The Consumers Union Report on Licit and Illicit Drugs

by Edward M. Brecher and the Editors of Consumer Reports Magazine, 1972

Part II. Caffeine

Chapter 22. Recent findings

To many, the above indictments will seem incredible——nothing more than quaint ramblings of puritanical physicians of an earlier, unenlightened generation. Yet, caffeine can be a dangerous drug. Contemporary scientists echo several of the early allegations made against caffeine. A reliable summary of current scientific opinion can be found in the 1970 edition of Goodman and Gilman's textbook, *The Pharmacological Basis of Therapeutics*. There Dr. J. Murdoch Ritchie reviews both the desirable and hazardous effects of the caffeine found in coffee, tea, cocoa, cola drinks, and other popular beverages.

The desirable effects are remarkably similar to those of cocaine and the amphetamines, to be reviewed in Part V:

Caffeine stimulates all portions of the [cerebral] cortex. Its main action is to produce a more rapid and clearer flow of thought, and to allay drowsiness and fatigue. After taking caffeine one is capable of a greater sustained intellectual effort and a more perfect association of ideas. There is also a keener appreciation of sensory stimuli, and reaction time to them is appreciably diminished. This accounts for the hyperesthesia, sometimes unpleasant, which some people experience after drinking too much coffee. In addition, motor activity is increased; typists, for example, work faster and with fewer errors. However, recently acquired motor skill in a task involving delicate muscular coordination and accurate timing may . . . be adversely affected. These effects may be brought on by the administration of 150 to 250 milligrams of caffeine, the amount contained in one or two cups of coffee or tea.

In addition to its effects on the cerebral cortex and other portions of the central nervous system, caffeine in modest doses (a few cupfuls of coffee or tea) affects the heart rate, heart rhythm, blood vessel diameter, coronary circulation, blood pressure, urination, and other physiological functions. The secretion of gastric acids is stimulated, a matter of concern in connection with peptic ulcers. "A number of investigators have shown," Dr. Ritchie writes,

that the administration of caffeine to animals in large single doses, in smaller repeated daily doses, or by intramuscular injection in beeswax results in pathological changes in the gastrointestinal tract and ulcer formation. . . . The significance of experimental peptic ulcers produced in this way has been questioned because of the high doses used. However, in view of
the responsiveness of the human gastric mucosa to caffeine, cognizance must be taken of the ubiquitous use of coffee and cola beverages in the pathogenesis of peptic ulcer, and in management of the ulcer patient.  

Coffee also markedly affects the human metabolic rate. "Numerous investigators have reported that the ingestion of 0.5 gram of caffeine [three or four cups of coffee] may increase the basal metabolic rate an average of 10 percent and occasionally 25 percent."  

A typical case history of a victim of caffeinism, similar to the cases described in 1909 by Sir Clifford Allbutt and Dr. Dixon, was reported in the Journal of the American Medical Association in 1967 by Dr. Hobart A. Reimann of the Hahnemann Medical College and Hospital in Philadelphia. The patient, a thirty-nine-year-old housewife and waitress, had run a low-grade fever for six months, with occasional flushing and chilliness, insomnia, irritability, and lack of appetite; she had lost 20 pounds in the course of this mysterious illness and now weighed only 107 pounds. When antibiotics failed to bring down her fever, she was admitted to the hospital for further diagnostic tests. Except for a finding of albumin in her urine, however, laboratory tests were all negative—and throughout her five days in the hospital her temperature remained normal.

"On further inquiry," the case report continued, "the patient stated that she . . . smoked a pack or more of cigarettes and drank from 15 to 18 cups of brewed coffee from 8 a.m. until 4 p.m. when she left home for work."  Careful temperature measurements after she left the hospital and started drinking 15 to 18 cups of coffee daily again showed that her temperature rose daily to a peak at 4 P.m., and declined again each day when she started work at 5 P.m., interrupting her daily coffee-drinking. Warned that coffee might be producing her symptoms, she gave up the beverage altogether. Thereafter her temperature remained normal, her appetite improved, her insomnia lessened, and she began to regain her lost weight. "The patient declined a request to resume the former high intake of coffee to see if fever again appeared."  

Caffeinism, Dr. Reimann noted in conclusion, "is said to be current among intellectual workers, actresses, waitresses, nocturnal employees, and long-distance automobile drivers. Illness otherwise unexplained may be caused by excessive ingestion of the xanthine alkaloids, including those in coffee, tea, cocoa, and those in some popular [cola] beverages."  

Some readers may seek to distinguish their own use of coffee from the objectionable use of mind-affecting drugs by other people on the ground that they drink coffee only because they enjoy the taste—not as a mind affecting stimulant. A detailed study of this alleged motivation difference was published in 1969 by Drs. Avram Goldstein and Sophia Kaizer of the Department of Pharmacology, Stanford University School of Medicine.

Drs. Goldstein and Kaizer distributed a questionnaire to all of the housewives in a housing project for married graduate students; 239 of the 250 questionnaire recipients (96 percent) responded. The coffee drinking habits reported by the 239 young women were distributed as follows:  

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<th>Amount of coffee</th>
<th>Percentage</th>
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Even those who drank only one or two cups of coffee a day almost invariably drank a cup in the morning. When asked why they drank coffee in the morning, the vast majority (72 percent) give the usual answers suggesting that coffee is a nondrug: they "enjoyed it" or they "liked the taste." A remarkable number, however, gave additional answers indicating a concomitant awareness of a stimulant drug effect:

<table>
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<tr>
<th>Reason</th>
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<tbody>
<tr>
<td>Helps you wake up</td>
<td>46</td>
</tr>
<tr>
<td>Gets you going in the morning</td>
<td>42</td>
</tr>
<tr>
<td>Gives you a &quot;lift&quot;</td>
<td>28</td>
</tr>
<tr>
<td>Stimulates you</td>
<td>24</td>
</tr>
<tr>
<td>Gives you energy</td>
<td>21</td>
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Nearly a third of these young housewives, moreover, frankly recognized that they were dependent on their morning coffee; they said that they drink it because they "feel the need for it."

A special subgroup of the morning coffee drinkers consisted of 25 housewives who drank coffee before breakfast. This group was particularly aware of the drug effect of the coffee; 80 percent reported that it "helps you wake up," 56 percent that it "gives you a lift," and 44 percent that it "stimulates you." In this group, moreover, 60 percent reported that they drink coffee in the morning because they "feel the need for it."

The housewives were also asked what would happen if they skipped their morning coffee. Here a remarkable difference arose between the light users (one or two cups daily) and the moderate and heavy users (three or more cups daily). Drs. Goldstein and Kaizer report: "Among the moderate and heavy users (especially the latter) in contrast to the light users, an array of symptoms that

<table>
<thead>
<tr>
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<tr>
<td>None</td>
<td>23</td>
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<tr>
<td>1 or 2 cups daily</td>
<td>20</td>
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<td>3 or 4 cups</td>
<td>27</td>
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<tr>
<td>5 or more cups</td>
<td>26</td>
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<tr>
<td>Unknown</td>
<td>4</td>
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<td></td>
<td>100</td>
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</table>
may fairly be described as a withdrawal syndrome is revealed: headache, irritability, inability to work effectively, nervousness, restlessness, and (curiously) lethargy.”

To check the questionnaire responses, Drs. Goldstein and Kaizer invited some of the housewives to participate in a controlled experiment. Eighteen non-coffee drinkers and 38 drinkers of five or more cups a day were each supplied with nine coded vials containing specially compounded instant coffee. They were told to use one vial each morning in preparing their morning cup. The coffee prepared with the various vials could not be distinguished either by appearance or by taste; but three of the vials contained 300 milligrams of caffeine (the equivalent of two or three cups of brewed coffee), three contained 150 milligrams, and three contained no caffeine at all. The subjects were asked to score their moods in various respects before drinking the morning cup and again at half-hour intervals for the subsequent two hours. The 9,240 mood scores thus secured were analyzed with the aid of a computer.

The results strikingly confirmed the women's earlier questionnaire responses. The five-or-more-cups-a-day users felt less alert, less active, less content, more sleepy, and more irritable before their morning coffee. On days when they drank caffeine-free coffee, they continued to feel that way throughout the next two hours; and they felt increasingly jittery, nervous, and shaky as the caffeineless hours dragged by. On days when their morning cups contained caffeine, however, these withdrawal symptoms were dramatically relieved. They also reported fewer headaches on caffeine mornings. The favorable effects were more marked with the 300 milligram dose than when the morning cup contained only 150 milligrams of caffeine.

The effects were reversed among the participants who did not ordinarily drink coffee. These housewives reported an increase in unpleasant stimulant effects such as jitteriness and nervousness, plus more gastrointestinal complaints on caffeine mornings. Since this study was double-blind—neither the housewives nor the experimenters knew until after the scoring was completed whether a particular housewife on a particular day had received 300 milligrams, 150 milligrams, or no caffeine at all the study clearly demonstrated the specific drug effects of one or two cups of coffee. If there ever was any doubt that caffeine as consumed in the United States, a cupful or two of coffee at a time, is a mind-affecting drug, those doubts were put to rest by the Goldstein-Kaizer study.

Many coffee drinkers who think of caffeine as a nondrug when they themselves drink it recognize that it is a drug in another context—they forbid coffee and tea to their children. Thus caffeine is often the first forbidden drug for which children yearn (and which they may imbibe in secret when they get a chance). The taboo against caffeine for children, moreover, is curiously inconsistent. For while refusing them coffee and tea, many parents make available, and even encourage children to drink, cola beverages that also contain significant amounts of caffeine. More remarkable still, hot chocolate and cocoa are widely accepted as specific children's beverages—despite the fact that they contain significant quantities of caffeine.

Is caffeine addicting? Opinions vary, depending on one's definition of addiction. One feature of heroin addiction, it will be recalled, is tolerance, the gradual fading of effects as the same dose is taken daily. "An appreciable degree of tolerance may develop to certain effects of the xanthines," Dr. Ritchie reports in Goodman and Gilman's textbook, "especially the diuretic and
vasodilator actions. Cross-tolerance between the members of the group also occurs," \(^\text{15}\) as it does among the various narcotics.

Another feature of heroin addiction is the withdrawal syndrome or physical dependence. Caffeine unquestionably produces withdrawal effects at some dosage levels. "There is no doubt that the excitation of the CNS [central nervous system] produced by large amounts of caffeine is followed by depression," Dr. Ritchie writes. "There has been considerable controversy, however, as to whether this is also true after the mild physiological stimulation produced by the small amounts contained in the average cup of tea or coffee." \(^\text{16}\) The 1969 Goldstein-Kaizer findings demonstrate that physical dependence does occur on five or more cups of coffee a day.

Like the amphetamines, the barbiturates, and alcohol, caffeine produces the most marked adverse effects when taken to excess. "Overindulgence in xanthine beverages," Dr. Ritchie notes, "may lead to a condition which might be considered one of chronic poisoning. Central nervous stimulation results in restlessness and disturbed sleep; myocardial stimulation is reflected in cardiac irregularities, especially premature systoles [irregularities of heart rhythm], and in palpitation and tachycardia [rapid heart rate]. The essential oils of coffee may cause some gastrointestinal irritation, and diarrhea is a common symptom. The high tannin content of tea, on the other hand, is apt to cause constipation." \(^\text{17}\)

When taken in very large doses, moreover, caffeine is a potent poison. "A fatal dose of caffeine given to an animal," Dr. Ritchie reports, "produces convulsions because of the central stimulating effect. Early in the poisoning, these are epileptiform in nature; as the action of the drug on the spinal cord becomes manifest, strychnine-like convulsions may appear. Death results from respiratory failure." \(^\text{18}\) The fatal caffeine dose in man is estimated at 10 grams (70 to 100 cups of coffee).

Even a single gram of caffeine (7 to 10 cups of coffee) produces acute toxic effects. "Insomnia, restlessness, and excitement are the early symptoms," Dr. Ritchie notes, "which may progress to mild delirium" — such as that reported by Dr. Crothers for the Civil War general. "Sensory disturbances such as ringing in the ears and flashes of light are common. The muscles become tense and tremulous. Tachycardia and extrasystoles are frequent, and respiration is quickened." \(^\text{19}\)

These effects may seem irrelevant to the ordinary coffee drinker, who is rarely tempted to drink seven cups, much less a hundred cups, at a sitting. But here another popular American custom must be borne in mind. Caffeine in tablet form is readily available without a prescription at drugstores and some supermarkets throughout the country. Sold under such trade names as NoDoz, it comes in 100 milligram tablets priced at 69 cents for fifteen tablets, more or less. Many Americans use caffeine in this concentrated form. How many, and how much of it they take at a time, is unknown — but ten tablets contain a gram of caffeine, enough to produce the symptoms of acute toxicity described above.

A remarkable case of the adverse effects of caffeine tablets taken in excess was reported in 1936, in the *New England Journal of Medicine*, by Drs. Margaret C. McManamy and Purcell G. Schube. The patient in this case began taking a grain and a half of caffeine citrate (equivalent to 45 milligrams of pure caffeine) three times a day during the fall and winter of 1935, on the
advice of a hospital intern. This overcame the "persistent fatigue and exhaustion which had lasted for three years and which was interfering with her working efficiency." * But she also "became nervous, restless, and could not sleep at night. For her insomnia she was given phenobarbital." 20

* A decade or two later, amphetamine rather than caffeine would very probably have been prescribed for those complaints (see Part V).

In February 1936, in order to pep herself up for a party, she took several of the grain-and-a-half caffeine citrate tablets. "Shortly afterward she became silly, elated, and euphoric. As hours passed she consumed more and more of the tablets until before the party started she had taken the contents of the box-forty tablets, sixty grains," equivalent to 1,800 milligrams of pure caffeine. "She became confused, disoriented, excited, restless and violent, shouted and screamed and began to throw things about her room." Despite her deep religious feelings, "she became exceedingly profane. Finally she collapsed and was removed to a general hospital." The staff there, ignorant of her caffeine "binge," diagnosed her condition as "psychoneurosis, anxiety type, with a hysterical episode."

Five weeks later she again took an entire box of the caffeine citrate tablets and was admitted to the general hospital in "an irrational state varying from wild, manic screaming, kicking and biting, to muttering semi-stupor." Again the role of caffeine was overlooked. A consultation was held. The verdict: "Hysteria without question." When she failed to improve and remained wildly manic for several days, she was transferred to a psychiatric hospital, where she was at first kept tied to a bed. After almost two months in the hospital, during which she slowly recovered, a mild relapse occurred. "Investigation showed that she was drinking coffee, four cups a day." At this point, suspicion for the first time turned to caffeine. "Coffee and tea were removed from her vicinity and soon she again became entirely normal, and was dismissed from the hospital." 21 When we examine the behavioral effects of large doses of caffeine in animal experimentation, even more shocking findings must be noted. Several research teams have reported, for example, that rats fed massive doses of caffeine become aggressive and launch physical attacks against other rats. More remarkable still, a caffeine-crazed rat may bite and mutilate himself. "Automutilation was so acute and intense in some rats that the animals died from hemorrhagic shock." 22

Some readers may here be moved to protest that the bizarre behavior of rats fed massive doses of caffeine is irrelevant to the problems of human coffee drinkers, who are not very likely to bite themselves to death. Let us promptly and wholeheartedly agree. There is a lesson to be learned, nevertheless, from these rat reports. If the drug producing this effect in rats were marijuana, or LSD, or amphetamine, the report would no doubt have made headlines thrown about the country. One of the distorting effects of categorizing drugs as "good," "bad," and "nondrugs" is to protect the "nondrugs" such as caffeine from warranted criticism while subjecting the illicit drugs to widely publicized attacks— regardless of the relevance of the data to the human condition.
Thus we come to the coffee paradox—the question of how a drug so fraught with potential hazard can be consumed in the United States at the rate of more than a hundred billion doses a year (see Chapter 61) without doing intolerable damage—and without arousing the kind of hostility, legal repression, antisocial condemnation aroused by the illicit drugs.

The answer is quite simple. Coffee, tea, cocoa, and the cola drinks have been domesticated. Caffeine has been incorporated into our way of life in a manner that minimizes (though it does not altogether eliminate) the hazards inherent in caffeine use. Instead of its being classified as an illicit drug, thereby grossly amplifying caffeine's potential for harm, ways to make caffeine safer have been searched for and found.

In the first place, people generally take caffeine in forms so diluted as to make it highly unlikely that excessive doses—more than 300 or 400 milligrams at a sitting—will be ingested. The contrast here with alcohol is noteworthy. Whiskey, gin, and other distilled beverages, in contrast to light wines and beer, increase the likelihood that excessive amounts of alcohol will be ingested.

Again, coffee is customarily served with cream or milk, which may at least partially protect the lining of the stomach from the irritation the coffee might otherwise produce. Society’s failure to take similar steps with respect to nicotine—by encouraging the chewing of tobacco, for example, instead of tobacco smoking, thus minimizing the hazard of lung cancer—will be discussed in Part III.

People have also developed the custom of drinking coffee and tea after a meal—further protection for the stomach lining. Cocktails, in contrast are usually drunk before a meal, increasing the inherent hazards.

By keeping coffee, legal, society has avoided extortionate black-market prices that might otherwise bankrupt coffee drinkers and lead them into lives of crime. And coffee drinkers are not stigmatized as criminals, driven into a deviant subculture with all that criminalization entails.

That other drugs now deemed illicit might be similarly domesticated, with a similar reduction in the damage they wreak on individuals and on society, is a possibility readers may wish to keep in mind as they read the chapters that follow.

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Footnotes

Chapter 22


2. Ibid., p. 363.

3. Ibid.

5. Ibid., p. 1106.

6. Ibid.


8. Ibid., p. 482.


10. Ibid.


12. Ibid., p. 490.

13. Ibid., pp. 495-496.


16. Ibid., p. 360.

17. Ibid., p. 368.

18. Ibid., p. 365.

19. Ibid.


21. Ibid.