term users.

Recently, Ashley (1978) has commented on the consequences of continued use among PCP users or "peepheads":

> Chronics users clearly enjoy PCP and experience it in a positive way. . ..Most say it takes a few days to return to normal, but many of them don't bother to and use the drug every day.... (they) almost always complain of being spaced and worry about turning into 'vegetables'. They are noticeably depressed when not high, so much so that some have committed suicide at this point. Serious accidents are commonplace among users. Almost all report having been in an automobile accident or knowing someone who was, while on PCP. Falls are common, even off cliffs or out of boats and windows. Impairment of motor and sensory functions makes many normal physical activities dangerous (p. 64).

VARIABLES AFFECTING USE AND INTOXICATION

The precise description of the state of phencyclidine intoxication requires information about concomitant variations between the characteristics of the behavior and the drug (cf. Siegel 1977a). Information about the behaviors should be specific with-respect to individual variability, type of behavior and behavioral history. Information about the drug should be specific with respect to dose, adulterants, routes of administration, dose-response and time-response relationships, among others. Such variables can be further modified by environmental variables such as set and setting. While a full understanding of these interactions is presently restricted by limited knowledge concerning arylcyclohexylamines, the presence of such a myriad of interacting variables should temper a desire to simplify use and intoxication with succinct labels such as "lovely high," "perpetual peaceful place," "psychotic," or "schizophrenomimetic." The studies described below were undertaken in an attempt to elucidate some of these variables in relation to the psychological intoxication.

THE SAMPLE

A large population of recreational drug users, recruited through advertisements in several Los Angeles area newspapers, was initially screened. by a telephone interview and a subsequent drug history questionnaire. A total of 319 phencyclidine users (referred to as Adult Group) were eventually selected for study. All subjects in the sample met the initial requirement of having used PCP more than once in the last year. All subjects were male, 21-38 years old, and were examined and tested in the Neuropsychiatric Institute at UCLA. Examination procedures included a personal history questionnaire, drug history questionnaire, mental status examination, Minnesota Multiphasic Personality Inventory (MMPI), Experiential World Inventory (El-Meligi and Osmond 1970), in-depth interview, physical examination (for most subjects) and visual imagery and perception tests.

One additional group of chronic PCP subjects was also recruited for study. This latter group (referred to as Juvenile Group) consisted of 20 juvenile males, 14-17 years of age, who were initially referred to the author for evaluation by the courts or law enforcement officials. All subjects in this sample met the initial requirement of having used PCP at least once per week for the previous 6 months.

MULTIPLE DRUG USE

All subjects in the Adult Group had past or present histories of multiple drug use. Concomitant with their use of PCP, 86 percent were using caffeine preparations; 81 percent were using alcohol; 81 percent were using cannabis preparations: 62 percent were using hallucinogens other than cannabis; 58 percent were using tobacco products; and 20 percent were using cocaine, amphetamine and other stimulants. Prior to their PCP use, subjects reported experiences with barbiturates (11 percent), tranquilizers (10 percent), and opiates (2 percent).

All subjects in the Juvenile Group had past or present histories of multiple drug use. Concomitant with their use of PCP, 100 percent were using caffeine preparations (mostly cola beverages and chocolate); 40 percent were using alcohol: 40 percent were using cannabis preparations: and 15 percent were using barbiturates. Prior to their PCP use, some subjects (20 percent) reported experiences with stimulants while one (5 percent) used heroin intranasally. Interestingly, none of the Juveniles had tried hallucinogens other than cannabis, while 16 (80 percent) had used volatile solvents in the past.

PREPARATIONS AND PURITY

All subjects used PCP in the form of either tablets, capsules, powders, botanical mixtures, or liquids. It should be noted that Helisten (1977) has reported that 88 percent of street THC samples contain either PCP, PCP and PCC, or PCP and other drugs. Almost

5 percent of street THC samples are combinations of TCP and PCC. Since these are all arylcyclohexylamines, whenever subjects in these studies reported use of street THC, it was recorded as PCP use. Lundberg, Gupta, and Montgomery (1976) have identified the quantitative and qualitative aspects of street PCP in the Los Angeles area. They report that tablets contained 1.0-6.4 mg each (mean of 5.3 mg); powder averaged 88-100 percent PCP; botanical leaves (usually mint or parsley leaves) varied from 0.2-7.9 percent; and prerolled cigarettes ranged from 1.0-3.0 mg total for each cigarette. Another street drug assay laboratory in California (PharmChem, Palo Alto) has found some parsley "joints" of PCP containing from 3.2-28.3 mg of PCP (Perry 1975). The most common adulterants for samples received by these laboratories are LSD and TCP. Recently, NIDA (DuPont 1977) has noted that street preparations of PCP may be combined with other psychoactive drugs including heroin, cocaine, methaqualone, methylenedioxamphetamine (MDA), aspirin, and caffeine. Liquid forms of PCP are usually diverted licit vials of Sernylan (formerly called Sernyl, phencyclidine hydrochloride, from Bio-Ceutics Laboratories in Missouri). These vials are usually 10 ml each with each ml containing either 20 or 100 mg. Illicit PCP in liquid form is often seen in small "cokevials" or similar glass bottles.

The most common street preparation is in the form of botanical mixtures sometimes referred to as leaf mixtures. These consist of PCP mixed with mint leaves, oregano, or parsley. Rarely catnip is used and, because of the hallucinogenic nepetalactone oils present in this material, the resultant mixture may be more hallucinogenic than PCP alone. Lundberg, Gupta, and Montgomery (1976) also report that marihuana or other cannabis products are sometimes present in street PCP material.

The Juvenile Group often employed a special preparation called "Super Cools." This consisted of a mentholated tobacco cigarette that had been dipped in liquid PCP and dried. The additive effects of nicotine and PCP in such preparations often resulted in states of extreme intoxication.

ROUTES OF ADMINISTRATION

In the Adult Group, 280 subjects (88 percent) had experience with smoking PCP preparations, 38 subjects (12 percent) had orally ingested tablets or capsules, 15 subjects (5 percent) had used PCP intranasally via snuffing or snorting, and three subjects (0.9 percent) had injected PCP intramuscularly.

All 20 Juvenile subjects (100 percent) used PCP exclusively via the smoking route.

DOSAGES

A number of researchers have attempted to calculate dosages employed in recreational use of PCP. Burns and Lerner (1976) have estimated that the average amount smoked "per episode" is 35-75 mg,

usually delivered in one or two cigarettes or "joints." When PCP was used intranasally, subjects usually self-administered one "cokespoonful" per nostril or one "line" per nostril. The amount of pure PCP in commercially available "cokespoons" has been determined (by this author) to range from 3.5-7.1 mg for a level cokespoon. Assuming an average street purity of 95 percent (cf. Burns and Lerner 1976), this amounts to an average intranasal dose of approximately 10 mg (total for both nostrils) per administration. The average line of PCP is about 0.5 x .15 inches and amounts to approximately 5 mg of PCP if pure or 4.75 mg if street PCP is used. Since two lines are used per administration, this amounts to approximately 9.5 mg, considerably more than previously estimated (cf. Burns and Lerner 1976). when PCP is taken by mouth, the average dosage is estimated to be 5 mg.

DOSE REGIMES

Subjects in both the Adult and Juvenile Groups fell into several patterns of PCP use (discussed below). In general, when smoking the drug, Adult subjects tended to "titrate" or adjust their dose intake to what was perceived to be an optimal level of intoxication. Most subjects (Adults) used approximately one cigarette per week in this manner (range = 0.3-4.0). This amount was generally consumed in one episode per week. When Adults used PCP intranasally or orally, a single administration would occur approximately once every 8 weeks. In the Juvenile Group, 10 subjects (50 percent) reported that they always attempted to titrate their use but these users consumed approximately 28 grams of leaf mixture per month each. However, doses were not evenly distributed across time. Generally, Juveniles consumed their supply within a few days, but such use was marked by much sharing and selling among peers. The remaining 10 Juvenile subjects reported that they always attempted to stay chronically intoxicated and used approximately 5 cigarettes per day (range = 2-20).

These doses and dose regimes have created what researchers have generally agreed are three distinct levels of intoxication: low (5-10 mg), moderate (10-20 mg), and high (100 + mg). (See Burns, Lerner, and Corrado 1975 for discussion of dose-effect relationships).

PATTERNS OF USE

The dose regimes together with the set and setting define the pattern of drug use. Five patterns of drug use have been designated by The National Commission on Marihuana and Drug Abuse (1973) and will be used for discussion here.

Experimental Use

Of the 319 Adult subjects, 267 (84 percent) were classified as experimental users engaged in short term, nonpatterned trials of PCP with varying intensity and a maximum frequency of 10 times in their entire drug history. These users were primarily motivated

by curiousity about PCP and a desire to experience the anticipated drug effects of tranquilization, euphoria, inebriation, dissociation, and hallucinations. Their use was generally social and among close friends. Most did not enjoy the experience and did not express a desire to repeat the drug use. Interestingly, most of the Adult users endorsed the street myth that PCP is a "bad" drug that inevitably produces adverse reactions. Only those experimental users who expressed a belief that their PCP was really THC or some other drug also expressed a desire to continue using it beyond the experimental stage. These latter users typically claimed that PCP was simply "strong marihuana and something you could probably learn to handle." This latter finding suggests the importance of psychological set and setting in determining drug reactions.

None of the Juveniles were classified as expertimental users.

Social-Recreational Use

The remaining subjects in the Adult Group (52, or 16 percent) were classified as social-recreational users who engaged in more regular use than experimenters. Use generally occurred in social settings among friends or acquaintances who wished to share an experience perceived by them as acceptable and pleasurable. These users were primarily motivated by social factors and their use was always voluntary. It did not tend to escalate to more individually oriented patterns of uncontrollable use. Many of these Adult subjects started as expermental users but only 12 of them (23 percent) engaged in episodes of more frequent use (see below), although their primary pattern was the social-recreational one.

In the Juvenile Group, 10 subjects (50 percent) were classified as social-recreational users. Unlike their Adult counterparts, these Juveniles all tended to engage in more frequent patterns of use.

When asked to rank all drugs in terms of recreational drugs of choice, the Adult social-recreational users ranked cocaine first, cannabis second, and, surprisingly, PCP third. This may be related to the findings that both PCP and cocaine share similar sympathomimetic effects (Chen, Ensor, and Bohner 1965). When asked to rank all drugs in terms of potency in producing intoxication, 93 percent ranked PCP first. Other drugs ranked above PCP in this category included LSD and Ketamine (discussed in the second part of this chapter). Juveniles ranked marihuana first as a recreational drug of choice and PCP second. All Juveniles also ranked PCP first in potency.

PCP retained popularity as a recreational drug among may Adults and Juveniles for several reasons:

1) PCP was viewed by Adult users as a misunderstood drug which opened new altered states of consciousness for exploration. These states were considered to be unobtainable

or less easily reached via conventional hallucinogens.

2) PCP was viewed by Juvenile users as economical and readily available.

3) PCP was viewed by both Adults and Juveniles as an extremely effective and different hallucinogen that could induce intoxication quickly and with such rapid onset of action allow one to titrate dose. It was considered by these users to be a "social hallucinogen" which, because of the paucity of visual effects, allowed the user to be more social than with the more "visual" psychedelic hallucinogens like LSD.

most social-recreational users felt that the possibility of unpleasant and adverse reactions was a rate-limiting determinant of PCP use. Consequently, they engaged in stable, low frequency patterns of use which did not escalate to individually oriented patterns of uncontrollable use. They also felt that PCP was not physiologically harmful but rather "expanded consciousness" in long-lasting ways. Indeed, many of the Adults felt that the drug took the user "to places that LSD only suggested were there" and "with PCP the afterglow stays with you for a long time."

Circumstantial-Situational Use

Only three Adult users and four Juveniles engaged periodically in circumstantial-situational use, defined as a task-specific, self-limited use which was variably patterned, differing in frequency, intensity, and duration. This use was motivated by a perceived need or desire to cope with a specific condition or situation. The motivations cited by users, in order of decreasing frequency, were: to alleviate the dysphoria associated with situation depression (81 percent); to enhance appreciation of social situations or musical events (73 percent); and as general entertainment when other recreations were unavailable (56 percent).

Intensified Drug Use

Nine Adult users (3 percent) and 10 Juvenile users (50 percent) engaged in episodes of intensified use characterized by long term patterned use of at least once a day. Such use was motivated chiefly by a perceived need to achieve relief from a persistent problem or stressful situation, or a desire to maintain a certain self-prescribed level of intoxication. Nonetheless, users here referred to their intensified use as "too much," "loaded most of the time," "really Dusted," or "bombed." or "toasted" and were aware of negative effects including unpleasant feelings. For most intensified users this subsequently curtailed such patterns of intensified use for varying periods of time.

Compulsive Drug Use

None of the subjects studied engaged in compulsive use, which is characterized by high frequency and high intensity levels of

relatively long duration, producing some degree of psychological dependence. Two Adult users did appear to become compulsive users, but they dropped out of the study before adequate assessments of their behavior could be made.

PHENOMENOLOGY AND INCIDENCE OF INTOXICATION EFFECTS

The acute physiological and psychological effects reported by users did not differ substantially from these described in the literature (e.g., Burns and Lerner 1976) or elsewhere in this volume. Briefly, subjects (Adults and Juveniles are combined here) repeatedly sought and experienced heightened sensitivity to stimuli (94 percent), stimulation (92 percent), dissociation (88 percent), mood elevation (61 percent), inebriation (55 percent), relaxation or tranquilization (53 percent), hallucinations (30 percent), increased sociability (14 percent), increased cognitive activity (11 percent), and euphoria (8 percent). A number of untoward effects were also reported by the users: perceptual disturbances (78 percent), restlessness (76 percent), disorientation (63 percent), anxiety (61 percent), paranoia (34 percent), hyperexcitability (27 percent), irritability (22 percent), mental confusion (22 percent), and partial amnesia (18 percent). Dysarthria was not assessed in the questionnaire but roughly 80 percent of the respondents in the interviews admitted having experienced this effect as well.

Taken together, individuals reported experiencing negative or untoward effects in all intoxications and positive or desired effects in only 60 percent of the intoxications.

The chronic effects reported by the Intensified Drug Users were also similar to those reported elsewhere in the literature. In addition to acute intoxication phenomena, users experienced both desired and undesired effects. The desired effects included: a generalized feeling of well-being and detachment from worldly tensions and anxieties (65 percent), heightened perceptual sensitivity in some modalities (43 percent), and psychedelic or transcendental reactions (8 percent). The undesired effects included: disturbances in time perception (38 percent), nervousness and irritability (38 percent), perceptual disturbances (31 percent), fatigue or lassitude (27 percent), and memory disturbances (25 percent).

Overall, chronic negative effects experienced in all intoxications, while positive effects were experienced inapproximately 74 percent of the intoxications.

HALLUCINATIONS AND PSYCHOSES

Of the phenomena reported above, the changes in perception,mood, and thinking are perhaps the least understood but also among the most important in determining the precise nature and form of PCP intoxication. Indeed, Domino and Luby (1972) have suggested that these abnormal states induced by PCP strongly resemble schizo-

phrenia, especially in creating profound perceptual and cognitive disorganization and occasionally catatonic immobility. Furthermore, the presence of perceptual changes such as hallucinations is a key diagnostic criterion in the determination of the psychotic phase. Therefore, these perceptual changes were the subject of concentrated examination and testing in the study.

The definition of the word hallucination (which comes from the Latin Hallucinari, meaning to prate, to dream, or to wander in mind) is far from precise. However, a widely accepted definition in psychiatry is: "A false sensory perception in the absence of an actual external stimulus. May be induced by emotional and other factors such as drugs, alcohol and stress. May occur in any of the senses." By this definition, it is not surprising that most PCP users have experienced hallucinations. For most such subjects (94 percent) these consist of a wandering in mind or attention which is manifested as lapses in attention, mental confusion, clouding, and related phenomena. Such experiences include difficulty in maintaining attention during complicated tasks: difficulty in maintaining thoughts during conversation; and general preoccupation with subjective sensations. These effects are similar to those Domino and Ludy (1972) have described as "attention disorder," "withdrawal," and "clouding delirium."

The most common perceptual disturbance was a change in body image. Luby and co-workers (1959) have described this state as "accompanied by loss of 'ego boundaries', impaired ability to distinguish self and nonself stimuli, feeling of depersonalization, and a sense of unreality" (p. 364). Generally, subjects reported that their bodies felt strange and distorted and these feelings were usually coupled with changes in tactile sensations. Visual changes included macropsia and micropsia, while tactile changes included numbness and paresthesias.

The most common mood disturbance was a blanding of affect, although many users tended to admit that this made them somewhat euphoric in light of pre-existing dysphoria. Previous researchers have described this as "ambivalence" and "affect disorder." Undoubtedly, these changes in mood contributed to the feelings of dissociation or estrangement from self and body which were commonly reported.

The most common thinking disturbances have been described in the literature as "loosening of association," "overinclusive thoughts," "concreteness," "delusional thinking," and general "disorganization" Associated with these phenomena are "negativism" and "hostility." In order to assess these states, the MMPI and the Experiential World Inventory (EMI) were administered. Only the intensified Adult and Juvenile users manifested abnormal profiles on these tests. The most consistent high point on the EMI was the ideation scale, which strongly suggests thought disorder including unbridled fantasy activity, inability to connect experiences purposefully, flights of ideas, and serious loss in the capacity to select and resist thoughts and to produce and connect new thoughts. Other consistently high scores were seen

on both sensory perception, time perception, and body perception scales. Surprisingly, the impulse regulation scale, an indicator of hostility and violence, was usually the lowest point on the profile. The MMPI profile for these intensified users indicated a large number of experiences and symptoms which are characteristic of psychotic thinking, including hallucinations, delusions, paranoia, feelings of unreality, and a general sense that things are wrong. The MMPI content scales also indicated a large number of symptoms of the type sometimes associated with organic involvement of the central nervous system. Complaints here included skin sensations, nausea, dizziness, and difficulty with speech, memory, concentration, ability, coordination and motor control. Unlike the EWI results, the MMPI profile indicated that most of these users were distractable and when faced with frustration might become irritable, aggressive, or impulsive, often out of proportion to the reality of the situation. Taken together, these findings indicate that PCP produces many of the symptoms characteristic of schizophrenia, although it most be emphasized that the correlation of symptoms does not imply a direct causal relationship.

II. KETAMINE

In the 1959 horror film, The Tingler, actor Vincent Price injected himself with the little-known drug LSD in order to produce a state of fear and panic. That single cultural incident heralded a much wider phenomenon of LSD use during the psychedelic revolution of the Sixties. In the 1976 film, Family Plot, Alfred Hitchcock depicted a kidnap victim sedated with a little-known drug called ketamine. Once again the cultural productions of man acted as a barometer of the social times, as the Seventies are witnessing a growing problem of ketamine abuse.

DISCOVERY AND INITIAL USE

Dissatisfied with the clinical experience of PCP as a surgical anesthetic druq (the duration of action and emergence excitement were too great to recommend use of the drug), Parke Davis and Company developed a congener of PCP for anesthesia in man. The drug was called ketamine hydrochloride or 2-orthochlorophenyl, 2-menthylamino cyclohexanone hydrochloride (original code name CI-581). Marketed under the names Ketalar (Parke Davis and Company), Ketaject (Bristol Laboratories and Ketavet (for veterinary purposes), ketamine is rapidly emerging recreational street drug.

Ketamine was enthusiastically described as a nonbarbiturate anesthetic that is a "rapid-acting general anesthetic producing an anesthetic state characterized by profound analgesia, normal pharyngeal-laryngeal reflexes, normal or slightly enhanced skeletal muscle tone, cardiovascular and respiratory stimulation, and occasionally a transient and minimal respiratory depression" (Bristol official package circular for Ketaject). Anesthesiologists endorsed its use initially because surgical patients remained

physiologically very strong and required little support of vital processes. Surgeons were also impressed with the rapid action but somewhat disturbed when patients appeared responsive to stimuli in the operating room. Gradually the clinical experience demonstrated that ketamine produced a number of complications from which it was originally claimed to be free. The complications included: "severe laryngospasm and respiratory arrest in neonates, cardiac arrest secondary to respiratory depression in an adult, severe airway obstruction with vaniting and aspiration in children, and hysterical postanesthetic reaction" (Clin-Alert 1971). Indeed, these latter emergence reactions have been variously described as "confusional states," "vivid dreaming," "hallucinations," and "preseizure and seizure activity."

Nonetheless, the drug produced extremely effective analgesia which was still judged useful in certain situations such as for burn dressings and radiotherapy, in emergency field work, and in war conditions. Indeed, the drug enjoyed popularity among surgeons as the most widely used battlefield anesthetic in Vietnam. The analgesia is probably achieved through the drug's dissociative action in that it appears to selectively interrupt association pathways of the brain before producing somesthetic sensory blockade (Sparks et al. 1973; Weingarten 1972; Winters 1975). Some observers (e.g., Young et al. 1977) attribute the present popularityof the drug to experiences gained among patients in Vietnam and elsewhere during the late 1960's.

Street use of ketamine hydrochloride solutions was first noted in 1971 in San Francisco and Los Angeles (Siegel, personal observation), while other forms of ketamine (e.g., powders, tablets, etc.) were first noticed on the street in 1974 (Ashley 1978). Solutions go under a variety of street names including: Ketalar, Ketaject, Ketavet, K, Kay, Jet, Super Acid, 1980 Acid. Powder forms of ketamine on the street as: Green, Purple, Mauve, Special LA Coke, Super C, and K. For both medical and nonmedical users, the emergence reaction characterized as adissociative hallucinatory period is probably the most dramatic aspect of the ketamine experiencee.

MAINTENANCE OF USE

The ketamine dissociative reactions, while producing analgesia, also produce classic hallucinogenic reactions which undoubtedly motivate recreational users. These reactions were originally described in the anesthesiology literature (e.g., Kreuscher 1969) as emergence reactions that could be quickly "managed" or suppressed via treatment with a variety of agents such as diazepam, droperidol, fentanyl, pentobarbital, or meperidine (e.g., Wantz 1977). Doenicke and co-workers (1969) reported on the phenomenology of this reaction when it was not suppressed by other medications. Both their patients and experimental subjects experienced analgesia concomitant with depersonalization, derealization, changes in body imagery, nausea, dizziness, dreams, and hallucinations. Most of their subjects stated that the dream period and hallucina-

tory phase was "pleasant" and a typical description of the intoxication follows:

> During the first subjective experience, I imagined myself in a complicated system of pipes which reminded me of an oil refinery. A driving force shot me through the colorful, occasionally angled, pips. I was wondering about the provenance of these strange circumstances and believed I had been hexed by relatives . Now this seemed to be my eternal fate, which made me very sad. Some time later, I was first able to perceive acoustic impressions from my surroundings, which previously had been missing. The voices of the people present in the room sounded distant, but yet loud and resounding. I could hear the sounds, but I could not understand them. I thought that they were voices of relatives who had hexed me. Later I was able to perceive visual impressions. The room appeared dusky-foggy to me. In the distant opening of a pipe appeared the head of a colleague. Now I understood a few words and began to answer. My speech sounded babbling and booming to me. Intermittently the hallucination of being hexed returned. Later I was told that I had uttered strange sounds. My tongue seemed to me to be extremely big, but very light. In my extremeties, too, I felt a striking lightness. Shortly before awakening, I was again able to understand what was said around me and I saw my surroundings again, though greatly blurred and constantly revolving around me (pp. 149-150, translated from the German by R.K. Siegel).

Rumpf and colleagues (1969) found their subjects described ketamine hallucinations as "utopic," "phantastic," "unreal," or "mysterious." Only one out of their 18 subjects considered the dream experiences normal and ordinary. The experience was termed pleasant by 6 subjects, unpleasant by 8, and neutral by 4. Experiences reported by these test subjects included dreams of recent memories, feelings of floating in space or falling or riding in various vehicles, vividly colored (primarily red) geometric patterns and designs, and were in general similar to the phenomenology of other drug-induced hallucinations (see Siegel 1977b). Unexpectedly, Rumpf and colleagues reported that fully one third of the experimental group (6 subjects) had true hallucinations with the concomitant delusions that their dreams were not dreams, but, in point of fact, real events! Such intense hallucinations are rare in drug-induced experiences (Siegel and Jarvik 1975).

In a well controlled study, Collier (1972) demonstrated that most ketamine dreams or hallucinations were judged by subjects as pleasant and of unusual intensity. One dream sequence was markedly transcendental as "the patient ascended to Heaven, saw God and was re-incarnated in Italy. Luminosity, green colour, tranquility and marked euphoria predominated. This these continued for over 2 hours

into the awake phase during which he thought that he was speaking Italian. A central object blindness occurred. Six months later he had not experienced any similar dreaming or spontaneous phenomena but still remembered the episode vividly" (p. 125).

Current recreational users of ketamine appear to be motivated to achieve these dissociative hallucinatory states. Young et al. (1977) likens this state to an LSD trip, only the ketamine tripper "feels as if he is floating in a dreamlike state while experiencing vivid visual images" (p. 107). Stafford (1977) has recently cited a report from a current recreational ketamine user which illustrates the romantic appeal of the state similar to the "perpetual peaceful place" described by PCP users:

> And when I closed my eyes a lot of information started to happen. Colors, patterns, cross-connections in sensory perception. Like sound and inner visions sort of got confused. I got deeper and deeper into this state of realization, until at one point the world disappeared. I was no longer in my body. I didn't have a body. And I reached a point at which I knew I was going to die.... .And what incredible feelings that evoked! . . . . . .I just yielded. And then I entered a space in which . . .there aren't any words.....I mean, at-one-with-the-universe, recognizing-your-godhead.....The feeling was: I was home. That's really the feeling of it. And I didn't want to go anywhere, and I didn't need to go anywhere. It was a bliss state. Of a kind I had never experienced before. I hung out there awhile, and then I came back. I didn't want to come back. I guess in the deep state it was no longer than half an hour (pp. 348-349).

CONSEQUENCES OF CONTINUED USE

During the acute intoxication with ketamine, there is significant impairment in attention, learning, and memory functions (Harris et al. 1975). In particular, subjects have impairment in organizing and understanding the enviroment during emergence reactions. But few, if any researchers have documented the long term consequences of continued use of this drug. In preclinical animal studies, chronic ketamine administration results in abnormal brain wave activity, and withdrawal is marked by progressive increases in epileptiform activity without gross behavioral manifestations (Manchar, Maxwell and Winters 1972). Since such abnormal electrical activity in the brain is not correlated with observable changes in behavior, it is not surprising that clinical studies have failed to detect any long term impairment of behavior or personality functioning. Nonetheless, "bad trips" are frequent can result in paranoia and fear of subsequent similar intoxications (see Johnstone 1973).

A number of studies have documented recurrent hallucinations following ketamine anesthesia as well as flashbacks (Fine and Finestone

1973; Perel and Davidson 1976), and some have even suggested, albeit weakly, resulting psychoses (Johnson 1971). While the incidence of ketamine flashbacks far exceeds that for other hallucinogens (Siegel and. Jarvik 1975), the presence of flashbacks and allied perceptions does not normally present psychological problems; for the patients or users. Indeed, a number of psychiatric investigators have utilized continued treatment with ketamine to create abreactive effects in psychotherapy and research settings (e.g., Khorramzadeh and Lofty 1973; Lilly et al. unpublished).

VARIABLES AFFCTING USE AND INTOXICATION

The variables affecting intoxication with ketamine are similar to those discussed above with reference to phencyclidine. In addition, because of the more profound hallucinatory quality of the ketamine experience, intoxication is greatly influenced by set and setting. Because ketamine induces an extreme sensitivity to environmental stimuli, the physical surroundings are particularly important. Indeed, recovery personnel in hospital operating rooms have long since learned the importance of isolating the ketamine patient from intense light, noise, and other stimulation. The intrusion of even the most innocent stimuli such as monitoring the patient's vital signs can trigger hyperexcitability, psychomotor activity, and even seizures. Accordingly, recovery from ketamine anesthesia is usually handled with minimal verbal and tactile stimulation in medical settings, but rarely is this precaution observed in non-medical situations. Furthermore, since ketamine is often injected either intramuscularly or intravenously, such factors as sterile procedures and instruments, purity of the solution, and site of injection are especially important determinants of the intoxication. Respiratory depression may occur from overdosage and the presence of sedative drugs (barbiturates, opiate narcotics, etc.) in the body may also influence the intoxication and risk of overdosage.

THE SAMPLE

Two separate populations were sampled for studies of recreational ketamine use. One population (referred to as the Intranasal Group) consisted of recreational users recruited from a previous study of cocaine use (Siegel 1977a). Another population (referred to as the Injection Group) consisted of recreational hallucinogen users recruited from a previous study (Siegel and Jarvik 1975). A total of 10 Intranasal users and 13 Injection users were eventually selected for study. All subjects in the sample met the initial requirement for having used ketamine more than once in the last year. Subjects were approximately equally divided between men and women, 21-45 years of age, and were examined and tested in the manner described in the phencyclidine section of this chapter.

MULTIPLE DRUG USE

All subjects in the Intranasal Group had past or present histories of multiple drug use. Concomitant with their use of ketamine, 100 percent were classified as social-recreational users of cocaine

(see Siegel 1977a). All subjects in the Injection Group also had past or present histories of multiple drug use. Their use of ketamine ran parallel to their use of other hallucinogens and fully 77 percent were currently using LSD. Interestingly, none of the Intranasal or Injection users were using phencyclidine, although two subjects from each group had experimented with it in the past.

PREPARATIONS AND PURITY

All subjects used ketamine hydrochloride in the form of capsules, powder, crystals, tablets, or solutions. Solutions are usually diverted legal vials of ketamine available in concentrations of 10 or 50 mg/ml (Ketaject) or 10, 50 or 100 mg/ml (Ketalar). An occasional street adulterant of these solutions is vitamin B_{12} due to a common street myth (partially true) that this attenuates adverse reactions. Capsules (usually clear, red, or black/yellow), powders (green, mauve, or white), crystals (white), or tablets (usually white) are usually mixtures of ketamine hydrochloride and various nonpsychoactive compounds such as lactose, flour, talc, and vitamins. The most common psychoactive adulterant found in powders or crystals is cocaine hydrochloride, although others including amphetamines and caffeine are also found. At the present time no quantitative information is available on these preparations.

ROUTES OF ADMINISTRATION

By definition, all subjects in the Intranasal Group employed the intranasal route of self-administration, and none of these users had ever experimented with other routes of ketamine administration. Similarly, all subjects in the Injection Group employed the intramuscular (i.m.) route of self-administration. However, of the 13 subjects here, four subjects experimented with intravenous (i.v.) injection and one subject had experimented with smoking ketamine.

DOSAGES

Little reliable information on recreational intranasal dosages of ketamine is available. Young and colleagues (1977) estimate that "the normal abuser's dose is 50 mg" (p. 107). However, judging from the reactions and intoxications reported by users (see below) it is estimated that intranasal doses range from 60-100 mg. For Injection users, the surgical anesthetic dosages range from 6.5 to 13.0 mg/kg (i.m.) and 1.0 to 4.5 mg/kg (i.v.). Recreational Injection users employ dosages of approximately 1.0 to 2.0 mg/kg (approximately 0.5 to 1.0 mg/lb.) for both intramuscular and intravenous administration.

DOSE REGIMES

Subjects in both the Intranasal and Injection Groups fell into several patterns of ketamine use (discussed below). In general, when using the drug intranasally, subjects tended to administer the drug only once in any given episode and to repeat episodes

of administration less than once per month. Injection users also tended to administer the drug cnly once per episode. However, repeated injections were usually self-administered once per hour until a desired level or period of intoxication was achieved.

PATTERNS OF USE

The five patterns of use previously designated by The National Commission on Marihuana and Drug Abuse (1973) will be used for discussion here.

Experimental Use

Six subjects (60 percent) of the Intranasal Group and one (8 percent) of the Injection subjects were classified as experimental users and engaged in short term, nonpatterned trials of ketamine with varying intensity and a maximum frequency of 10 times or less in their entire drug history. These users were motivated by curiosity about ketamine (or its advertisement as a different type of drug such as "Green" or "K") and a desire to experience the anticipated effects of euphoria and hallucinations. Their use was generally social and among close friends or intimate others. Most subjects enjoyed the experience but did not express a desire to continue regular use because of the street myth that "something that strong must have some harmful effects on the brain." Other subjects desired to repeat the self-administration but found cost to be prohibitive (the drug is in short supply).

Social-Recreational Use

In the Intranasal Group, four subjects (40 percent) were classified as social-recreational users. Ten subjects (77 percent) in the Injection Group were also classified in this way, but three of these subjects (23 percent) engaged in episodes of more frequent use (see below). In general, social-recreational use occurred more regularly than experimental use and was primarily motivated by individuals seeking to share with others an experience they judged to be pleasant and fun. Such users describe their ketamine use as "absolutely safe" and "better than LSD." The set and setting for recreational use parallels that observed with other more conventional hallucinogens. The Intranasal users tended to employ low dosages (probably less than 50 mg) and found the experience to be similar to cocaine but more "trippy." This comparison to cocaine is probably related to ketamine's cocaine-like effects on vascular adrenergic neurons (Nedergaard 1973). The use of the term "trippy" refers to ketamine's hallucinatory and dissociative effects.

Injection users tended to employ sufficient dosages to produce the "psychedelic" effects. When asked to rank all recreational drugs in terms of potency, all social-recreational ketamine users ranked ketamine as the most potent hallucingen and 71 percent rated it as the hallucinogen of choice. The remaining subjects were equally divided between LSD and psilocybin mushrooms as their hallucinogen

of choice. When asked to rank all drugs in terms of general recreational preference, Intranasal Users ranked cocaine first, while Injection Users ranked LSD first. Ketamine was consistently described in several ways which contributed to the maintenance of social-recreational patterns of use:

1) Ketamine was perceived by users to be a safe, nontoxic, potent hallucinogen with a short duration of action and few adverse reactions or bad trips.

2) Ketamine was perceived by most users as the only hallucinogen that did not produce anxiety or fear reactions.

3) Ketamine was considered to have unique euphoric-hallucinogenic properties that enabled a user to experience, with varying dosages, effects similar to either cocaine, amyl nitrite, phencyclidine, or LSD.

4) Ketamine was considered to be a glamorous avant-garde drug and had associations with cotemporary folk heroes of high status (see Duncan 1976).

Circumstantial-Situational Use

Only two subjects in the Injection Group (15 percent) engaged periodically in circumstantial-situational use, defined as a task-specific, self-limited use which was variably patterned, differing in frequency, intensity and duration. This use was motivated by a desire to explore new states of consciousness and work through personal problems. Such use is similar to that of ketamine in experimental psychotherapy situations (Khorramzadeh and Lofty 1973).

Intensified Drug Use

Only two subjects in the Injection Group (15 percent) engaged in intensified use characterized by long term patterned use of at least once per week for several months. Such use was motivated chiefly by a perceived need to achieve relief from a persistent problem or stressful situation or a desire to maintain a certain self-prescribed level of intoxication. Nonetheless, users here still referred to their use as "experimental" in the sense that they were exploring new altered states.

Compulsive Drug Use

Only one subject (8 percent) in the Injection Group characterized herself as a compulsive ketamine user with high frequency and high intensity levels of relatively long duration. This user admitted to both psychological and physical addiction to the drug, although this latter claim could not be substantiated. Indeed, she was able to "withdraw" repeatedly from the ketamine use which continued intermittently for several years.

PHENOMENOLOGY AND INCIDENCE OF INTOXICATION EFFECTS

The acute physiological and psychological effects reported by ketamine users did not differ substantially between the Intranasal and Injection Groups. Therefore, the users are combined (total N = 23) in discussion here. In general, most users recognized that they were using a hallucinogen, and considered the hallucinogenic and psychotomimetic properties to be positive effects. This attitude (set) contrasts sharply with most phencyclidine users who only recognized that they were using an intoxicant similar to marihuana, which is commonly not considered a hallucinogen in street usage.

Ketamine users repeatedly sought and experienced a number of positive effects, including: floating sensations and dissociation (87 percent), stimulation (83 percent), hallucinations (78 percent), increased cognitive or mental associations (74 percent), euphoria (26 percent), and transcendental or religious experiences (17 percent). Despite the widespread beliefs among users about the lack of adverse reactions, a number of untoward effects were also reported: ataxia (100 percent), slurring of speech (70 percent), dizziness (61 percent), mental confusion (35 percent), hyperexcitability (26 percent), unpleasant imagery (26 percent), blurring of vision (17 percent), negative hallucinations, or the inability to see things that were really there (17percent), decreased sociability (17 percent), anxiety (13 percent), nausea (13 percent), insomia (13 percent), and decreased sexual motivation (9 percent). Interestingly, one subject also experienced several episodes of psychomotor seizures as a result of acute intoxication.

Taken together,ketamine users experienced more negative effects than positive effects as a result of acute intoxication. Nonetheless, they continued to rate the overall experience as positive and rewarding.

The long term effects resulting from ketamine use are similar to those reported for many other hallucinogenslike LSD. Typically, the ketamine users claimed a chronic elevation of mood (43 percent), deeper insights into self and others (35 percent), and positive changes in attitudes personality (17 percent). The undesired long term effects included: flashbacks (57 percent), attentional dysfunction (22 percent), and decreased sociability (9 percent).

Overall, long-term effects appeared equally divided between positive and negative experiences.

HALLUCINATIONS

Of the phenomena reported above, the hallucinations appeared to be conspicuous as both positive effects resulting from acute intoxication and as important determinants of positive/negative long term effects. Therefore, the ketamine hallucinations among these nonmedical users were the object of concentrated examination and study. In general, the nature of ketamine hallucinations in recreational

users was similar to that reported in both surgical and experimental subjects (e.g., Collier 1972; Siegel and Jarvik 1975). One subject from the Injection Group described her prototypical hallucinations in a session that she tape-recorded for the author:

> I see Mexico City when I close my eyes. Crazy. I've never been there before. Now it's just black. It reminds me of a cave. I see people moving about in some sort of kaleidoscope pattern. I don't know where I am. (Laughter) The crowd of people are all having a good tine and they're laughing. My sister has got her Sunday blue dress on, although she's always dressed in black. I don't recognize anyone except her and her husband. Now they're gone. They disappeared. Now I just see commercials from TV and lots of geometric patterns. There's someone's stereo hanging on the wall. (Laughter) I feel a little childish. Happy. Very happy. (Laughter) Now I see kitty cats. Striped ones like out of a child's coloring book.

Another Injection subject described a similar experience, also tape-recorded for the author:

> I see flowers. All colors, blue and green and purple, yellow. And now a weird looking nightclub. Now stars. Everything happening very fast.....vegetables, pictures, a house, a pinwheel, there's a man sitting on a chair. It's just like a movie or a dream. There's an igloo and a tepee. And some more flowers. (Laughter) Now I feel like I'm in church. Really, it's really a church. My tongue hurts. And in the church is a tiny dot in the middle and some black space and then from the middle comes a white light. Surrounded by flowers like lilacs, rippling like in the wind. And pink flowers and white picket fence. Now I see Jesus. And I see a man and a woman kissing. Now I see white flowers and just green leaves. And there is an old man on the other side and he is waving his hand and he's gotasuitonandahat. That must be God. Now I see a little girl. (Laughter) That's me. She's laughing. This is all very clear. I can even see their features and everything.

Even Intranasal users experience similar, albeit weaker, hallucinations as exemplified by one subject's report:

> The first thing that happens when I snort Green (ketamine) is that I start to get speedy like with coke (cocaine). I feel a rush of good feelings, almost euphoric. Then things get a little blurry. I feel like I'm floating and sometimes dizzy. But I usually lie down and float along with the trip. When I close my eyes I see the "retinal circus" that Tim Leary described with kid (LSD)--lights, colors, patterns, even

> cartoons and memory pictures. If it's dark in the room and I open my eyes I can sometimes project things onto the wall or ceiling. But most of the time I just lie there thinking great thoughts and solving lots of problems. It's a lot like nitrous oxide only it's a more intense body trip as well. When you snort it you come down very quickly.

As suggested above, experienced users of ketamine can learn to utilize the state of intoxication for personal growth and exploration. This use is similar to that underlying long term recreational use of other hallucinogens, and Lilly et al. (unpublished manuscript) describe the unique aspects of ketamine in this regard.

> In our group we symbolize this by saying that this chemical induces a state in which you live in a well of neutral reinforcement. Typical tasks are simplified and made more efficient, condensed, abstracted, and the nonsense removed from the computations involved in carrying them out. Mental processes in a similar way sharpen out. It looks as if the contrast enhancement of such as edges, colors, thoughts, ideas and so forth is forthcoming. Colors seem brighter and yet more meaningful. Objects contain their own meanings. People are read very readily and with great ease and evaluated in their current state anrd dealt with in the most efficient and energetic manner possible. After some weeks of training to get through the initial phases of the emergence symptoms so-called, these states occur. The subject learns to centrally control, integrate and use the neutral energy afforded by the ketamine and becomes that which he potentially could become otherwise without the chemical at his best performance (p.4).

III. OVERVIEW

The nonmedical use of phencyclidine (PCP) and ketamine has been examined in four populations of recreational users. The first population sample consisted of 319 Adult users of PCP while the second population sample consisted of 20 Juvenile users of PCP. Both groups used PCP primarily by smoking in social-recreational patterns and settings. However, Juveniles tended to be more intensified users than Adults, many of whom were only experimenting with the drug. PCP was viewed as a potent hallucinogen by users, who tended to titrate dosages in order to achieve desired levels of stimulation, dissociation, and inebriation. Such positive effects were achieved in approximately 60 percent of the intoxications. Despite the fact that negative effects such as perceptual disturbances, dysarthria, and hyperexcitability were common in nearly all intoxications, a substantial number of individuals maintained continued use of and preference for the drug. These patterns of use are probably related to the dissociation and estrangement from self and others induced by PCP, as well as the drug's euphoro-hallucinogenic properties.

!The third population sample consisted of 10 Intranasal ketamine users while the fourth population sample consisted of 13 Injection users of ketamine. Use of ketamine was primarily experimental or social in nature and the drug was viewed by users to be a safe, potent hallucinogen with a short duration of action and few if any adverse effects. Ketamine users tended to titrate their use in order to achieve desired effects of dissociation, stimulation, hallucinations, and transcerdental experiences. Despite the users' beliefs that the drug was totally safe, negative effects were reported; these included ataxia, dizziness, mental confusion, and hyperxcitability.

Long term intensified use of PCP tended to be associated with abnormal personality profiles indicating the drug's psychotomimetic actions. Long term use of ketamine was marked by a high incidence of flashbacks as well as attentional dysfunction. Nonetheless, recreational users of both drugs tended to experience generalized feelings of well-being, heightened perceptual sensitivity, and positive and rewarding experiences which reinforced and maintained drug use. Some tendency toward transient psychosis was noted in the PCP groups, while the ketamine users manifested some decreased sociability with no concomitant personality changes as measured by standard psychometric tests. An important caveat is that these effects are neither uniformly negative nor uniformly predictable. The number of variables affecting their production is presently unknown.

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