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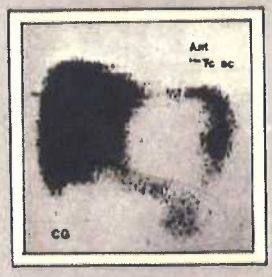
Emory University Medical Board Review Quiz:

Renal Medicine

J. Willis Hurst, M.D., William A. Peters, M.D.



The Hospital Physician Surgical Board Review Quiz:

The Liver

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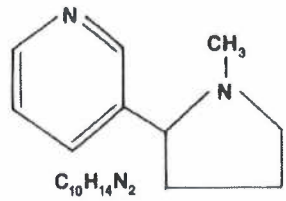
Nicotine



By Lewis Goldfrank, M.D., Menachem Melinek, M.D., and Alan Blum, M.D.
Consulting Editor: Richard S. Weisman, Pharm.D.

Nicotine is a highly toxic chemical found in the leaves of the tobacco plant (*Nicotiana tabacum*). It is the major pharmacologically active constituent in tobacco. Nicotine is a colorless, bitter-tasting liquid, water soluble, volatile, and strongly alkaline in reaction. It has no therapeutic uses.

A 58-year-old architect presented to the emergency service complaining of headaches, cold sweats, and feeling faint for the past three or four days. He stated that he had suffered a mild heart attack two years ago, and feared he might have another one.

Since his heart attack, he had been repeatedly advised by his own physician to stop smoking. This advice was given in the strongest terms one week prior to this ER visit. Within two days, he had reduced his smoking from two packs per day to zero. His present symptoms started a day or two later, and it was only with enormous effort that the patient resisted the urge to resume smoking.

Physical examination revealed a well-nourished male in an obvious state of anxiety and restlessness. BP was 115/70, R 18, T 37°C (98.6°F), P 60 and regular. The patient was diaphoretic, with slightly cool skin. Pupils were equal and reactive. Extra-ocular motions were intact. The fundi were benign. The neck was supple, with no adenopathy and no enlargement of the thyroid. The lungs were clear. The heart rate was regular, and no murmurs were heard. The abdomen was soft and non-tender, with normal bowel sounds and no organomegaly. Neurological examination was unremarkable.

Laboratory studies (CBC, SMA-6, urinalysis, and cardiac enzymes) were all within normal limits. ECG showed

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Butting In Where it Counts

By Alan Blum, M.D.

- A 31-year-old steelworker, a father of four, visits the emergency room complaining of abdominal pain. Apart from previous episodes of such pains, he is in generally good health. He drinks six cups of coffee and two or three cans of beer daily. He admits to fears of being laid off from work, and has recently increased his smoking to three packs of Marlboros per day.
- A 45-year-old insurance executive presents to the emergency room complaining of severe and sudden onset of pain in the left side of the chest and left shoulder. The ECG indicates acute inferior myocardial infarction. In addition to being in a sedentary occupation and getting too little exercise, he is 20 pounds overweight and smokes two packs of Kent per day.
- A 28-year-old psychologist presents to the gynecology clinic for her annual Pap smear. She has no complaints other than occasional cough and cold symptoms. She is concerned about an article she just read in a popular magazine, which reported the adverse effects of smoking and the use of oral contraceptives. Accordingly, she has decided to stop using the pill and has asked to be fitted for a diaphragm.
- A 15-year-old high school girl has been referred by

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Q waves in leads II, III, and aVF, with no ST segment elevation or depression, indicating an old inferior wall infarction. The patient's physician later confirmed that these findings were consistent with other recent tracings.

Assessment of mental status revealed marked anxiety and irritability, but no evidence of depression. Nor was there any evidence of delusions, hallucinations, or other thought-process disorder. The patient was oriented to person, place, and time, but had difficulty performing serial sevens. Proverb testing elicited a slow but appropriate response. Short-term memory, tested by forward and backward recall of number-sequences, was moderately impaired. The patient attributed his inability to concentrate to lack of sleep over the past few days, since his abrupt cessation of smoking.

The impression was an anxiety-like state secondary to withdrawal from tobacco. The ER physician reluctantly instructed the patient to resume moderate smoking until

Seduction of the innocent: Cigarette-shaped sticks of bubble-gum are marketed in a package virtually identical to real Marlboro cigarettes, thereby letting children anticipate using the real thing, as cigarette-smoking adults.

the school nurse because of frequent absences from classes. She is hoarse, and has a loud cough. She admits to smoking about a half of a pack of Virginia Slims cigarettes daily for the last four years.

None of these patients presents with a primary concern about smoking, and none of them expect a lecture on the subject at this time. However, in each case, the clinician has an opportunity to counsel the patient about cigarette smoking. The approach should be personalized, taking into account social, cultural, ethnic, and occupational factors. Different methods will be needed for a blue-collar worker beginning to show symptoms of a cigarette-related illness, a seriously ill executive, a professional person who already expresses knowledge of the hazards of smoking but continues her habit, and a high school girl who is relatively new to smoking.

For the steelworker, the best approach might be to talk about the chances of increased fitness for work, athletic ability, and even an improved sex life — if he were to stop smoking. (However, the phrase "stop smoking" sounds like a lecture. A lighter or more imaginative phrase, such as "kick the cigs" may be more effective.) The money saved and the reduced risk of fire at home might also be worth mentioning.

Once the executive is over the immediate crisis, long term management of the case will require that he fully

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In the 1940's, there were many variations of the "More Doctors Smoke Camels" ad which appeared in *Time* magazine. Even a respected source like *JAMA* could carry an ad (March 12, 1949) recommending one brand as better for patients with throat conditions, and "For your own smoking as well, Doctor" (right).

he could see his own physician again. A week later, the patient reported that he felt better, and he was referred to a special program to help him stop smoking.

What is nicotine?

Nicotine is a highly toxic chemical found in the leaves of the tobacco plant (*Nicotiana tabacum*). It is the major pharmacologically active constituent in tobacco. Nicotine is a colorless, bitter-tasting liquid, water soluble, volatile, and strongly alkaline in reaction. It has no therapeutic uses, but is used industrially as an insecticide.

How is nicotine absorbed and metabolized?

About 90% of the nicotine in inhaled mainstream smoke is absorbed from the respiratory tract. But nicotine can be readily absorbed from almost any site: through the oral or gastrointestinal mucosa, or directly through the skin. Once absorbed, the serum half-life of nicotine is 20 to 60 minutes.

Most of the absorbed nicotine is metabolized by the liver, but the kidneys and lungs also are involved. The breakdown products are of relatively low toxicity. Approximately 10% may be excreted unaltered. Excretion in the urine is complete within three to four days of cessation of smoking. Because of its alkalinity, nicotine is more completely ionized and more rapidly excreted when the urine is acidic. Nicotine is also excreted in the milk of lactating women who smoke.

What are the physiological effects of nicotine toxicity?

Whatever the route of absorption — alveolar, mucosal, gastrointestinal, or through the skin — nicotine's toxic effects evolve from the same three principal sites of action: the autonomic ganglia, the somatic neuromuscular junction, and afferent fibers from sensory receptors.

continued overleaf

In small doses, nicotine has a generally stimulatory effect. EEG studies confirm the excitatory effect of low-dose nicotine. Stimulation of peripheral sensory receptors (such as the chemoreceptors in the carotid body, pain and temperature receptors in the skin and tongue, and stretch receptors in the gastrointestinal tract and lung) may also produce central, systemic effects. Small doses of nicotine cause increased release of catecholamines from the adrenal medulla, and enhanced neurotransmission associated with an increase in the excitatory action of acetylcholine at the post-synaptic level (the pre-synaptic effect of nicotine is not yet understood).

With larger doses, the initial stimulation gives way to a depressant effect, due to *inhibition* of catecholamine release and *decreased* ganglionic and neuromuscular transmission.

The most complex effects of nicotine are seen in the cardiovascular system. Nicotine can increase heart rate by excitation of sympathetic fibers or by inhibition of parasympathetic (vagal) fibers; or heart rate may be decreased by vagal stimulation or sympathetic blockade.

"With larger doses, the initial stimulation gives way to a depressant effect, due to *inhibition* of catecholamine release and *decreased* ganglionic and neuromuscular transmission."

Actions at remote sites — such as the adrenal medulla, and the chemoreceptors of the carotid and aortic bodies — can also have a profound effect on cardiac output, by causing alterations in heart rate, contractility, venous return and filling pressure, and total peripheral resistance.

In summary, nicotine acts on a wide range of neuroeffectors, with both stimulant and depressant results. "The ultimate response of any one structure or system may thus represent the algebraic summation of the several different and opposing effects of nicotine."[1]

What are the effects of acute nicotine poisoning?

While the most commonly encountered toxic effects of nicotine are seen in association with tobacco use, cigarette smoking does not produce acute poisoning. Smoking results in the absorption of 50 to 150 μg of nicotine per puff, or 1 to 2 mg per cigarette. Serum levels of nicotine absorbed from inhaled smoke are generally below 0.5 μg/dl. Acute toxicity and death may occur with serum levels between 0.5 and 1.0 mg/dl.

At the low levels of nicotine seen in smokers, clinical findings include increased heart rate, respiratory rate, and blood pressure. Arterial blood carboxyhemoglobin may be elevated. An antidiuretic effect is produced by increased release of vasopressin (ADH). Activation of parasympathetic ganglia and cholinergic nerve endings in the bowel results in increases in gastric secretion and GI tone and motility.

However, when nicotine is ingested (in tobacco, or in certain pesticides), much more may be rapidly absorbed, with correspondingly more severe toxic effects. Direct exposure of the skin to concentrated liquid nicotine (from pesticides, or during extraction from tobacco in the processing and manufacture of cigarettes) may also produce serious illness.

Acute nicotine poisoning may produce a variety of clinical effects, including seizures, vomiting, diarrhea, bradycardia, hypotension, weakness, confusion and changes in the level of consciousness, and respiratory depression. Severe respiratory depression produces the characteristic blood-gas picture of respiratory acidosis. Death may result from paralysis of the respiratory muscles. The lethal dose of nicotine is 40 to 60 mg.

What is the treatment for acute nicotine poisoning?

As little as 4 mg of orally ingested nicotine may produce serious symptoms in nonhabituated individuals. Children are sometimes brought to the ER after having eaten several cigarettes, but GI absorption of nicotine is minimized in such cases because vomiting removes most of the tobacco from the stomach. Ingestion of nicotine-containing pesticides is more serious, and requires prompt treatment. Gastric lavage with a solution of potassium permanganate is an old form of treatment; lavage with activated charcoal is safer and equally effective. Mechanical ventilatory support and oxygen therapy may be needed.

In cases of exposure of the skin to concentrated liquid nicotine, the patient's clothing must be removed and the skin washed thoroughly, to reduce absorption.

Because of the variety of stimulatory and depressant effects produced in the sympathetic and parasympathetic systems, nicotine toxicity is a complex therapeutic problem. Atropine may be used to counteract parasympathetic overstimulation. Phentolamine (Regitine®) may be used for sympathetic overstimulation. Seizures should be controlled by standard means.

What are the addictive properties of nicotine?

Because human addiction to nicotine is invariably associated with smoking, it is difficult to separate the habituating physical and psychological effects of one from the other. There is some controversy as to the etiology of dependence on tobacco, the need for smoking, and the cause of withdrawal symptoms. Evidence for the physiological role played by nicotine in cigarette addiction can be seen in several ways. Serum levels of nicotine tend to remain fairly constant in habitual smokers, and smoking frequency is inversely related to the cigarette's nicotine content. Because of its acidifying effect in the urine, Vitamin C speeds up nicotine excretion; patients taking Vitamin C may therefore end up smoking more frequently. Nicotine supplementation (both oral and intravenous)

has been experimentally shown to decrease the frequency of smoking. Withdrawal symptoms may develop in patients who unwittingly begin smoking cigarettes of lower nicotine content. All of these findings suggest that smokers titrate their intake and serum levels of nicotine.

On the other hand, part of the dependence on smoking is probably due to oral gratification and other psychological components, including those which are suppressed by smoking and appear during withdrawal. Also, in experiments with intravenous nicotine infusion, volunteers did smoke fewer cigarettes — but there was far *less* reduction in smoking seen than would have been expected if nicotine were the only factor in the craving for tobacco. The conclusion is that nicotine plays a definite — but not exclusive — role in the smoking habit.[2]

Tolerance to the effects of nicotine does develop in some people, and has been experimentally shown to develop in rats. The existence of "nicotine receptor" cells in the brain is currently under investigation.

"Withdrawal symptoms may develop in patients who unwittingly begin smoking cigarettes of lower nicotine content."

What are the clinical manifestations of nicotine withdrawal?

The objective physical signs observed after cessation of smoking include decreased heart rate and blood pressure, diaphoresis, and rapid respiration. Increased slow rhythms on the EEG are also seen. These events begin within the first hour after the last cigarette (corresponding to the serum half-life of nicotine), and reach their peak between six and 98 hours later.

The most consistent and dramatic subjective symptom seen after stopping tobacco use is an intense urge to smoke. Other symptoms include anxiety, impaired concentration and memory, depression or hostility, headaches and muscle cramps, sleep disturbances, GI disturbances, and increased appetite. Symptoms may be mild or significant. They may appear as soon as 20 minutes after the last cigarette, but may also present hours, or even days later, depending on the degree of the patient's habit and addiction. Symptoms may be as much psychological in origin (withdrawal from the act of smoking) as physiological (withdrawal from nicotine).

What is the treatment for acute nicotine withdrawal?

The differential diagnosis of nicotine withdrawal includes withdrawal from any other addictive or habituating substance, and other causes of anxiety.

In treating the patient in withdrawal, many approaches have been tried. Most involve breaking the smoking habit. In the case of acute nicotine-withdrawal syndrome, some clinicians will reluctantly advise the patient to resume moderate smoking. This is a stop-gap measure only, aimed at relieving the worst manifestations of withdrawal until a more gradual detoxification program can be instituted. It should be kept in mind that such advice is directly contrary to the desired goal of having the patient stop smoking. The use of sedative medications is discouraged. Other therapeutic measures that might be taken to help the patient in acute withdrawal employ general emotional support and counseling. Consumer-oriented patient education about the nature of the product and its promotion may in the long run be the most effective approach to prevent resumption of smoking (see accompanying article). □

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Acknowledgement: We wish to thank Mr. Keith Lobert for his assistance in the preparation of this article.

understands the role of smoking in his condition. Here, cessation of smoking will be only part of a generalized program to institute and maintain good health habits.

The psychologist who diligently reports for an annual Pap smear is probably well motivated about maintaining her health, yet she chooses to give up the pill, rather than stop smoking. She may have been misinformed about the relative risks involved. A straightforward presentation of the facts should take place before any cervical smear is taken, to emphasize the proper priorities.

The teenager, perhaps more anxious about her self-image than any of the others (and therefore more susceptible to the glamorous images in cigarette advertisements) may or may not respond to a discussion about lung cancer and heart disease; it may be more helpful to emphasize the physical unattractiveness of yellowed teeth, bad breath, and constant coughing, as well as the drain on her probably-limited finances.

The goal in each case is to get the patient to re-examine his or her habit, by presenting the facts in detail, and in a manner that the patient will listen to and comprehend.

Such counseling is rarely undertaken. A recent study showed that only about a fourth of physicians even talk to their adolescent patients about cigarette smoking.[1] Yet such low-keyed informative dialogue — not preaching — may well be what patients are seeking when they criticize physicians for not listening.

One-to-one counseling is difficult and time-consuming, and demands a close relationship between patient and clinician. Few clinicians seem willing to invest the time and effort needed. But that investment is what is required to de-program the smoker or prospective smoker. It is too important a task to be relegated to ancillary personnel, a pamphlet off a shelf, or referral to a stop-smoking clinic. Smokers frequently say they have been hoping for an opportunity to discuss their habit with a physician, and sense the caring nature of the clinician who exhibits such personal commitment and concern. Continued encouragement and support during subsequent visits then takes relatively little time. The clinician who gains a reputation for truly caring about patients should also find an improvement in overall patient cooperation, making the practice of medicine more rewarding and effective.

Unfortunately, there seem to be few incentives, particularly in the hospital setting, for clinicians to practice the communication skills needed for effective counseling — for it is not enough simply to say, "Smoking is bad for you, so stop!" Many clinicians consider themselves advocates of prevention even when they do virtually nothing in this area. "You can't tell people what to do," they reason. "Besides, they've already heard about smoking. The ads were even taking off television, and everyone still smokes!" The fact is that most people cannot identify even a single risk factor for myocardial infarction.[2] Only one in five people are aware that cigarette smoking is a major risk factor for M.I.[3] Obviously, they *haven't* heard it all before.

The clinician, then, has the responsibility to present these facts to patients. The approach should be one of concerned encouragement, rather than an attempt to instill fear and guilt. Even so, there is no guarantee of success. Then why waste time even trying to reverse a long-standing addiction?

One answer is that although most people who stop smoking claim that they did it alone, nearly all admit on further questioning that the physician was a significant impetus.[1] Knowledge of the facts about smoking does make a difference. Consider that 25 years ago, two-thirds of all adults, including physicians, were smokers. Today, the overall figure is one-third — but only one-*sixth* among physicians. This reduction suggests that physicians' greater awareness and understanding of the dangers of cigarette smoking made a real difference. If physicians, who are subject to the same temptations and pressures as anyone else, can be convinced, so can others — if they are presented with the facts.

Clinicians who are not smokers can be effective counselors as long as they do not dismiss the problem or shift the entire responsibility onto the patient. A clinician who smokes sets a personal example for patients — a good and effective one if he stops smoking himself; a very poor and discouraging one if he continues.

"De-programming the smoker or prospective smoker is too important a task to be relegated to ancillary personnel, a pamphlet off a shelf, or referral to a stop-smoking clinic."

Whether or not the clinician smokes, individual counseling is still the most effective way to help patients break their smoking pattern. For contrary to the barrage of how-to-quit claims, there is no simple formula for dealing with this problem. No method has been proven superior to the individual clinician's personal involvement.

To be an effective counselor, clinicians must practice and perfect their communication skills, just as they must practice their skills in physical diagnosis. Those skills can then be used to present the case against smoking: its promotion, its addictive effects, and its role in illness and health costs.

The Growth of an Epidemic

Tobacco has been used for thousands of years; but cigarettes — the only tobacco product which is inhaled — were not mass-produced until about a century ago. At that time, the per capita consumption was only about 25 per year. Last year, about 4,000 cigarettes were smoked for every adult American.

In the 19th century, the German bacteriologist Robert Koch suggested that spitting — such as by cigar smokers

and tobacco chewers — spread tuberculosis. A number of anti-spitting ordinances were soon passed, and the tobacco companies shifted most of their production to cigarettes. However, even well into this century, cigarette smoking still hadn't caught on widely, and definitely not among women.

It took a well-promoted campaign to make people equate smoking Camels with romance, social success, and sophistication. The American Tobacco Company advertised, "To keep a slender figure, reach for a Lucky instead of a sweet!" Some of Hollywood's most attractive actors and actresses appeared in cigarette advertisements of the 1930's and 40's.

The tobacco industry even tried to promote cigarettes in terms of *beneficial* effects: Smoking, they claimed, gave people "healthy nerves," a flow of energy, relief from fatigue, relief from sinus conditions and colds — all with no throat irritation and "not a cough in a carload!" Initial reports linking smoking to a variety of ailments were met with more advertisements. For years, the R.J. Reynolds Company proclaimed that "More Doctors Smoke Camels Than Any Other Cigarette!" Even in the *Journal of the American Medical Association,* one advertisement which appeared in 1949 stated "Many leading nose and throat specialists suggest (changing to) Philip Morris!" The slogan "More Scientists and Educators Smoke Kent" ran into the 1960's.

To allay public anxiety and to "solve the problem," manufacturers came up with the filter tip. Marlboro, with a filter, could then be promoted as a rugged man's smoke — even though without the filter, in the 1940's and early 50's, it had been known as a woman's cigarette, advertised as being "Mild as May!"

An Unequal Fight

Cigarette smoking is, of course, an entirely learned behavior. The "peer pressure" cited as the reason for adolescent smoking is as much a manufactured product as cigarettes themselves. The purpose of advertising isn't only to sell cigarettes, but to promote the casual acceptance of smoking as a social norm — and not just among smokers.

Today, cigarette manufacturers spend about $800 million annually to promote smoking. The federal government spends less than $1 million to discourage it. Tobacco companies buy a large percentage of all magazine, billboard, and transit system advertising space, as well as having numerous displays in stores, restaurants, newsstands, etc. In contrast, pamphlets and posters put out by the federal government must be *requested* by the public. Government at all levels is one of the biggest beneficiaries of cigarette sales, earning approximately $8 billion annually in taxes.

Although cigarette advertisements no longer appear on radio and television, part of the reason is that the tobacco companies themselves, seeing the success of some pro-health anti-cigarette ads which were broadcast between 1967 and 1969, removed their own ads in order to invest in subtler promotional methods. Some ads discouraging smoking still appear on TV as public service announcements. But the organizations which produce them — like the AMA and various health agencies — do not *purchase* advertising time. Stations are under no obligation to broadcast such counter-advertising in preference to any other public service announcements. It is hoped that pharmaceutical manufacturers and insurance companies may become more active in patient education about cigarettes.

In any case, the brunt of the responsibility for getting the message to smokers and prospective smokers must be borne for now by individual health practitioners.

Who Smokes?

In counseling patients, it is essential to know as much about the psychological make-up of the individual as possible. Some researchers have tried to outline a personality-profile of the smoker, who is portrayed as being more extroverted, angry, and impulsive than the non-smoker. Such generalities are of limited use to the clinician, who must deal with real human beings, not stereotypes.

However, in trying to understand the motivation for smoking, certain patterns are fairly consistently seen. The original impetus can usually be traced back to "The Three P's:" parents, peer pressure, and propaganda — of which the last-named is the most basic. For example, children smoke to look older, or older children to look sexier (in which case the clinician should be alert for evidence of a poor sexual self-image on the part of the adolescent). But it was advertising that identified cigarette smoking with sex appeal and sophistication in the minds of those children. Another manifestation of the effects of those images is seen in the individual who smokes as compensation for some physical impairment, short stature, or unattractiveness. The clinician should also keep in mind that smokers tend to consume more alcohol than non-smokers, and are probably more likely to use other so-called recreational drugs — both of which may complicate the overall plan of counseling and treatment. The purpose of making such observations is not to stereotype anyone, but to be aware of certain *tendencies* in order to be a more effective counselor.

"Twenty-five years ago, two-thirds of all adults, including physicians, were smokers. Today, the overall figure is one-third—but only one-*sixth* among physicians."

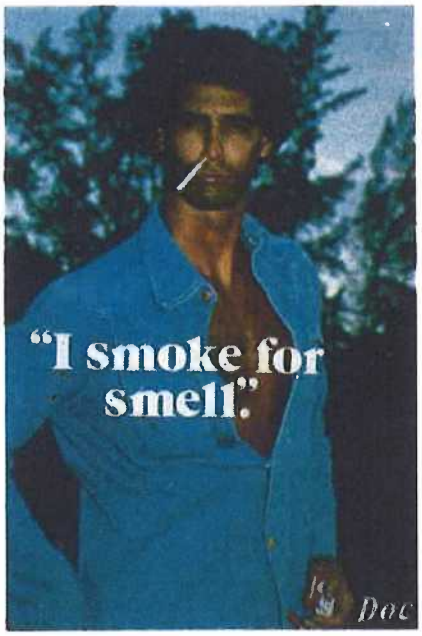
The Product

Even if the smoker knows nothing more than what can be

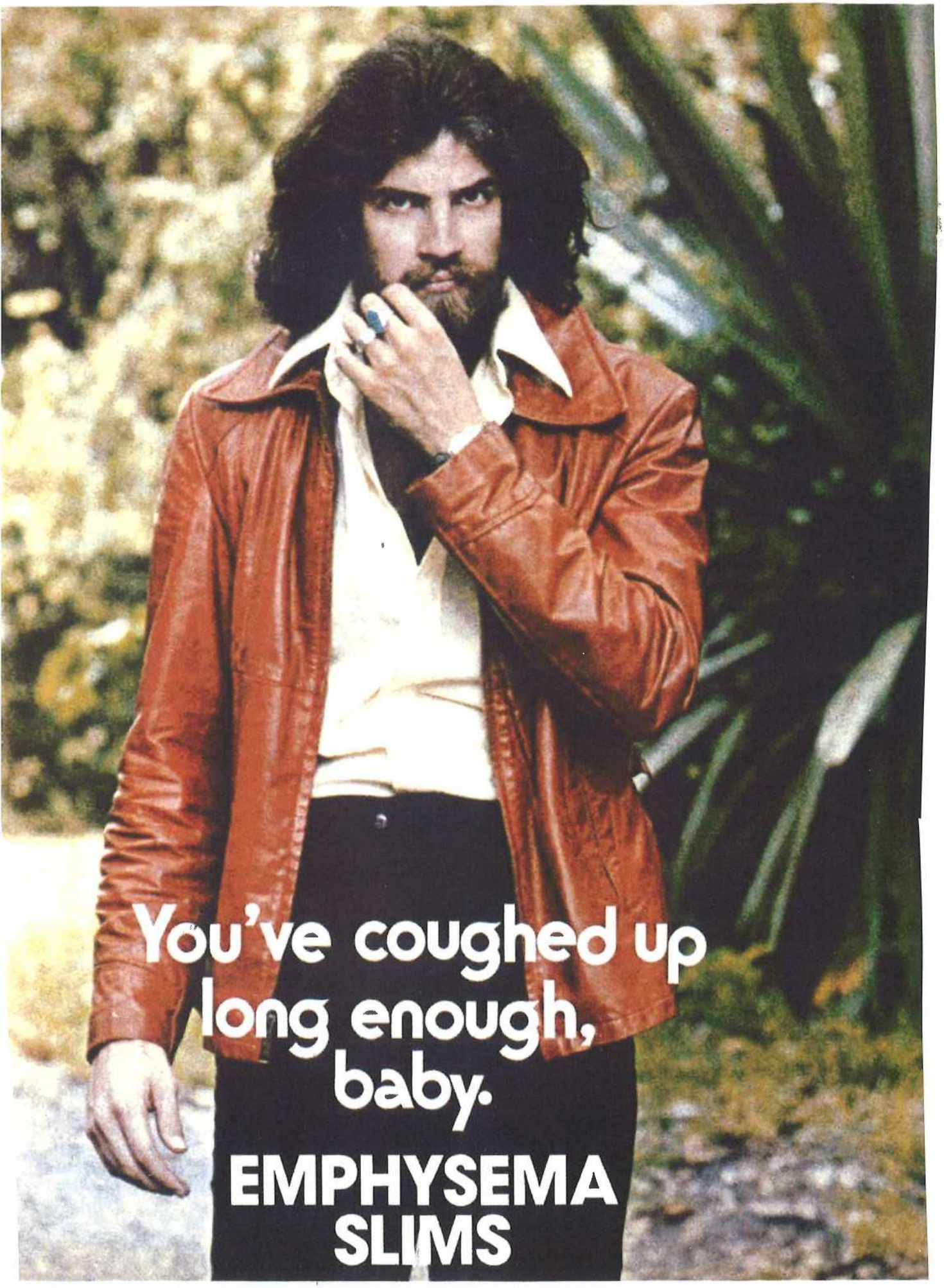
Getting started on cigarettes...

Ads like this appeared widely from the 1920s through the 40s. The acceptability of cigarette smoking was further reinforced by medical endorsements: if the doctor smokes, it must be good, and if the doctor smokes a particular brand, it must be the best.

...and stopping



DOC counter ads discourage would-be smokers by challenging the images of sophistication and sex appeal fostered by cigarette advertising. Cigarette smoking is shown as preposterous rather than glamorous in the "I smoke for smell" item (left). Teenaged girls are the target for the center ad, which is accompanied by text in which the girl says that she used to smoke cigarettes, "but then my boy-friend told me I had zoo breath, and that was enough for me." Paid ads from DOC (above right) supplement public service announcements against cigarette smoking, with the same message: *not* smoking makes you a winner in terms of health and personal attractiveness. The "Emphysema Slims" ad (opposite page) can be clipped out and posted in the physician's waiting room or clinic waiting area to make a strong statement to patients.


You've coughed up
long enough,
baby.
EMPHYSEMA
SLIMS

learned from the warning printed on every pack of cigarettes — that it is "dangerous to your health" — he or she may still feel at least some concern, and may seek reassurance or approval from the clinician for having recently switched to a low tar, filter cigarette. This is a good opportunity to begin presenting the facts, for the patient probably does not know what tar is, or what filters do and don't do.

Cigarettes contain a mixture of tobacco, sugar and other flavoring agents, humectants for moistening, nitrates or other preservatives, and chemical additives such as saltpeter in the paper. In all, more than 1,500 chemicals are used in cigarette manufacture. Yet there is no label-listing of ingredients.

As the Surgeon General's report notes, the lighted cigarette generates about 4,000 compounds, which can be separated into gaseous and particulate phases.[4] The particulate phase — tar — includes at least a dozen known carcinogens as well as nicotine, the principal active agent in tobacco (see "Toxicologic Emergencies: Nicotine," in this issue).

In other words, tar is *poison* — a combination of hundreds of poisons, including many carcinogens. Ask the patient: "Would you purchase a loaf of bread which was advertised as having 'only three ounces of poison'?" The tar content of cigarettes is measured in milligrams. The clinician can point out that although a milligram of tar is a very small amount, a smoker can inhale a pound of it in just a few years.

"Cigarettes contain a mixture of tobacco, sugar and other flavoring agents, humectants for moistening, nitrates or other preservatives, and chemical additives such as saltpeter in the paper. In all, more than 1,500 chemicals are used in cigarette manufacture. Yet there is no label-listing of ingredients."

Furthermore, tar is not the only poison involved: carbon monoxide, ammonia, and hydrogen cyanide are just three of the gases found in significant amounts in cigarette smoke. Ironically, the filter — which is designed to trap and reduce delivery of the particulate poison, tar — may actually have a concentrating effect on those poison gases, by inhibiting their dilution with air.

Similarly, switching to a low-nicotine cigarette may "perversely increase the hazards of smoking;"[5] for in titrating his intake of nicotine, the heavy smoker may end up smoking more cigarettes and taking more puffs of each. As a result, nicotine and tar intake may be the same as before while absorption of gases such as carbon monoxide is *increased,* with resultant *increased* risk of arteriosclerosis, ischemic heart disease, fetal damage, etc.

Information must be presented to the patient in terms that are meaningful. Counting pack-years is useless: a smoker who is pleased to have only a one-pack-per-day habit does not realize that 20 cigarettes means 200 inhalations of carbon monoxide, cyanide, and arsenic. A 30-year-old who started smoking at a rate of a pack per day in his late teens has already smoked more than 100,000 cigarettes and inhaled one million breaths of poison.

Risks and Costs

The clinician should point out that the case against cigarette smoking does not rest solely on the risk of cancer, but on a whole spectrum of serious disorders. "Only" one out of seven smokers may develop lung cancer — but *all seven* will have some form of disability, be it lost workdays due to bronchitis, inability to compete in sports, or having a heart attack.

The litany of cigarette-related illnesses can be recited by many individuals, including smokers. But to illustrate the magnitude of the problem, the clinician can emphasize that smoking is considered to be responsible for 350,000 deaths in the United States each year — more than the number of men we lost in all of World War II; seven times the number of American lives lost in Vietnam — *every year.*

Coronary heart disease, not lung cancer, is the chief contributor to the excess mortality among cigarette smokers, according to the Surgeon General's report. About 25% of the 700,000 annual deaths due to heart disease are attributable to cigarette smoking. Women are not immune to the risk of heart disease, either, despite the supposed protective influence of estrogen: according to the Chief Medical Examiner of Dade County, Florida, a woman in her 40's who dies suddenly of a heart attack is by definition a cigarette smoker.[6]

Similarly, because of the far greater increase in smoking among women compared to men in the past generation, the rate of mortality from squamous cell lung cancer among women is rapidly approaching that of their male counterparts. On January 14, 1980, Surgeon General Julius B. Richmond predicted that within three years, lung cancer will overtake breast cancer as the leading cause of death due to cancer among women. Last year, of 96,000 deaths from all histological types of lung cancer in this country, 80% are attributed to cigarette smoking: a figure representing virtually all cases of squamous cell carcinoma of the lung. A similar relationship is expected among the predicted 100,000 deaths from lung cancer in 1980.

Consider the risk of cancer from asbestos exposure: the incidence of lung cancer is doubled in non-smokers who are exposed to asbestos; among asbestos workers who smoke, the incidence is *90 times* as high as among non-smoking, non-exposed individuals.

Moreover, despite medical and surgical advances, the

five-year survival rate in lung cancer is still less than 5%, essentially no better than it was 25 years ago. One reason for this is that half of all newly diagnosed cases are already inoperable.

Apart from cancer of the lung, cigarette smokers have significantly higher rates of cancer of the larynx, pharynx, oral cavity, esophagus, pancreas, kidney, and urinary bladder. In these conditions, there may be a synergistic effect between smoking and alcohol intake (which, as has been noted, is higher among smokers). Switching to a pipe or cigar will not lower the risk for these cancers.

The risk of peptic ulcer in both males and females who smoke is increased by 70%; the risk of dying from peptic ulcer disease is twice as high for smokers as for non-smokers.

The Surgeon General's report calls attention to the fact that birth weight and fetal growth are significantly affected by maternal smoking during pregnancy. Twice as many babies of smoking mothers weigh less than 2,500 grams as babies of non-smokers. Also, there is a somewhat higher percentage of fetal deaths associated with smoking during pregnancy.

"Cigarette manufacturers spend about $800 million annually to promote smoking. The federal government spends less than $1 million to discourage it."

Teenagers who smoke have are more respiratory problems than non-smokers, with demonstrable impairment on pulmonary function studies. Even the younger children of parents who smoke have a higher rate of respiratory illness, apparently because of the presence of tobacco smoke in the home environment. Coughing is directly related to the number of cigarettes smoked, and recurrent respiratory infections are more frequent among cigarette smokers than non-smokers. Cigarette smoking is believed to be responsible for approximately seven out of ten cases of chronic bronchitis and emphysema, which claim 25,000 lives each year.

The cost to the country (and therefore to taxpayers) of cigarette-related illness is staggering — totalling approximately $40 billion annually. Cigarette smoking results in 81 million excess man-days lost from the work force, and 145 million excess man-days of bed-disability within the general population. Employers are realizing this and taking appropriate action: the Alexandria, Virginia, Fire Department no longer hires persons who smoke cigarettes. This decision was made after finding that of the 22 people who retired in the previous five years, 16 did so on the basis of cigarette-related disability, costing the city $300,000 additionally each year in early retirement benefits. A California computer firm began paying its employees who quit smoking an extra $750, which is what each cigarette-smoking employee costs the firm every year in medical expenses and lost work days.

Means and Ends

The overriding importance of smoking in the etiology of illness and disability warrants an activist approach on the part of the clinician, for he has a responsibility to get the facts to the patients. The objective is to counsel the patient in so effective a manner that it changes the way he or she has been led to view cigarette smoking.

Whatever approach works with an individual patient is the correct approach. The clinician may choose to show the effects of cigarette smoking graphically, with photographs or even actual specimens of tissue with coronary artery disease and lung cancer. Teenaged patients and prospective smokers can be introduced to the laryngectomy victim or emphysema patient.

Has the smoker ever considered cigarettes a rip-off? A two-pack-per-day smoker invests more than $600 yearly in the habit. In 10 years, counting inflation and interest lost, this amounts to about $7,000. Why are cigarettes so expensive? It can be pointed out that paying 75¢ for a pack of cheap-grade tobacco and sugar (chemical additives included) is like buying hot-dogs at $20 per pound.

Dozens of withdrawal methods have been described, but cessation of cigarette smoking usually does not call for clinics, aversion techniques, nicotine substitutes, or hypnosis. What *is* required is that the clinician be willing to devote time and effort toward curbing this single most important and preventable cause of illness and high medical costs. A positive strategy begins right in the office or clinic waiting area, by getting rid of ashtrays and refusing to display magazines that carry cigarette advertising. (*Runners World* is the first magazine to solicit subscriptions *on the basis* of its refusal to carry cigarette advertising.) Support of local health initiatives concerning the sale and promotion of cigarettes, and involvement in school health education programs are important reinforcing activities for the clinician.

Far from having heard it all before, patients are gaining new insight into cigarette smoking, by means of informed, innovative approaches on the part of health practitioners. Through personal counseling and instruction, and a commitment to discuss the problem from many angles (including manufacture and promotion, as well as the risks to health), the cigarette epidemic may be brought closer to an end. □

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