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 Press Release

New Research: Narghile Smokers Exposed to Dangerous Chemicals

Two new studies conducted by researchers at the American University of Beirut and St. Joseph University in Beirut show that narghile smoke contains significant quantities of the same chemicals which make cigarette smoke harmful. The findings contradict the commonly held belief that the water of the narghile water pipe renders the smoke harmless.

In the AUB study, which appears in the January 2003 issue of the prestigious journal *Food and Chemical Toxicology*, the tar, nicotine, and heavy metal contents of narghile smoke issuing from an experimental smoking machine were determined with a common *mo'assel* tobacco. The measurements were made using various smoking conditions meant to represent "average" narghile smoking behavior in terms of the puff volume, duration, and time interval between puffs.

The results showed that the collected smoke of 100 puffs contained nicotine, tar, and carcinogenic heavy metals (part of the tar) in alarming quantities, in some cases exceeding several-fold

those found in a single cigarette. Along with carbon monoxide, which was not measured, tar and nicotine are considered to be the primary causes of smoking-related diseases, which include cancer of the respiratory track, bladder, and heart disease.

While tar levels in the narghile smoke appeared in alarmingly high levels in comparison to cigarette smoke, the study's author, Dr. Alan Shihadeh, Assistant Professor in the AUB Department of Mechanical Engineering, cautioned in interpreting the results. "While a single 100-puff narghile smoking session produces as much tar as 20 or more cigarettes, the composition of the tar is likely to differ from that for cigarette smoke because of the lower temperature at which the tobacco burns in the narghile head." Tar content is considered the best index of a cigarette's cancer-causing potential. The AUB study showed that the maximum temperatures found in the narghile head are approximately 450 °C, considerably lower than maximum temperatures of approximately 900 °C found in cigarettes.

Summary of findings

Substance	Narghile AUB [†]	Narghile USJ [‡]	Cigarette*
Nicotine [mg]	2.25	1.90	0.05-2.5
Tar [mg]	242		0.5-35
Benzo(a)pyrene [ng]		52	20-40
Arsenic [ng]	165		40-120
Beryllium [ng]	65		300
Nickel [ng]	990		0-600
Cobalt [ng]	70		0.13-0.2
Chromium [ng]	1340		4-70
Lead [ng]	6870		34-85

[†]Ten grams of tobacco mixture used in narghile head, 100 3-second puffs of 0.3 liter volume each, spaced 30 seconds apart.

[‡] Seven grams of tobacco mixture used in narghile head, 300 2-second puffs, spaced 10 seconds apart. Experimental puff volume selected to give same nicotine level in smoke as measured with an experienced smoker.

*Values for a single cigarette reported in a comprehensive review of previous studies (Hoffmann, D. and Hoffmann, I. Letters to the Editor, Tobacco Smoke Components. Beitr. Tabakforsch. Int., 18, 49-52)

In the USJ study, Dr. Chawky Harfouch and Dr. Negib Geahchan measured the nicotine and polycyclic hydrocarbons content of narghile smoke using a common *mo'assel* tobacco. Like the AUB study, they found that while some nicotine is filtered by the water, it did not filter the cancer-causing benzo(a)pyrene, a key component of the tar and a powerful carcinogen. Based on other studies that found similar levels of nicotine in the blood of narghile and cigarette smokers, Dr Harfouch concluded that “an addicted narghile smoker likely smokes more tobacco than a cigarette smoker to achieve similar nicotine blood levels. In doing so, the smoker is exposed to a higher level of cancer-causing chemicals.”

While the USJ and AUB studies used different smoking parameters, the results were consistent in that both found that water only partially filtered nicotine in the smoke, but had little effect on cancer-causing tar fractions. “There are important public health implications to these studies” commented Dr. Samer Jabbour, a cardiologist and a public health practitioner and director of the QUIT SMOKING Program at AUB. Dr. Jabbour noted that “while the consequences of reduced level of nicotine in narghile are unknown, it is possible that repeated exposures can lead to addiction.” “Whether narghile is addictive or not”, he added, “repeated exposures to tar in narghile smoke also raise the possibility of cancer.” Previous studies have linked narghile smoking with oral cancer, reduced lung function, and low birth weight. “Considering the increased use of narghile in Lebanon,” Dr. Jabbour urges that “this is the time to act to prevent the anticipated future health problems.” Dr. Geahchan, the USJ study supervisor, cautioned “neither cigarette nor narghile smoke are safe, nor is one preferable to the other. As a physician, I would not advise people to substitute one dangerous practice for another. The wisest approach is to refrain from smoking altogether.”

What is worse: cigarette or narghile smoke?

From the two studies, it is clear that some toxins appear at greater levels in narghile smoke than in cigarette smoke, while others are more prevalent in cigarette smoke. Neither is “preferable” to the other; both have the potential to cause disease.

What about the water?

The water was found to have little impact on the amount of tar and benzo(a)pyrene present in the smoke, but on the other hand reduced the average nicotine content considerably. Even with the water, however, the nicotine content of the narghile smoke was high.

A brief introduction to tobacco smoke and its constituents

Tobacco smoke is comprised of thousands of chemical compounds whose health implications are understood to varying degrees. The smoke is made up of a visible mist of micron-sized liquid particles (the mist is commonly referred to as “particulate phase”) suspended in a colorless gas (this is commonly referred to as “gas phase”). The mist, which typically accounts for approximately 10% of the weight of the smoke, consists of condensed water, tar, and nicotine. Tar is a mixture of thousands of compounds and is primarily responsible for the cancer-causing potential of tobacco smoke. It contains powerful carcinogens such as benzo-pyrene (one member of the class of compounds known as polycyclic aromatic hydrocarbons, PAH), nitrosamines, and aromatic amines, as well as a host of carcinogenic heavy metals such as arsenic, chromium, and lead. Nicotine is the most powerful addictive agent in tobacco smoke. It is thought to contribute to coronary heart disease. While not a proven carcinogen, recent studies indicate that nicotine interfere with the body’s defenses against cancer.

The gas phase accounts for roughly 90% of the weight of tobacco smoke. It consists mainly of nitrogen, oxygen, and carbon dioxide (these three account for approximately 85% of the gasses in the smoker), carbon monoxide, water vapor, volatile hydrocarbons, carbonyls, and other materials. From a health perspective, carbon monoxide is the most significant component as it has been implicated in coronary heart disease, atherosclerosis and sudden death, and chronic respiratory disease. The volatile hydrocarbons include known carcinogens such as benzene, but because of their low concentrations they are not deemed important in comparison to the compounds present in tar fraction.