

## THE INFLUENCE OF SMOKING ON HEALTH

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The title of this paper reveals that consideration is not given to the larynx only. As laryngologists our field of labor is limited, as physicians we are interested in the normal functioning of every organ in the human body. Since the mucous membrane of the mouth and air passages absorbs the poisons of, and is irritated by smoke it seems fitting to speak of various methods of smoking, the evolution of the American Cigarette, the systemic effect of nicotine also its effect on special organs including the air passages. In preparing this paper there is no thought of provoking reform, but there is a sincere and an earnest desire to provoke thought.

This fact must constantly be kept in mind: *it is not every one who is injured by smoking.* Myriads of people use tobacco; some smoke pipes, some smoke cigars, today more are smoking cigarettes. The larger number apparently suffers no harm.

Smoking tobacco leaves has been a social custom for centuries, and is constantly becoming more popular. Since the discovery of this plant by the white man, millions of people have had pleasure in smoking, and, until recent years, little or no thought was given to the possibility of the habit disturbing the normal functioning of any organ in the human body.

However, science and modern inventions have changed the material used in, also the methods and manner of smoking. Formerly dry crushed tobacco leaves were placed in a pipe; to ignite this a live coal was taken from a fire-place; usually one pipeful after each meal satisfied. Today the smoker has an article scientifically<sup>1</sup> produced from various types of tobaccos, kept moist by hygroscopic agents, made fragrant by aging and by adding many chemical substances; to ignite this the smoker uses a quick-flash match or a manufactured lighter; and he smokes several hours each day. The methods of smoking a pipe and a cigarette

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differ: with the first, one usually draws the smoke into the mouth and puffs it out, with the second one not only puffs, but often also inhales the smoke.

These three factors: the greater number of hours spent in smoking, the moistened tobacco, and the inhalation of the smoke, have in so many people (not all) produced an abnormal action of various organs of the human body, that the attention of physicians and research workers is now being focused on the effect of smoking on health.

*Evolution of the American Cigarette.* The manufacturing of cigarettes in America began in the early seventies<sup>2</sup> at Richmond, Virginia. At first only American tobaccos were used. Soon Oriental (Levantine) tobacco was mixed with our domestic product. In 1912 an article known as *the blended cigarette* gained a foothold, and to this type credit is given for the enormous growth of the domestic cigarette industry. A typical blend cigarette contains<sup>1</sup> flue-cured\* tobacco, 60 per cent; Burley (Kentucky), 15 per cent; Maryland, 10 per cent; Levantine (Oriental), 15 per cent.

Other materials than tobacco used in making cigarettes are hygroscopic agents, flavoring substances and cigarette paper. Some tobaccos burn faster than others, therefore the slow and rapid burning are mixed in proper proportions; hygroscopic agents are necessary to provide "a rigid control of the moisture fundamental to the working properties of tobacco, and to smoking and keeping qualities following manufacture"; some of the flavoring<sup>1</sup> materials used are: brandy, chocolate, cocoa, cinnamon, ginger, honey, licorice, maple syrup, molasses, methol, oil of anise, oil of juniper, oil of cloves, rum, and sugar; the paper wrapper must be of such quality as *not to burn* faster than the tobaccos, but together with them.

A study of statistics published by the U. S. Department of Commerce<sup>3</sup> shows the peak in the consumption of smoking tobacco and cigars was in 1920. Since that date there has been a gradual decrease in the use of these two products and a steady increase in the number of cigarettes smoked.

\* Flue-cured tobacco is that in which the leaves are thoroughly dried in a barn in which the heat is kept at a constant, definite temperature until both leaves and stems are completely dehydrated. This process of curing takes about five days, and for smoking adds a valuable flavor.

|                | No. of cigars. | Pounds of smoking tobacco. | No. of cigarettes. |
|----------------|----------------|----------------------------|--------------------|
| 1880 . . . . . | 2,509,653,107  | 35,283,321                 | 582,718,995        |
| 1900 . . . . . | 6,176,596,421  | 101,548,467                | 3,254,130,630      |
| 1920 . . . . . | 8,723,980,895  | 219,270,561                | 47,430,105,055     |
| 1937 . . . . . | 5,345,092,322  | 187,762,987                | 169,847,245,964    |

*Nicotine Content.* The nicotine content of tobacco depends on many factors: seed, soil, fertilizer, seasons, also on methods of harvesting and curing the plant. The amount of this chemical is greater in hot than in cool seasons; *e. g.*, in 1930, a hot summer, Maryland tobacco contained 2.26 per cent; in 1932, a cool season, the same type of Maryland tobacco contained only 0.86 per cent. Analysis of the following types of tobacco reveals the difference in the average<sup>4</sup> nicotine content:

|                            | Per cent. |
|----------------------------|-----------|
| Oriental tobacco . . . . . | 1.5       |
| Maryland . . . . .         | 2.0       |
| Virginia . . . . .         | 6.0       |
| Kentucky . . . . .         | 8.0       |

To produce a standardized cigarette from raw materials which differ so much demands scientific exactness in chemical analysis and meticulous care in mixing the various types of tobacco. Each manufacturer employs a corps of chemists and trained technicians whose duty is to analyze<sup>2</sup> all raw materials and to see that the proper proportion of each type of tobacco is used to make the finished product meet the stipulated requirements. In order to show something of the uniformity of standards in the cigarette industry, herewith is presented a few brands<sup>5</sup> manufactured by different companies.

| Brand and manufacturer.                            | Per cent of nicotine. | Flavoring present. | Type.                       |
|--|-----------------------|--------------------|-----------------------------|
| Camels (Reynolds)                                  | 1.9                   | Present            | American blend              |
| Chesterfield (Liggett-Myers)                       | 2.5                   | Present            | American blend              |
| Kool (Brown & Williamson)                          | 2.1                   | Menthol            | American blend              |
| Lucky Strike (American Tobacco Co.)                | 2.0                   | Present            | American blend              |
| Marvels (Stephano Bros.)                           | 2.1                   | Present            | American blend              |
| Old Gold (Lorillard)                               | 2.0                   | Present            | American blend              |
| Pall Mall Georges (American Cigarette & Cigar Co.) | 1.5                   | Slight             | Predominantly Turkish blend |
| Philip Morris (Philip Morris)                      | 2.2                   | Present            | American blend              |
| Twenty Grand (Axton-Fisher)                        | 2.5                   | Present            | American blend              |

Much work is being done to determine which hygroscopic agent used to keep cigarettes moist causes least irritation in smoking.

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Work is also being done to find whether smoke from dry or moist tobacco is more irritating. The consensus of opinion is that smoke<sup>6</sup> from dry tobacco is less irritating than that from moist. Dixon says: "The water content of tobacco is more harmful to the smoker than the original nicotine content," and Chapman<sup>7</sup> reports, "The nicotine and other irritating by-products of tobacco are increased by the amount of moisture, the rapidity of smoking, and the tightness of the packing. With the increase of moisture in the stump of a cigarette or a cigar, the last one-third is estimated to contain 15 per cent more nicotine, and if smoked rapidly as high as 66 per cent increase." The amount absorbed into the system depends on the method of smoking. By drawing<sup>7</sup> the smoke into the mouth and puffing it out one absorbs 66 per cent; by inhaling the smoke the absorption is increased to 88 per cent.

As to the method of smoking, McNally<sup>8</sup> says the nicotine content varies:

In pipe tobacco from 1.25 to 2.8 per cent

In cigars from 0.91 to 1.9 per cent

In cigarettes from 0.43 to 3.34 per cent

According to McCormick,<sup>9</sup> "There are other toxic products of combustion and distillation which must be considered—carbon monoxide, ammonia, formaldehyde, methylamine, methane, methyl alcohol, hydrogen sulphide, pyridine, furfural, arsenic, carbonic acid, and prussic acid."

Of the many elements found in tobacco smoke, nicotine and tar are thought to be the most harmful. The first irritates<sup>10</sup> not only the mucous membrane of the respiratory tract, but it also acts on the nervous, circulatory and gastro-intestinal systems. The second, which is a product<sup>11</sup> of the stems or veins of the tobacco leaf, has been found to injure the mucous membrane of the respiratory tract. Investigators<sup>5</sup> have found that some cigarettes "have a slightly larger proportion of stems, rolled out paper-thin, and then mixed with the leaf." "The tar<sup>8</sup> of cigarette smoke contains nicotine, phenolic bodies, pyridine bases, and ammonia, irritants which could account for cigarette cough, the chronic bronchitis of the cigarette smoker, the leukoplakia in heavy smokers, and the recorded increase of cancer of the lungs."

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*Effect of Nicotine Well Known.* Each year one finds an increasing number of articles published on the harmful effect of smoking. These are not limited to medical journals, but are found in the Proceedings of the Life Extension Examiners,<sup>10</sup> in the Scientific American,<sup>12</sup> in Science News Letter,<sup>13</sup> in Reader's Digest,<sup>14</sup> in Science,<sup>15</sup> in Consumers Union,<sup>5</sup> etc. In our popular magazines and newspapers, advertisers do not say smoking is harmful, but by recommending the use of a filter in smoking cigarettes or a pipe, they do, by inference, imply that it is injurious. The annual sale of millions of filters evidences the layman's judgment on the subject.

Mendenhall, Professor of Pharmacology, Boston School of Medicine, in discussing the effects of tobacco on the body, makes the following classification:

Circulatory—pulse increased 5 to 10 per minute, raises blood pressure.

Alimentary tract—loss of appetite, favors duodenal ulcers, cancer of the mouth, chronic intestinal catarrh.

Respiratory tract—irritation of throat, larynx, bronchi, etc.

Eyes—dimness of vision, derangement of accommodation, dilated pupils.

Central nervous system—nicotine has a calming effect on the central nervous system—it also has a bad effect.

Though inhaling smoke from a single cigarette will increase the pulse rate and raise<sup>16</sup> the blood pressure, according to Paul White,<sup>17</sup> tobacco causes no actual heart disease. He thinks "tobacco heart" is not heart disease but a temporary cardiac irritation. Observations of insurance organizations, however, indicate injury from smoking. Fisk, of Life Extension Institute ascertained that among the heavy smokers there were 10 per cent more than the average with organic heart disease and 15 per cent more with over-rapid heart.

Graybiel, Starr and White,<sup>18</sup> after studying electrocardiographic changes following the inhalation of tobacco smoke, suggest the changes in the "electrocardiogram lie in the characteristic action of nicotine on the cardiac ganglion . . . those occasional instances where attacks of angina pectoris are precipitated by smoking ('tobacco angina') the attacks are not the result of coro-

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nary vasoconstriction, but the result of a sudden increase in the work of the heart as shown by the increase of blood pressure, or heart rate or both."

All writers agree on angina not being caused by smoking, but they are of the opinion that the toxins in tobacco smoke incite an attack. Clendenning tells of a patient suffering from angina who for years refrained from smoking and was free from attacks during that period. Later, on smoking a cigar, an attack was induced which proved fatal.

Harkavy,<sup>21</sup> writing on thrombo-angiitis obliterans and angina, says a discontinuance of smoking causes an arrest in the progress of the disease and a resumption calls forth an exacerbation of all symptoms.

The effect of nicotine on the vascular system, *in susceptible individuals*, presents a phenomenon that has commanded the attention of investigators. The smoking of a single cigarette caused the lowering of dermal<sup>4</sup> temperature at the tips of fingers and toes as much as 5 to 15° F., and in the nail folds the capillary circulation was almost entirely stopped. Lampson<sup>22</sup> cites a case of a young man, twenty years old, who smoked and inhaled 20 to 25 cigarettes daily. The rate of peripheral blood flow showed a sudden drop during the period of smoking and at the end of forty minutes the flow was partially depressed. His conclusions were that smoking cigarettes and inhaling causes a sudden marked peripheral vasoconstriction which lasts about sixty minutes, when not inhaled the vasoconstriction lasts for only fifteen minutes.

Wright and Moffat<sup>4</sup> say, "The toxins (of tobacco) act on the central nervous system involving certain cortical areas and the sympathetic trunks controlling the vascular supply to the parts affected, rather than on the walls of the blood vessels directly. The smoking of tobacco in the form of standard cigarettes produces in the majority of normal individuals, certain definite pharmacological effects. A marked drop in the surface temperature occurs at the tips of the fingers and toes."

The lowering of this surface temperature is due to the effect of nicotine on the sympathetic nervous system which causes a constriction of the capillaries. As proof<sup>7</sup> of this statement, it has been shown that in patients who have had a sympathetic ganglion-

ectomy on one side, the toes on that side showed a normal surface temperature after a cigarette had been smoked, whereas the toes on the opposite side evidenced a lower temperature.

In order to determine the amount of vasoconstriction of vessels, Herrell and Cusick<sup>23</sup> directed their observations into the eye, the only part of the body where arteries and veins can be seen clearly and their size measured accurately. In twelve months they found 10 cases in which the vasoconstriction produced varied from 17 to 26 per cent. "By no means," they say, "do all people who have latent hypertension or hypertensive disease experience increased vasospasm following inhalation of tobacco smoke: in fact, many of them have little or no change in the blood pressure. The finding, however, of vasospastic response following inhalation of tobacco smoke among individuals who have a tendency toward hypertension, we think is especially significant and such a patient has everything to gain and nothing to lose by discontinuing the use of tobacco."

Buerger's<sup>24</sup> and Reynaud's<sup>25</sup> disease have very similar characteristics in that each is marked by a gradual decaying of extremities, toes and fingers. Their etiology is not known. However, since smoking affects the sympathetic nervous system and causes a constriction of the vessels in the extremities, patients suffering from these maladies, if smokers, are required to discontinue all usage of tobacco.

*Nicotine and Females.* The work of DeEds<sup>26</sup> and Campbell<sup>27</sup> shows that nicotine affects the estrus cycle of rats and that "in some way produces histological changes in the ovaries of rats, mice and guinea pigs which result, in some cases, in sterility and unhealthy offspring."

In female albino rats<sup>28</sup> subjected to inhaling cigarette smoke "that would approximate human smoking of about a package of cigarettes a day," it was found that the mothers were underweight and that "many of the young of this group were undersized and died early. Twenty-eight per cent lost one or more of the young before weaning, and 13.5 per cent lost all of their young. Temporary sterility, resorption of young *in utero*, and abortions were noted. A marked parallelism exists between the treated rat families and their young, and human mothers and their young in cases

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"A statistical study<sup>29</sup> of rat mortality following the administration of nicotine to 336 rats showed that for any given dose, female rats died in much larger proportion than males."

Campbell<sup>30</sup> quotes Kiefer as saying: "Women who smoke . . . suffer from disturbance of menstruation, menorrhagia and amenorrhea." He states that women in general are more sensitive to the toxins in smoke, "as they have a more mobile vegetative balance."

In 81 records<sup>31</sup> made on 5 pregnant women to determine the effect of cigarette smoking on the fetal heart beat, there was found to be an increase of 11 to 14 beats per minute in every case where the expectant mother inhaled the smoke.

Nicotine has been found in the milk<sup>32</sup> of a nursing mother who had been smoking 25 cigarettes a day.

*Impaired Vision and Hearing.* Tobacco amblyopia is a term used when vision is impaired by excessive smoking. The patient observes increasing foginess of vision, less marked of evenings and in dull light. Central vision is greatly diminished, and the patient eventually becomes unable to differentiate red and green colors. Studies have been made on the effect of smoking on hearing in 36 cases of toxic amblyopia due to tobacco and alcohol. The investigators<sup>33</sup> report: "The most outstanding results of the examination was the finding of a notch in the audiogram curve occurring at a frequency of 4.096 (C.5) vibrations per minute." In their summary they say: "This was not observed in the control group, and is quite comparable to the island of defect found in the visual field of patients with amblyopia."

*Cancer of Respiratory Tract Increasing.* In the past twenty years a gradual increase in the number of patients suffering from cancer of the mouth, lungs, larynx, esophagus and stomach has been observed. It may be that with the improved method of examining and diagnosing, the medical profession is now finding what formerly was missed. However, research work on the carcinogenic properties of cigarette smoke is being carried on inasmuch as observations have been made showing the increase of cancer

in these organs seem to run parallel with the constantly increasing number of persons smoking cigarettes.

An article on *The Tar in Cigarette Smoke, and Its Possible Effect*<sup>8</sup> says: "Where there is an inflammation of the mucous membrane, continually irritated by the products of smoke, the regeneration processes are disturbed, and there is a predisposition of cancer."

Another author<sup>34</sup> asserts, "Smoking habits unquestionably increase the liability to cancer of the mouth, the throat, the esophagus, the larynx and the lungs."

Writing on this subject Roffo<sup>35</sup> says, "The tobacco tars are very strong cancer producing," that they are in the "same form as the coal tars and contain substances whose properties are very like those of the hydrocarbons distilled out of coal, in their fluorescence and their spectrometry. This cancer producing unit of the tobaccos and coal tars, which was established by the present experimentation, shows the necessity to intensify the active prophylaxis against the cancer by lessening the use of tobacco."

Roffo has not only shown the similarity of coal tar and tobacco tar by spectrometry, but he has also proven that tobacco tars produce tumors when applied to rabbit's ears daily for a period of time, and by sectioning these neoplasms he has shown the cancer formation by the microscope. Having estimated the amount of tar in a cigarette he states: "One can easily see large opportunity of cancerization in a regular smoker who consumes 1 kilo of tobacco monthly, which means 70 cc. of tar; in that way the average smoker loads in one year 840 cc. and in ten years over 8 liters of tar on his bucco-pharyngo-laryngo-pulmonary membranes which certainly has not the biological resistance of the skin of a rabbit."

Cancer of the lungs is a growing problem.<sup>36</sup> In 1937 in the United States, 7356 deaths were caused by cancer of the respiratory system. Of this number, "4985 (68 per cent) were reported as due to cancer of the lungs and pleura."

**COMMENT AND CONCLUSIONS.** Since its beginning in the United States, the cigarette industry has made a phenomenal growth.

Credit for the increasing number of men and women who smoke cigarettes is given to the scientific blending of different types of tobacco, also the use of hygroscopic agents and flavoring materials.

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Moisture added to and maintained in cigarettes makes the nicotine content in the smoke much greater.

Using tobacco stems in manufacturing cigarettes augments the tar content in the smoke.

Inhalation of cigarette smoke increases the amount of toxic products absorbed by the mucous membrane.

In susceptible people the absorbed nicotine has a morbid effect which causes abnormal action in the respiratory, circulatory, gastro-intestinal and nervous systems.

According to reports the female is injured more than the male.

Improved methods of diagnosing, instead of inhaling smoke, may explain the constantly increasing number of patients found suffering from cancer of the respiratory tract.

Though literature reveals that for certain individuals smoking is injurious, much more work must yet be done to prove that the abnormal actions of organs, produced by nicotine and other chemicals found in smoke, are lasting. Medical and other researchers who are seeking the truth on this subject are increasingly calling attention to the damaging effect on the human body produced by smoking, and especially by inhaling smoke. Because of the carcinogenic action of tar found in tobacco smoke there is need for the closest observation of the air passages, and most skillful diagnostic acumen when patients habitually smoking and inhaling, present themselves for medical care.

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## DISCUSSION

DR. RALPH A. FENTON, Portland, Ore.:

This paper is entirely too well documented for comfort, and its facts, while they may be subjected to counterattack by researchers subsidized by cigarette manufacturers, are not to be cast aside lightly. Particularly is this true of Roffo's splendid experimental studies.

May I be permitted to contribute a case report to this discussion? I observed this individual very closely. Nearing sixty, he had used from 10 to 30 cigarettes daily for many years. He had noticed an increasingly rapid heart for several years, with transient increases of blood pressure to 160 or 180 from his normal of 150.

A professional man, he put in some time daily outdoors, smoking heavily at such periods. Each winter for several years he suffered from an attack of rather severe acute tracheobronchitis, lasting several days. He had a small amount of thick nasopharyngeal discharge each morning, and commonly expectorated small amounts of rather thick tracheal mucus several times daily. He did not inhale smoke deeply or blow it from the nostrils.

Seven months ago he was incapacitated for three weeks by a severe auricular fibrillation, pulse 160 to 120, requiring digitalis and bed rest. The blood pressure ranged from 170 to 190 and electrocardiograms were rather disquieting to his physician.

Complete cessation of smoking brought this man's pulse and blood pressure to normal within four weeks. Nasopharynx and bronchi are clear; his only present annoyance is an increase in appetite.

We are too prone to accept the annoying accompaniments and

sequela of smoking because of the comfort and cheerfulness of its habitual use. I am sorry Dr. Myers is right, but am grateful for his courageous message. One might suggest, however, that abstinence from tobacco has not reduced the circumference of either of us.

DR. JOSEPH C. BECK, Chicago, Ill.:

This is going to be, I think, a morning of confessionals. I think that most of you who know me, know that I have been just an inveterate smoker of cigars, nothing but cigars. I do not like cigarettes, I have tried them and I have tried a pipe. As a boy I chewed tobacco a good deal out in Missouri but they would not let me do it later on.

I think Dr. Myers' paper had one statement in it which must be taken very definitely by all of us, that it is an individualistic proposition. It is not uniform.

I, too, am a sufferer from the toxic effects of tobacco. Thirty-five years ago I had my first attack at a baseball game. I did not know whether to blame it on the baseball game or not because we were losing, but at the same time I had a very severe attack of auricular fibrillation and since that time I have been afflicted, faster and faster in the attacks, until November, 1939 I went into a permanent irregularity of auricular disturbance and I am here to make that confession. It has not done one thing, which I had hoped, to reduce the weight. This is as Dr. Fenton has said. It has not increased my blood pressure but it has made me very uncomfortable at times with vertigo.

These vertiginous attacks are counteracted by a remedy which has been given to me by a doctor. I am sure you will be interested in this fact. This neurologist in Chicago, who examined me for this condition, stated, "Joe, I am going to give you a medicine and you will not know what it is and you cannot find out." I am not here to tell you what it is. I could perhaps go to work on it or have it analyzed, but I do not want to because it gives me absolute relief when I take it once or twice a day, that is, a teaspoon of this medicine. It may be suggestion, but anyway the vertiginous attacks are relieved.

One condition which the doctor did not mention, which is more disturbing to me than anything else, is I am always fearful of having pneumonia. I have a pneumophobia on account of perspiration, which at times makes me fearful of going out. I just go out and it does not seem to have any effect as perspiration would which is brought about by exercise or other conditions to which one is exposed and where you would receive a chill if exposed. I am never chilled on account of this condition, but have a fear.

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The gastro-intestinal tract, the appetite, is certainly affected and I am fat. I assure you I am one of the smallest of eaters.

Something was said about cancer. You all have noticed that I carry a little insignia on my upper lip. I know it is dangerous for cancer. It is a mole, a colored pigmented mole. I am experimenting with it. Lately Larry has been trying to bribe me to find out what I am experimenting with.

Tobacco, perhaps, has caused the going through the lip of something of that kind. I have had no fear from my standpoint of hyperkeratosis. It does not affect me in that sense at all. Yet, I have seen it in my practice.

I watch cases of laryngeal carcinoma in my practice in various stages and have made a particular notation as to the inhalation and you find that that is a very important factor, that is whether you inhale or do not inhale the smoke.

This has been a very interesting paper. I am sorry I did not hear it thirty-five years ago.

DR. HARRIS P. MOSHER, Boston, Mass.:

I was asked by Dr. Myers to discuss his paper. I took that as a command and have written out what I have to say.

I would like to preface what I have to say by saying that last night I had a shock. Dr. Babbitt, through the kindness of his heart and probably from a sense of duty, asked me to speak. I spoke perhaps twenty or thirty words and sat down. Dr. Dean, who sat beside me, remarked it was the best speech I had ever made. He said, "You have said nothing."

Now in spite of that I have got to go ahead with this discussion. I would like to make a confession, but nothing as long or as intimate as those which have been given.

The first is, crossing overseas with Dr. de Schweinitz during the World War, I was told if I did not stop smoking, I would be blind in ten years. I am not blind except to my own faults.

I own up to a cigarette cough and a certain amount of cigarette bronchitis. Now for the discussion of the paper.

Alcohol and tobacco have long been among the chief targets for reformers. I was a bit afraid that Dr. Myers had joined this long-haired group. It was a relief to find that he has not gone wrong yet. The paper is an honest attempt to separate fact from prejudice. The long bibliography shows that a large amount of work has been put on it.

The writer states that he wants to make us think a bit and not reform us. I am afraid, however, that the reform bug is hiding somewhere in his bloodstream.

He narrows the problem at the start by saying that only some people are harmed by tobacco, namely those who are susceptible, and gives ample proof, most of it scientific, to substantiate this statement. If now he would only give the figures showing how many people are susceptible his paper would be complete and so much more valuable. Only this knowledge will tell us how much of a sinner tobacco is. It is entirely an individual question with tobacco as with alcohol how much harm it does to us. With each drug each of us has to settle the question for himself. In gaining this knowledge both drugs can and have humiliated many of us.

In these days of allergy everyone finds something which disagrees with him; even milk, nature's first and universal food can be toxic. Water alone has an unblemished record—except with a Kentucky Colonel.

Tar and nicotine are the two harmful ingredients in tobacco, but one author, McCormick, quoted by Dr. Myers, names a most formidable list of by-products whose very names frighten you.

The literature on this subject is voluminous and one can pile up a large number of articles for and against tobacco, the early articles of the opposition seldom being fully scientific.

The innocent looking cigarette has the largest nicotine content and therefore by inference is the most harmful. This is too bad because the cigarette is the neatest and cleanest way to take tobacco. There is a sociability about a cigarette which a pipe lacks. No one would ever borrow your pipe, and you cannot pass a pipe around, not in these hygienic days; although the Indians did this when they smoked the pipe of peace, but the pipe of peace is far away today.

It helps and sometimes is necessary to know your man when you evaluate a medical article. Of the many men quoted by Dr. Myers I happen to know Dr. Paul White. He is one of the staff of the Massachusetts General Hospital and has specialized in diseases of the heart for many years. He feels that tobacco has no harmful effect on the heart.

Experiments show that tobacco will increase the pulse rate and slow the circulation in the finger tips and in the toes. This is far away from the vital centers of the body.

The literature states that women are more prone to the bad effects of tobacco than men. Sterility and miscarriage have been laid to it. Perhaps this is why young women smoke so much.

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I do not believe that the apparent increase of cancer of the lung is due to smoking. Better methods of diagnosis explain it.

Since the time of Sir Walter Raleigh it has been known that tobacco has a calming effect on the nervous system. This action of tobacco should be a Godsend in these nervous times.

DR. HOWARD C. BALENGER, Chicago, Ill.:

I have been more interested in the local effects of tobacco smoking on the throat rather than the systemic effects. However, the systemic effects seem to be of far greater importance. Two or three years ago we examined 200 or 300 young medical students to determine the relationship of the amount of smoking and any local evidence of irritation in the pharynx or nose as manifested by redness or inflammation of the mucosa or by hyperplasia of the lymphatic tissue of the pharynx. We were unable to find any correlation between the amount of smoking and these findings. The absence of redness of the pharynx may possibly be due to the peripheral vasoconstricting action of the tobacco smoke.

Mulinos and Schulman, in a recent issue of the *American Journal of the Medical Sciences*, studied the vasoconstricting action of tobacco smoking. They found that it lasts, as Dr. Myers says, about fifteen minutes. They measured the hand volume very accurately in both the denicotinized and the regular cigarettes and found that there was no difference in the vasoconstriction action. They found that inhaling the smoke prolonged this action, as Dr. Myers brought out, and also found that deep inhaling alone would produce the same peripheral vasoconstriction.

When we try to determine the systemic effects of tobacco smoking it is not certain just what agent produces the harmful effect. However, nicotine is generally conceded to be most important with carbon monoxide in second place.

The pyridine bases and ammonia, that is, the tars and aldehydes and particularly  $\text{NH}_3$  would seem to have a local action rather than a systemic one.

Nicotine affects the central nervous system and of equal, if not of greater importance, is the action on the ganglia of the sympathetic nervous system. The third and least important action is on the nerve ends of the voluntary muscles. This last action (stimulation followed by a paralysis) need not be considered as there would not be sufficient nicotine from smoking to affect the nerve ends to any physiologic extent.

When we sum up the possible systemic effects, perhaps one of the most important factors which has been mentioned and stressed, but should be stressed again, is a possible sensitization factor. This factor probably has to be present to produce marked deleterious effects.

Dr. Mosher asked about some statistics on the effects of tobacco smoking on the heart. Graybird, Stan and White, in the *American Heart Journal*, I think in 1932, gave statistics on a limited number of patients. Increased heart rate seemed to be present in at least four-fifths of the smokers in this group.

Blood pressure was increased in about two-thirds of the group, that is, the average blood pressure increased about 13 mm. of mercury.

The decreased T wave, Lead 1 or 2, occurred in less than half in this particular group. This decreased T wave lasted for about thirty minutes.

DR. JOHN L. MYERS (in closing):

I want to repeat that my purpose in presenting this paper was to provoke thought. It has made me think and I have quit smoking.

The last speaker inquired about tabulated cases. That has not been done accurately or completely and I have no plan for doing it. Maybe a plan will be worked out. He spoke of denicotinized tobacco. A study of the literature will show that that term is used much but that always nicotine is found. If you care to investigate further, I refer you to the Consumers Union publication which presents a full page of companies and their products. The "sano" cigarette has the least nicotine and even that contains eight-tenths of 1 per cent.

I wish to thank each of you for the courteous attention accorded me in presenting a paper on an unpopular subject, and am grateful for the discussion.

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