

Chapter 13

Characterization of the
Tobacco Habit and
Beneficial Effects of Tobacco

Contents

	Page
CHARACTERIZATION OF THE TOBACCO HABIT	349
Nicotine	349
Distinction Between Drug Addiction and Drug Habituation .	350
Tobacco Habit Characterized as Habituation	351
Relationship of Smoking to Use of Addicting Drugs . . .	352
Measures for Cure of Tobacco Habit	354
Summary.	354
BENEFICIAL EFFECTS OF TOBACCO	355
Summary.	356
References	356

Chapter 13

CHARACTERIZATION OF THE TOBACCO HABIT

NICOTINE

Of the known chemical substances present in tobacco and tobacco smoke, only nicotine has been given serious pharmacological consideration in relationship to the tobacco habit. Lewin (17) stated, "The decisive factor in the effects of tobacco, desired or undesired, is nicotine and it matters little whether it passes directly into the organism or is smoked." Support for this statement is based mostly on rationalizations from smoking behavior, analogy to other habits involving pharmacological agents and, to a much lesser extent, on established scientific fact. The latter may be summarized briefly as follows:

1. Only plants with active pharmacological principles have been employed habitually by large populations over long periods; e.g., tobacco (nicotine); coffee, tea, and cocoa (caffeine); betel nut morsel (arecoline); marihuana (cannabinols) : khat (pseudoephedrine); opium (morphine); coca leaves (cocaine); and others (see Lewin, 17).

2. Denicotinized tobacco has not found general public acceptance as a substitute (16, pp. 531-532).

3. Chewing tobacco and using snuff, although providing oral gratification, also furnish nicotine for absorption to produce systemic effects (34).

4. Many but not all smokers can detect a reduction in nicotine content of cigarettes (9).

5. The administration of nicotine mimics the subjective effects of smoking (13). In uncontrolled experiments Johnston administered nicotine hypodermically, intravenously, or orally to smokers and non-smokers. Non-smokers found the effects "queer," whereas many smokers, including Johnston himself, claimed the subjective effects to be identical to those obtained by inhaling cigarette smoke and found that the urge to smoke was greatly reduced during nicotine administration.

In spite of the anecdotal nature of most of this information, the facts are that nicotine is present in tobacco in significant amounts, is absorbed readily from all routes of administration, and exerts detectable pharmacological effects on many organs and structures including the nervous system. The classical pharmacological characterization of nicotine-cellular stimulation followed by depression which is noted in isolated tissue and organ systems has been invoked to explain the widely differing subjective responses of smokers, many of whom describe the effects as stimulating ("smoking relieves the depression of the spirits"), while others obtain a soothing and tranquilizing effect (16, p. 533).

Wilder (33) summarized the literature by noting ". . . observations that cigarette smoking obviously serves a dual purpose: it will mostly pick us up

when we are tired or depressed and will relax and sedate us when we are tense and excited." In order to ascribe such biphasic effects solely to the direct action of nicotine it would be necessary to discount psychological responses and alterations in mood from all other types of stimuli associated with smoking or the use of tobacco, an obvious impossibility. Although Knapp and Domino (15) have shown nicotine in small amounts to exert potent arousal effects in the electroencephalogram in animals, this evidence is difficult to interpret as it relates to smoking in man. A consensus among modern authors (27) appears to be that smoking, and presumably nicotine, exert a predominantly tranquilizing and relaxing effect. The act of smoking is of such complexity that the difficulties associated with objective analysis of whether smoking induces pleasure by creating euphoria or by relieving dysphoria renders objective analysis virtually impossible. The anecdotal literature suggests that sedation plays a more important subjective role in pipe and cigar smoking than with cigarette smoking. Since most pipe and cigar smokers do not inhale, this suggests that bronchial and pulmonary irritation from cigarette smoke after inhaling may contribute an important sensory input to the central nervous system which could modify the sedative effects of nicotine, so that some individuals would describe the experience as stimulating rather than sedative. Heavy cigarette smokers who inhale often describe the act as a pleasant sensory experience which constitutes for them one of the prime drives to continue to smoke. Freedman (10) used the term "pulmonary erotism." Mulhall (19) and Robicsek (22) have commented on this concept. An interesting psychoanalytical approach by Jonas (14), which postulates central nervous system counterirritation to constant pulmonary irritation from smoking, is based upon this concept. If pulmonary irritation is a pleasure factor it probably is not related to nicotine alone but to other irritants in smoke and could represent a non-specific increase in afferent sensory discharge from the whole respiratory tract. A gap in knowledge exists in this area. Furthermore, until carefully controlled experiments with nicotine are conducted in man, the literature will be burdened further with anecdote and hypothesis rather than fact.

DISTINCTION BETWEEN DRUG ADDICTION AND DRUG HABITUATION

Smokers and users of tobacco in other forms usually develop some degree of dependence upon the practice, some to the point where significant emotional disturbances occur if they are deprived of its use. The evidence indicates this dependence to be psychogenic in origin. In medical and scientific terminology the practice should be labeled *habituation* to distinguish it clearly from *addiction*, since the biological effects of tobacco, like coffee and other caffeine-containing beverages, betel morsel chewing and the like, are not comparable to those produced by morphine, alcohol, barbiturates, and many other potent addicting drugs. In fact, to make this distinction, the World Health Organization Expert Committee on Drugs Liable to Produce Addiction (35) created the following definitions which are accepted throughout the world as the basis for control of potentially dangerous drugs.

Drug Addiction

Drug addiction is a state of periodic or chronic intoxication produced by the repeated consumption of a drug (natural or synthetic). Its characteristics include:

- 1) An overpowering desire or need (compulsion) to continue taking the drug and to obtain it by any means;
- 2) A tendency to increase the dose;
- 3) A psychic (psychological) and generally a physical dependence on the effects of the drug;
- 4) Detrimental effect on the individual and on society.

Drug Habituation

Drug habituation (habit) is a condition resulting from the repeated consumption of a drug. Its characteristics include:

- 1) A desire (but not a compulsion) to continue taking the drug for the sense of improved well-being which it engenders;
- 2) Little or no tendency to increase the dose;
- 3) Some degree of psychic dependence on the effect of the drug, but absence of physical dependence and hence of an abstinence syndrome;
- 4) Detrimental effects, if any, primarily on the individual.

TOBACCO HABIT CHARACTERIZED AS HABITUATION

Psychogenic dependence is the common denominator of all drug habits and the primary drive which leads to initiation and relapse to chronic drug use or abuse (25). Although a pharmacologic drive is necessary it does not need to be a strong one or to produce profound subjective effects in order that habituation to the use of the crude material becomes a pattern of life. Besides tobacco, the use of caffeine in coffee, tea, and cocoa is the best example in the American culture. Another example, the chewing of the betel morsel, exists on a world scale comparable to tobacco and involves several hundred million individuals of both sexes and of all races, classes, and religions (17). The morsel contains arecoline from the areca nut, an ingredient of the mixture. It is a very mild stimulant of the nervous system which is ordinarily no more detectable than nicotine subjectively. The morsel is chewed from morning to night, from infancy to death, and creates a craving more powerful than that for tobacco. As with tobacco, oral gratification plays an important role in this habit.

Thus, correctly designating the chronic use of tobacco as habituation rather than addiction carries with it no implication that the habit may be broken easily. It does, however, carry an implication concerning the basic nature of the user and this distinction should be a clear one. It is generally accepted among psychiatrists that addiction to potent drugs is based upon serious personality defects from underlying psychologic or psychiatric disorders which may become manifest in other ways if the drugs are removed (32).

Even the most energetic and emotional campaigner against smoking and nicotine could find little support for the view that all those who use tobacco,

coffee, tea, and cocoa are in need of mental care even though it may at some time in the future be shown that smokers and non-smokers have different psychologic characteristics.

RELATIONSHIP OF SMOKING TO USE OF ADDICTING DRUGS

Undoubtedly, the smoking habit becomes compulsive in some heavy smokers but the drive to compulsion appears to be solely psychogenic since physical dependence does not develop to nicotine or to other constituents of tobacco nor does tobacco, either during its use or following withdrawal, create psychotoxic effects which lead to antisocial behavior. Compulsion exists in many grades, from the habit pattern of the cigarette smoker who subconsciously reaches into his pocket for a cigarette and may even light his lighter before he realizes that he is already holding a lighted cigarette in his lips, to the heroin addict who becomes involved in crime, sometimes in murder, in his search for drugs to satisfy his addiction. Clearly there is a significant difference, not only in the personality involved but also in the effects upon the user and his relationship to society.

Proof of physical dependence requires demonstration of a characteristic and reproducible abstinence syndrome upon withdrawal of a drug or chemical which occurs spontaneously, inevitably, and is not under control of the subject. Neither nicotine nor tobacco comply with any of these requirements (26). In fact, many heavy smokers may cease abruptly and, while retaining the desire to smoke, experience no significant symptoms or signs on withdrawal. On the other hand, it is well established that many symptoms and a few signs which may be observed objectively by others may occur following cessation of smoking, but no characteristic abstinence syndrome occurs (16, p. 539). Rather, a gamut of mild symptoms and signs is experienced and observed as in any emotional disturbance secondary to deprivation of a desired object or habitual experience. These may be manifest in some persons as an increased nervous excitability, such as restlessness, insomnia, anxiety, tremor, palpitation, and in others by diminished excitability, such as drowsiness, amnesia, impaired concentration and judgment, and diminished pulse. The onset and duration of these withdrawal symptoms are reported by different authors in terms of days (20), weeks (30), or months (12, 28), obviously an inconsistency if one attempts to relate these to nicotine deprivation. In contrast to drugs of addiction, withdrawal from tobacco never constitutes a threat to life. These facts indicate clearly the absence of physical dependence.

This view is supported further by consideration of the diversity of methods which are reported (16, pp. 540-546) to be successful in treatment of smoking withdrawal. Most methods have been based strictly on symptomatic treatment; for those who are depressed, stimulants such as caffeine, theobromine, and metrazol; and for those who are excited, sedatives, barbiturates, and the like. Hansel (11) treated his patients by stimulating them in the daytime with 10 to 15 mg of dextroamphetamine and putting them to sleep at night with a sedative. At least this treatment has the advantage that it does not interfere with the usual patterns of diurnal and nocturnal behavior.

In contrast to addicting drugs, the tendency to continue to increase the dose of tobacco is definitely self-limiting because of the appearance of nicotine toxicity. Undoubtedly there is a considerable variation among individuals in inherited capabilities to tolerate nicotine. In some individuals this may completely deprive them of the pleasure of using tobacco (30). Although some tolerance is also acquired with repeated use, this is not sufficient to permit the nervous system to be exposed to ever-increasing nicotine concentrations as is the case with addicting drugs. This in itself may militate against the development of the adaptive changes in nerve cells which create physical dependence.

It is a well-known fact among smokers and other users of tobacco that certain toxic effects such as nausea and vomiting, which accompany the initial use of tobacco, disappear with repeated use. This tolerance is only relative and excessive use may at any time initiate these signs and symptoms even in the heavy smoker or other user (6).

Acquired tolerance may take two forms:

(a) A low grade tissue tolerance in mucous and pulmonary membranes to the irritants in tobacco or tobacco smoke (8). This probably involves adaptive changes in cell membranes, similar to those which occur with other local irritants, and a reduction in sensory nervous input permitting more prolonged exposure to those irritants without unpleasant subjective manifestations.

(b) Specific organ tolerance to nicotine which is also relatively low grade and comparatively short-lived. This tolerance, which may permit the administration of nicotine in quantities several times larger than those which would induce toxic signs and symptoms initially (13), varies with age (17), sex (30), and duration of exposure. Differences in metabolic disposition are not enough to account for tolerance (17, 29, 31). Animal studies indicate considerable tolerance to small but little if any to convulsant or lethal doses (2,4).

Another form of adaptation to tobacco which is psychologic in origin is also common to many other drug habits. It might better be termed toleration than tolerance; the user "puts up with" symptoms of irritation and nicotine toxicity which are unacceptable to the novice. Many smokers accept persistent cough, bouts of nausea, and other unpleasant manifestations of irritation and toxicity.

Much controversy concerns the relationship of smoking to other drug habits especially to those agents which are addicting like alcohol, the opiates, and others. Since the motivating factor in the habitual use of drugs of any type is the desire to change the status quo in order to achieve pleasure, to relieve monotony, to abolish tension or grief, etc., it is not unusual that many individuals in search of such gratification will habitually rely on several substances. Attempts to establish cause and effect relationships among the several habits have not been meaningful. A more plausible explanation is that the personality characteristics which lead to the search for change may find mild expression in smoking, coffee and moderate alcohol drinking, and in an exaggerated form by abusing the narcotic and stimulant drugs of addiction.

MEASURES FOR CURE OF TOBACCO HABIT

Measures directed at the cure of the tobacco habit have been designed principally to modify or abolish the psychogenic, sensory, or pharmacologic drives (16, pp. 540-546).

In the psychotherapeutic area these include psychoanalytic technics, hypnotism, antismoking campaigns based upon fear of health consequences, religion, group psychotherapy (similar to Alcoholics Anonymous), and tranquilizing or stimulant drugs.

Modification of tobacco taste by astringent mouthwashes (silver nitrate and copper sulfate); bitters (quinine, quassia), local anesthetics (benzocaine lozenges), substitution of other tastes (essential oils and flavors), and production of a dry mouth (atropine or stramonium) are all measures which have been aimed at diminishing the sensory drives.

Administration of oral lobeline, a substance from Indian tobacco, with weak nicotine-like actions as a nicotine substitute has had rather extensive trial (5, 21, 36), and commercial preparations are available. Carefully controlled studies have failed to establish the value of lobeline (1, 18, 24).

Of the methods cited above, those which deal with the psychogenic drives have been the more successful since ultimate realization of the goal involves the firm mental resolve of the individual to stop smoking. There is no acceptable evidence that this goal can be achieved solely by modifying sensory drives or using tobacco substitutes.

SUMMARY

The habitual use of tobacco is related primarily to psychological and social drives, reinforced and perpetuated by the pharmacological actions of nicotine on the central nervous system, the latter being interpreted subjectively either as stimulant or tranquilizing dependent upon the individual response. Nicotine-free tobacco or other plant materials do not satisfy the needs of those who acquire the tobacco habit.

The tobacco habit should be characterized as an *habituation* rather than an *addiction*, in conformity with accepted World Health Organization definitions, since once established there is little tendency to increase the dose; psychic but not physical dependence is developed; and the detrimental effects are primarily on the individual rather than society. No characteristic abstinence syndrome is developed upon withdrawal.

Acquired tolerance, even though comparatively low grade, is important in overcoming nausea and other mild signs of nicotine toxicity and is a factor in continued use of tobacco.

Discontinuation of smoking, although possessing the difficulties attendant upon extinction of any conditioned reflex, is accomplished best by reinforcing factors which interrupt the psychogenic drives. Nicotine substitutes or supplementary medications have not been proven to be of major benefit in breaking the habit.

BENEFICIAL EFFECTS OF TOBACCO

Evaluation of the effects of smoking on health would lack perspective if no consideration was given to the possible benefits to be derived from the occasional or habitual use of tobacco. A large list of possible physical benefits can be compiled from a fairly large literature, much of which is based upon anecdote or clinical impression.

Even in those circumstances where a substantial body of fact and experience supports the attribute, the purported benefits are comparatively inconsequential in a medical sense. Examples are: (a) maintenance of good intestinal tone and bowel habits (23), and (b) an anti-obesity effect upon reduced hunger and a possible elevation in blood sugar (3). Insofar as these are supported by fact they represent tangible assets and cannot be totally dismissed. On the other hand, it would be difficult to support the position that these attributes would carry much weight in counter-balancing a significant health hazard.

But it is not an easy matter to reach a simple and reasonable conclusion concerning the mental health aspects of smoking. The purported benefits on mental health are so intangible and elusive, so intricately woven into the whole fabric of human behavior, so subject to moral interpretation and censure, so difficult of medical evaluation and so controversial in nature that few scientific groups have attempted to study the subject.

The drive to use tobacco being fundamentally psychogenic in origin has the same basis as other drug habits and in a large fraction of the American population appears to satisfy the total need of the individual for a psychological crutch.

An attempted evaluation of smoking on mental health becomes more realistic if one is willing to confront the question, ridiculous as it may seem, What would satisfy the psychological needs of the 70,000,000 Americans who smoked in 1963 if they were suddenly deprived of tobacco? Clearly there is no definitive answer to this question but it may be illuminated by analogy with the past.

Historically, man has always found and used substances with actual or presumed psychopharmacologic effects ranging in activity from the innocuous ginseng root to the most violent poisons. In China, traditions and custom endowed the ginseng root with remarkable health-giving properties. The strength of this belief was so strong and the supply so short that the root often became a medium of exchange. The value of the root increased in direct proportion to its similarity in appearance to the human figure.

The remarkable aspect of this situation is that the ginseng root is historically the world's most renowned placebo, since science has failed to establish that it contains any active pharmacologic principle.

It would be redundant to recount here all of the potent substances at the other end of the scale. It will suffice to note that this human drive is so universal and may be so powerful that man has always been willing to risk and accept the most unpleasant symptoms and signs-hallucinations and delusions, ataxia and paralysis, violent vomiting and convulsions, poverty and malnutrition, destructive organic lesions, and even death.

If the thesis is accepted that the fundamental nature of man will not change significantly in the foreseeable future, it is then safe to predict that man will continue to utilize pharmacologic aids in his search for contentment. In the best interests of the public health this should be accomplished with substances which carry minimal hazard to the individual and for society as a whole. In relating this principle to tobacco it may be reemphasized that the hazard, serious as it may be, relates mainly to the individual, whereas the indiscriminate use of more potent pharmacologic agents without medical supervision creates a gamut of social problems which currently constitutes a major concern of government as indicated by the recent (1962) White House Conference on Narcotic and Drug Abuse (32).

SUMMARY

Medical perspective requires recognition of significant beneficial effects of smoking primarily in the area of mental health.

These benefits originate in a psychogenic search for contentment and are measureable only in terms of individual behavior. Since no means of quantitating these benefits is apparent the Committee finds no basis for a judgment which would weigh benefits versus hazards of smoking as it may apply to the general population.

REFERENCES

1. Bartlett, W. A., Whitehead, R. W. The effectiveness of meprobamate and lobeline as smoking deterrents. *J Lab Clin Med* 50: 278-81, 1957.
2. Behrend, A., Thienes, C. H. The development of tolerance to nicotine by rats. *J Pharmacol Exp Ther* 48: 317-25, 1933. [Abstract] *J Pharmacol Exp Ther Proc* 42: 260, 1931.
3. Brozek, J., Keys, A. Changes in body weight in normal men who stop smoking cigarettes. *Science* 125: 1203, 1957.
4. Dixon, W. E., Lee, W. E. Tolerance to nicotine. *Quart J Exp Physiol* 5: 373-83, 1912.
5. Dorsey, J. L. Control of the tobacco habit. *Ann Intern Med* 10: 628-31, 1936.
6. Edmunds, C. W. Studies in tolerance, l-nicotine and lobeline. *J Pharmacol Exp Ther* 1: 27-38, 1909.
7. Edmunds, C. W., Smith, M. I. Further studies in nicotine tolerance. *J Pharmacol Exp Ther* 8: 131-2, 1916. Also: *J Lab Clin Med* 1: 315-21, 1915-16.
8. Farrell, H. The billion dollar smoke. A working truth in reference to cigarettes and cigarette smoking. *Nebraska Med J* 18: 226-8, 1933.
9. Finnegan, J. K., Larson, P. S., Haag, H. B. The role of nicotine in the cigarette habit. *Science* 102: 94-6, 1945.
10. Freedman, B. Conditioned reflex and psychodynamic equivalents in alcohol addiction. An illustration of psychoanalytic neurology, with rudimentary equations. *Quart J Stud Alcohol* 9: 53-71, 1948.

11. Hansel, F. K. The effects of tobacco smoking upon the respiratory tract. *South M J* 47: 745-9, 1954.
12. Head, J. R. The effects of smoking, *Illinois Med J* 76: 83-287, 1939.
13. Johnston, L. Tobacco smoking and nicotine. *Lancet London* 2: 742, 1942.
14. Jonas, A. D. Irritation and counterirritation. A hypothesis about the autoamputative property of the nervous system. New York Vantage Press, 1962. 368 p.
15. Knapp, D. E., Domino, E. F. Action of nicotine on the ascending reticular activating system. *Int J Neuropharmacol* 1: 333-51, 1962.
16. Larson, P. S., Haag, H. B., Silvette, H. Tobacco: Experimental and Clinical Studies. Baltimore, The Williams & Wilkins Company, 1961. 932 p.
17. Lewin, L. Phantastica: Narcotic and stimulating drugs: Their use and abuse. London, Kegan Paul, Trench, Trubner, 1931. 335 p.
18. Miley, R. A., White, W. G. Giving up smoking. *Brit Med J* 1: 101, 1958.
19. Mulhall, J. C. The cigarette habit. *Trans Amer Laryng Assn* 17: 192-200, 1895. Also: *Ann Otol* 52: 714-21, 1943; and *N Y Med J* 62: 686-8, 1895.
20. Ochsner, A. Smoking and cancer: A doctor's report. *N Y J Messner*, 1954, 86 p.
21. Rapp, G. W., Olen, A. A. Lobeline and nicotine. *Amer J Med Sci* 230: 9, 1955.
22. Robicsek, M. U. H. Eine neue Therapie der Nikotinsucht oder die Kunst, das Rauchen zu lassen. *Fortschr Med* 50: 1014-5, 1932.
23. Schnedorf, J. G., Ivy, A. C. The effects of tobacco smoking on the alimentary tract. An experimental study of man and animals. *JAMA* 112: 898-904, 1939.
24. Scott, G. W., Cox, A. G. C., Maclean, K. S., Price, T. M. L., Southwell, N. Buffered lobeline as a smoking deterrent. *Lancet* 1: 54-5, 1962.
25. Sewers, M. H. Medical perspectives on habituation and addiction. *JAMA* 181: 92-8, 1962.
26. Sewers, M. H., Deneau, G. A. Tolerance and dependence to CNS drugs. In: Root, W. S., Hoffman, F. G. eds. *Physiological Pharmacology*, N Y Acad Press, 1963. p. 565-640. Vol. 1: Nervous system.
27. Silvette, H., Larson, P. S., Haag, H. B. Medical uses of tobacco past and present. *Virginia Med Monthly* 85: 472-84, 1958.
28. Swinford, V., Jr., Ochota, L. Smoking and chronic respiratory disorders. Results of abstinence. *Ann Allerg* 16: 455-8, 1958.
29. Takeuchi, M., Kuroguchi, Y., Yamaoka, M. Experiments on the repeated injection of nicotine into albino rats. *Folia Pharmacol Jap* 50: 66-9, 1954
30. Von Hofstatter, R. Uber Abstinenzerscheinungen beim Einstellen des Tabakrauchens. *Wien med Wschr* 86: 42-3, 73-6, 1936.
31. Werle, E., Muller, R. Uber den Abbau von Nicotin durch tierisches Gewebe. II. *Biochem* 308: 355-8, 1941.
32. White House Conference on Narcotic and Drug Abuse. Sept. 27-28, 1962. *Proc Govt Print Off*, 1963. 330 p.

33. Wilder, J. Paradox reactions to treatment. *New York J Med* 57: 3348-52.1957.
34. Wolff, W. A., Giles, W. E. Studies on tobacco chemistry. *Fed Proc* 9: 248, 1950.
35. World Health Organization. Expert Committee on Addiction-Producing Drugs. Seventh Report. 15 p. (Its Techn Rep Ser No. 116, 1957.)
36. Wright, I. S., Littauer, D. Lobeline sulfate. its pharmacology and use in the treatment of the tobacco habit. *JAMA* 109: 649-54, 1937.