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Smoking Tobacco May Add to Risk of Dementia

Researchers found that, among a group of older volunteers who did not have symptoms of dementia at the beginning of a two-year study, a greater percentage of smokers than nonsmokers later developed dementia. Smoking was associated with increased risk of Alzheimer's disease and vascular dementia in the study.

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A study that followed older smokers of tobacco during a two-year period has demonstrated a higher rate of the onset of dementia, including Alzheimer's disease, in smokers compared with nonsmokers.[1] Within the study population, current smokers had a relative risk of developing dementia that was 2.5 times to three times that of those who had never smoked. For former smokers, the relative risk of developing dementia was lower, but still greater than for those who had never smoked.

The findings emerged from a "prospective" study conducted by A. Ott and colleagues in the Netherlands. A prospective study is one that is conducted on subjects (participants) who on intake are free of a defined condition and who are then followed and assessed after a specific time. A prospective study is considered superior to a "retrospective" study that draws conclusions after an event has occurred.

The term dementia is derived from the Latin *de*, which means "loss of" or "taking away from" and *mens*, which refers to the mind. A broad range of conditions is contained within the term dementia, and dementia is diagnosed initially by the demonstrated impairment of logical thought processes in individuals who formerly were unimpaired.

The diagnostic criteria for dementia listed in the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised* (DSM-III-R) — the edition on which Ott and colleagues based their diagnoses — included, among others:

- "Demonstrable evidence of impairment in short- [term] and long-term memory. Impairment in short-term memory (inability to learn new information) may be indicated by inability to remember three objects after five minutes. Long-term memory impairment (inability to remember information that was known in the past) may be indicated by inability to remember past personal information (e.g., what happened yesterday, birthplace, occupation) or facts of common knowledge (e.g., past presidents, well-known dates).

- "At least one of the following:

"(1) Impairment in abstract thinking, as indicated by inability to find similarities and differences between related words, difficulty in defining words and concepts, and other similar tasks;

"(2) Impaired judgment, as indicated by inability to make reasonable plans to deal with interpersonal, family and job-related problems and issues;

"(3) Other disturbances of higher cortical [outer brain layer] function, such as aphasia (disorder of language), apraxia (inability to carry out motor activities despite intact comprehension and motor function), agnosia (failure to recognize or identify objects despite intact sensory function) and "constructional difficulty" (e.g.,

inability to copy three-dimensional figures, assemble blocks or arrange sticks in specific designs); [or,]

"(4) Personality change, i.e., alteration or accentuation of premorbid habits."

Those who have dementia may forget information, names or people whom they formerly knew. They may become disoriented and have trouble finding familiar places, habitually lose objects or forget to eat meals. Their speech may become vague and confused, and they may be unable to learn new tasks or ways of coping with life situations.

The most common cause of dementia is a stroke (or a series of small strokes) caused either by a cerebral blood-vessel hemorrhage or thrombus (clot) formation closing off circulation. The result is the functional loss of brain cells, resulting in the disturbance of thought processes (cognition), a category called "vascular dementia" in the study report and in a more recent DSM edition, although referred to in DSM-III-R as "multi-infarct dementia." Another category of dementia was first described in 1906, by Alois Alzheimer (1864–1915), and is known as Alzheimer's disease. This disease is thought to result from the deterioration of nerve cells that are necessary for logical thinking and for the comprehension of place and time. The cell loss also produces a slow, steady loss of memory.

Ott and colleagues studied a subject population of men and women in Rotterdam, Netherlands, who were 55 or older and placed them in three categories: never smokers, current smokers and former smokers. (The terms "never," "current" and "former" refer to the status at the beginning of the study, or "baseline.") The never-smoker category served as the reference group to determine the relative risk for the development of dementia compared with the other two categories.

Initially, 7,528 volunteers for the study were assessed for dementia. Volunteers who were found to have dementia or whose smoking history could not be ascertained were eliminated, leaving 6,870 dementia-free participants at the beginning of the study who were re-examined in the follow-up assessment, which occurred at a mean 2.1 years after the original assessment. The same diagnostic criteria (DSM-III-R) were used in both assessments.

Participants were screened by being given a brief cognitive test; those whose test results indicated a possible degeneration of cognitive function were tested more extensively, and the researchers interviewed caregivers or friends of the subject. Finally, when dementia was suspected, the participants were examined by a behavioral neurologist and were given neurophysiological testing and a magnetic-resonance imaging (MRI) scan.

The diagnosis of dementia, where appropriate, was made by physicians on the study panel as well as a neurologist and a neuropsychologist, who reviewed all available diagnostic records. Participants diagnosed with Alzheimer's disease were subdivided into those with and without cerebrovascular disease.

The follow-up assessment examined the status of the participants, who had been free of dementia at the study's inception. The follow-up assessment involved an examination similar to the original where feasible, although some participants could not be re-examined because they chose not to participate, because of their health or, in some instances, because they were no longer alive. Including in the follow-up those who had not lived to complete the study period was designed to avoid "survival bias," that is, skewing the results because some of the participants with the highest risk factors had been eliminated from the analysis.

Participants who could not be re-examined were assessed for dementia by obtaining information from their doctors and from the regional institute for outpatient care, which was responsible for diagnosis and care of dementia patients.

The participants were asked at the beginning of the study about their current and previous smoking habits.

Ott and colleagues said, "Those who smoked cigarettes [at the beginning of the study] were asked their age at first smoking, the duration of time without smoking and the average number of cigarettes smoked. Former smokers [at the beginning of the study] were asked about starting age, time without smoking, age when they stopped smoking and average daily number of cigarettes smoked.

"We grouped individuals at baseline into never smokers, former smokers and current smokers. We calculated pack-year exposure by the average daily number of cigarettes divided by 20 and multiplied by the number of years smoked. In all analyses, never smokers were used as the reference category."

During the study of the 6,870 participants, 146 cases of dementia emerged, of which 105 were Alzheimer's disease (88 without cerebrovascular disease and 17 with cerebrovascular disease) and 19 were vascular dementia. There were also 22 cases of "other dementia." Ott and colleagues concluded that smoking (current or former) increased the risk of dementia in men and women, by a relative-risk factor of 2.3 for Alzheimer's disease, 2.2 for vascular dementia and 2.1 for other dementia (Table 1, page 3).

Current smokers had a 2.5 times relative risk of developing dementia, compared with never smokers, if their exposure was less than 20 pack-years, and 3.0 if the exposure was 20 pack-years or more. For former smokers the relative risks were 1.5 and 2.1, respectively.

For never smokers who developed dementia during the study, the mean age of onset was 85.5. Both former and current smokers were younger at the onset of dementia, by a mean 4.1 years and 8.6 years, respectively.

In analyzing the data, Ott and colleagues adjusted for various factors other than smoking that could have influenced the likelihood of the participants developing dementia.

"Since age is a major determinant of dementia and age distributions differed by smoking status, we adjusted for age … in the [analytical] models," said Ott and colleagues. "Sex, education and alcohol consumption were judged to be possible confounders [factors other than smoking that might also account for the results] of the association [between smoking and dementia] and were therefore added to all models. Lack of education beyond primary level was associated with incident dementia, so we grouped education into primary school or less, and beyond primary school. Daily alcohol intake, expressed in grams of pure alcohol daily, was added as a continuous variable" (Table 2).

The researchers found that smoking was a strong risk factor for dementia, especially Alzheimer's disease, among participants without the APOEepsilon4 allele. (An allele is a pair of genes, one inherited from each parent.) But smoking had no effect on participants with this allele. Because there is no way, other than an expensive genetic test, for someone to know whether he or she possesses the APOEepsilon4 allele, the finding is unlikely to reassure any smoker.

"The relative risks of dementia were higher for men than for women," Ott and colleagues said. "However, the proportion of men who had never smoked (the reference group) was small and only a few of them developed dementia, which led to greater variability in our estimates of relative risk in men and, thus, the sex difference may reflect chance."

Many of the changes that formerly were attributed to aging now are recognized as adverse pharmacological effects of tobacco products on nerve tissues and blood vessels. According

Table 1
Relative Risk of Dementia Subtypes, by Baseline Cigarette Smoking

		Relative risk (95% confidence interval)		
	Number	Never smokers	Former smokers	Current smokers
All Alzheimer's disease	105	1.0	1.3 (0.8–2.1)	2.3 (1.3–4.1)
Without CVD	88	1.0	1.4 (0.8–2.3)	2.1 (1.1–4.0)
With CVD	17	1.0	1.2 (0.4–4.2)	3.9 (1.0–15.2)
Vascular dementia	19	1.0	1.4 (0.5–4.4)	2.2 (0.6–8.4)
Other dementia	22	1.0	1.5 (0.5–4.2)	2.1 (0.6–6.8)

Note: Relative risks adjusted for age, sex, alcohol intake and education. Never smokers group used as reference.
CVD = Cerebrovascular disease

Source: Ott and Colleagues[1]

Table 2
Baseline Characteristics of Study Population, by Sex and Smoking Status

	Study population (6,870 participants)					
	Never smokers		Former smokers		Current smokers	
Number (% of total)	2,686	(39.1%)	2,755	(40.1%)	1,422.0	(20.7%)
Mean (*SD*) age in years	71.9	(9.9)	68.3	(8.0)	66.4	(7.6)
Primary education only (% of group)	803	(29.9%)	534	(19.4%)	319.0	(22.4%)
Mean (*SD*) alcohol intake (grams/day)	5.6	(9.8)	12.2	(15.3)	15.1	(19.8)
	Men (2,776 participants)					
	Never smokers		Former smokers		Current smokers	
Number (% of total)	455	(16.4%)	1,627	(58.6%)	694	(25.0%)
Mean (*SD*) age in years	69.8	(9.8)	68.2	(7.7)	67.1	(7.9)
Primary education only (% of group)	68	(15.0%)	252	(15.5%)	128	(18.5%)
Mean (*SD*) alcohol intake (grams/day)	12.3	(15.2)	15.8	(17.2)	21.0	(23.6)
	Women (4,094 participants)					
	Never smokers		Former smokers		Current smokers	
Number (% of total)	2,235	(54.6%)	1,130	(27.6%)	729	(17.8%)
Mean (*SD*) age in years	72.3	(9.9)	68.5	(8.5)	65.7	(7.3)
Primary education only (% of group)	735	(32.9%)	283	(25.0%)	190	(26.1%)
Mean (*SD*) alcohol intake (grams/day)	4.2	(7.6)	7.1	(10.2)	9.9	(13.7)

SD = Standard deviation

Source: Ott and Colleagues[1]

to the U.S. Department of Health and Human Services (HHS), research has demonstrated that life expectancy — which already has increased for U.S. residents from an average 45 years at the beginning of the 20th century to 75 years — can be expected to increase further, with an improvement in the quality of life during those added years. This will occur less because of advances in curative techniques than because people will adopt healthier lifestyles.

HHS said, "Some 50 percent or more of all premature deaths are traceable to individual behaviors, such as poor dietary habits, lack of exercise and smoking."[3]

The evidence mounts that the use of tobacco often causes serious disease and impairment in various systems of the body. For aviation professionals, the findings concerning the adverse effects of tobacco are sufficient to preclude the use of tobacco.The benefits of smoking cessation are widely publicized and even casual reading on the subject is enough to convince all but the most stubbornly resistant that quitting smoking is the only sensible policy.

Aviation professionals, who exercise a high degree of discipline in their work, should not find it especially difficult to be equally disciplined in measures that will enhance their health and longevity.♦

References

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Further Reading from FSF Publications

Mohler, S. "Adhesive Nicotine Patches Help Pilots Quit Smoking." *Human Factors & Aviation Medicine* Volume 40 (January–February 1993).

Mohler, S. "The Dedicated Professional Pilot: No Nicotine Addict." *Human Factors Bulletin*. July–August 1979 and September–October 1979.

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