A review of drugs and their impurities

Everybody's talking about drugs, but no one does anything about them. In this article, Mark Segal, Assistant Professor of Pharmachology at Dalhousie, discusses "Effects of the Drugs and the Impurities that are Present in Drug Samples Illegally Sold in Canadian Cities".

Segal points out what are the real "drug problems", and presents a wealth of information for drug users and/ or interested observers.

by
Mark Segal, Ph.D.,
Associate Professor of Pharmacology,
Faculty of Medicine,
Dalhousie University

Numerous articles have appeared in scientific journals, in the news media and in lay journals offering definitions of drug, tolerance, physiological dependence, psychological dependence, physical, psychological and social toxicity, etc. The articles have dealt with alcohol, tobacco, sleeping pills (barbiturates), stimulants (amphetamines), tranquillizers, narcotics (morphine, heroin), solvents (glue, nail polish), "hallucinogens" (lysergic acid diethylamide, mescaline) and cannabis sativa (marihuana).

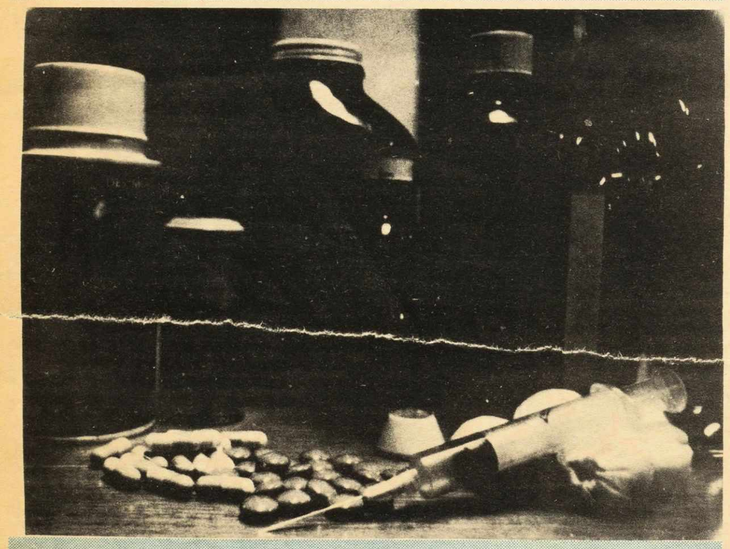
In order to make sense out of the enormous and often conflicting information that has been written about drugs over the past two years requires a lengthy discussion of the various drugs effects, putting their hazard potential in proper perspective.

This being the case, I want to try to point out some of the possible effects of the chemicals and chemical mixtures that are sold on the streets of Canadian cities.

First of all, in general, the effects of any drug are directly dependent upon the amount taken, the route of administration (injection, inhalation, oral), the frequency of use, the length of time in use, the individual personality of the user, and what, if any, problems are being suffered by the user. These criteria hold for the overall effects of all drugs.

Secondly in strict pharmacological terms, the use of any drug (in the widest sense of the word) can prove dangerous — IF it is taken by the wrong person, in inappropriate doses, at the wrong time and in the wrong place.

Thirdly, the requirement of definitions. **Drug** — any chemical agent which can modify the function of the living body or any one of its parts resulting in physiological or behavioral changes. **Street Drug** — any chemical agent or substance purchased illegally. The chances of assurance concerning the quality and quantity of substance purchased are highly speculative. **Psychological dependence** — the interaction between an individual and a substance, occupation or pre-occuaption which the individual finds pleasurable. The degree of pleasure will directly relate to the individuals continued use of said substance, occupation or pre-occupation. **Tolerance** — basic alterations in body chemistry necessitating the increased intake of specific substances in order to obtain equivalent effects. **Physiological dependence** — changes in basic body chemistry during the usage of specific chemical agents which manifest themselves in a series of physiological effects called a "withdrawal syndrome" when that specific chemical agents is no longer present in the body. **Drug use** — the use of any chemical agent whether for medical or non-medical purposes to modify physiological or behavioral parameters without the user developing adverse reactions or undue physiological, psychological, psychiatric or sociological problems. **Drug Abuse** — the use of any chemical agent, for medical or non-medical purposes, in such quantities as to manifest personal, or social problems.



The following list of effects are mainly physical effects which may be experienced when **abusing** various chemical agents for medical or non-medical purposes. Most important, the occurrance of such effects is directly dependent upon the quantity of agent used. The other factors listed above are also of importance.

Lastly, the chemical agents are listed in a decreasing order of potential physical danger:

1. **Volatile solvents** (glues, nail polish and remover, gasoline, varnishes, paint thinner, lighter fluid, etc.)

The active ingredients are acetone, toluene, benzene and xylene. All are fat solvents and can adversely affect body tissues when used over prolonged periods of time. Of immediate concern are several reports of death due to asphyxiation (death by smothering) when the user passed out with a paper or plastic bag tied over his head. Other reported deaths were due to direct effects of the solvents upon the heart. The solvents, in some cases, can cause heart block resulting in death. On prolonged use, kidney, liver and possibly brain damage occurs. The vital elements in blood can also be altered severely, resulting in many drastic problems. Inhalation of liquid gasoline (not merely the fumes) can result in a very painful death due to the interaction of the gasoline with fatty lung tissue.

2. **Stimulants** (amphetamines and amphetamine – like substances).

The amphetamine-like substances used on the street turn out to be caffeine which is a mild stimulant, ephedrine which is used as a nasal decongestant, the amphetamines themselves (weight reducing pills) and methamphetamine ("speed", crystal meth.) which is generally produced in illegal underground laboratories.

Some of the major problems resulting in the use of ephedrine result from the large oral quantities required to produce central effects. In these quantities, severe effects can result to the blood pressure and total cardiovascular system. The major ill-effects from methamphetamine injection result from unsterile syringes and inappropriate injection techniques. Other severe toxic reactions can occur from some of the substances used to dilute out the methamphetamine. These substances may be plain ordinary cake flour or detergents. Plain ordinary cake flour upon injection can cause severe toxic reactions by passing to the lungs where the flour may block the tiny alveolar passages resulting in hemorrhage and severe lung damage. Detergents injected intravenously are toxic to all body organs. The stimulants do induce psychological dependence, tolerance, and a physiological dependence that, however, is not similar to the narcotic physiological dependence.

3. **Tobacco**

Active ingredient in nicotine. Adverse effects are observed upon chronic use and have been reported as cancer of the lungs, larynx and mouth. Other problems are irritation of the respiratory system, chronic bronchitis, pulmonary emphysema, damage to the cardiovascular system, etc.

Strong psychological dependence develops. No true symptoms of classical narcotic withdrawal develop.

4. **Depressants** (a) barbiturates (sleeping pills)

The main toxic reaction from barbiturates occurs from overdosage. Resultant may be coma and death. Tolerance develops to the chronic use of barbiturates, but unlike the tolerance which develops to the narcotics, barbituarte tolerance may be incomplete. A person tolerant to large daily quantities of barbiturate taken in several doses may be killed if the total daily dose were taken all at once. Withdrawal of barbiturates from a tolerant individual is extremely hazardous as acute convulsions may be easily precipitated.

Tolerance to stimulants and barbiturates develops rapidly upon oral use. This may develop to the point where rapid injection is the only way to obtain the resultant effects. Tolerance then continues to develop to the quantity injected.

(b) **Minor tranquillizers** (Librium^{R}, Valium^{R}, etc.)

Excessively large quantities can lead to respiratory depression and death. Can induce tolerance, psychological dependence and physiological dependence.

(c) **Alcohol**

Physiological and psychological effects are directly related to the concentration in the blood stream. Acute overdosage can result in respiratory depression and death. Chronic use of excessive amounts can lead to severe liver damage as well as severe social problems. The tolerance developed to alcohol is similar to that developed to the barbiturates and may be incomplete. Psychological and physiological dependence also develops.

(d) **Narcotics** (morphine, heroin, codeine (222's), Demerol^{R}, etc.).

Severe, psychological and physiological dependence develops. The tolerance that develops is complete. Deaths which do occur, occur from calculated or miscalculated overdose which result in respiratory collapse.

5. **Psychedelic agents** (lysergic acid diethylamide (LSD), mescaline, dimethyltryptamine (DMT), pscilocybin, methylenedioxy-amphetamine (MDA), dimethoxymethylamphetamine (DOM, STP), etc.)

Although the psychedelics do induce psychological dependence, they are not known to induce a physiological dependence. The tolerance that develops to their use is rapidly developed upon continuous use but is rapidly lost upon discontinuance of use. Since the amount of LSD required to produce the "psychedelic" effect is so minute (microgram quantities), overdose in man is an almost unknown entity. Problems that occur generally result from the fact that users do not realize the phenomal psychological potency of these drugs and are ill-prepared for the effects. The major differences between the different psychedelics is not their psychological effects but the duration over which the effects last. At one end of the scale there exists DMT (15-45 minute duration), to the other end of the scale where there is DOM, STP (duration of several hours to several days).

The controversy that exists between the effects of psychedelics on chromosomes resulting in abnormal childbirth is not yet resolved. The chromosome problems do not appear to be more severe than those caused by some other potent chemical agents and do not appear to be the cause of abnormal births. As with any potent chemical agents, the use of the psychedelics during the **first three months of pregnancy** may be extremely hazardous to the as yet unborn infant.

The major physical side effects from the psychedelic chemicals are usually the result of the psychedelic not turning out to be what it was allegedly sold as.

Samples of mescaline generally turn out to be pure or impure LSD, phencyclidine (Sernyl^{R}), atropine, amphetamine or caffeine. Samples of LSD may be pure or impure or may turn out as above.

The effects of the impurities or substances are as follows:

(a) **Ergot alkaloids** — a series of chemical agents of complex structure which result upon incomplete synthesis of LSD or due to the breakdown of LSD from improper tableting, capsuling or storage techniques. These agents are medically used in obstestrics and in the treatment of migraine. However, in inappropriate doses they can cause nausea, vomiting, and gastrointestinal cramps. Altered vision may occur because of their constrictive properties on the small blood vessels in the eye. Ergot which occurs naturally as an infectant of grain was responsible for large epidemics of "St. Antonys Fire" — group maddness, gangrene, etc. The ergots being precursors of LSD do possess psychedelic properties.

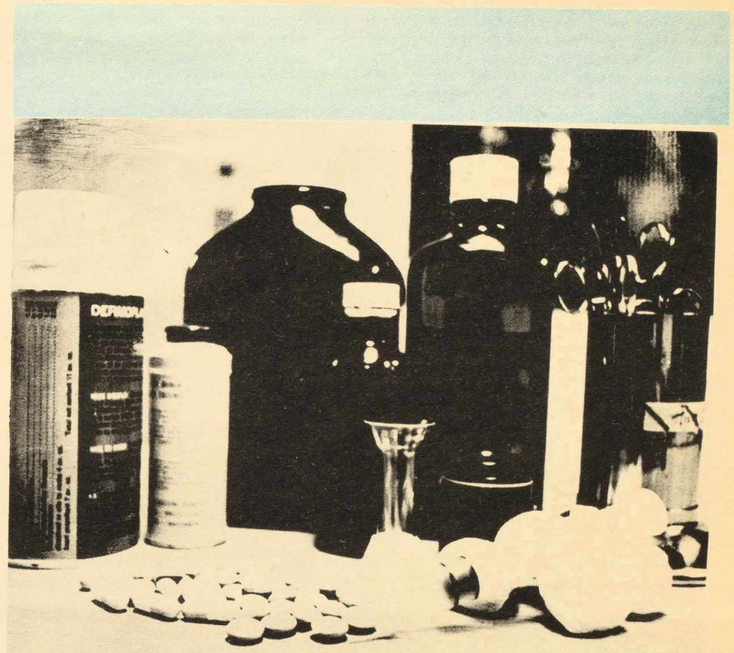
(b) **Phencyclidine (Sernyl^{R})**

Relegated to use as an intravenous anesthetic in dogs. Produces many body reactions such as nausea, vomiting, gastrointestinal cramps, effects upon blood pressure, etc., all of which result in detracting from the psychological phenomena.

(c) **Strychnine** — This is a central nervous system convulsant. Small amounts would result in minor convulsive muscular movements and twitches. Increasing quantities could result in overt convulsions, secondary depression and death.

(d) **Atropine** — (belladona-alkaloids)

Centrally effective, but physically hazardous. Resultant effects are dose dependent but may be summarized as follows.



Dose	Effects
0.5 mg	Slight cardiac slowing, some dryness of mouth, inhibition of sweating.
1.0 mg	Definite dryness of mouth, thirst; increase heart rate, pupil dilation.
5.0 mg	All of the above plus distrubed speech, swallowing difficulty, fatigue, headache, dry hot skin.
10.0 mg or more	All of the above, ataxic, restless, excitement, hallucinations, delerium, coma.

6. **Cannabis Sativa (Marihuana)**

Active ingredient is a tetrahydrocannabinol. Concentration of active ingredient directly dependent upon where the plant seed was obtained. In more concentrated form, marihuana is known as hashish. There are many terms used to classify marihuana and its more concentrated forms.

At present, there has been little shown concerning adverse physiological effects when used in moderate amounts. Since marihuana users generally titrate the amount they use to obtain the required effect — overdose can be controlled.

Abuse of marihuana, as abuse of any intoxicant can prove problematical. Tolerance, if it does develop to marihuana is minimal. The opposite generally occurs — users smoke less to obtain subsequent effects. Physiological dependence is **not** known to occur. Acute panic reactions are rare and psychotic reactions to marihuana even rarer. The acute panic reaction can be reversed by reassurance that the unpleasant feelings are drug-induced and that they are only temporary.

A major hazard of marihuana is the effects obtained from smoking marihuana that has been sprayed or dusted with other substances. These are (a) either, lighter fluid, etc. — not much of a problem because upon smoking a "joint" sprayed with these substances, these substamces would easily volatalize and not enter the system. (b) Ergot derivatives — in some instances, **effects resembling LSD have been obtained from smoking marihuana.** Users mistakingly relate this effect to an admixture of DMT. This is generally not the case, because of the resultant reports of effects lasting more than 4 to 6 hours. The resultant material can be and has in the past been ergot derivatives.

The major physical problems are as outlined above when it appears as a contaminant of LSD. A major psychological problem is a user's reaction to an ergot effect when expecting a cannabis "high". The unknown can prove devastating.

(c) Wood chips, hay, barn yard dirt, alfalfa, ordinary cigarette tobacco — generally harmless but a pure waste of money.

At present there is **no** way to guarantee the quality or quantity of any chemical or mixture purchased on the street.

In short summary, since man is a drug taking species, **drug use** is not a problem. **Drug abuse** is.

The above outlined information should not be taken as complete coverage of the drugs in use. Although lengthy, it merely represents a scratch on the surface of what is known about the drugs. The information should only be taken as a reference or starting point to further reading in the "drug issue". A major noted reference for further reading is the Interim Brief of the Commission of Inquiry Into the Non-Medical Use of Drugs, 1969, available at Queen's Printer and various bookstores. The final brief is due in the autumn of 1971.