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## Nicotine: The Brain and Body Background Information

### Smoking

Smoking has a tremendous impact on the health of Americans. According to the Centers for Disease Control and Prevention (CDC), 1 out of every 5 deaths is smoking related. Smoking has been linked with a number of health problems, including cancer, heart disease, bronchitis, emphysema, and stroke.

The following lessons are designed to help students understand why smoking is harmful to the body and brain. Addressing this issue in elementary school is important. According to the 2000 Youth Tobacco Surveillance Study, 15.1% of middle school students use some type of tobacco product. In addition to the long-term consequences of smoking, research has also documented more immediate consequences of smoking for youth such as a reduced rate of lung growth, a negative impact on physical fitness, and a lower level of lung function (CDC, 2001).

### Nicotine and the Body

Tobacco smoke contains over 4,000 chemicals. Although the amount of chemicals in each cigarette is small, their effects are cumulative, which means that the amount stored in the body increases with each puff of a cigarette. Nicotine is the chemical in cigarette smoke that has received the most attention as a

potentially addictive agent.

Nicotine enters the body by “riding” in with tar that is inhaled from a lit cigarette. When the nicotine/tar mixture gets into the lungs, the nicotine is absorbed quickly, about 8 seconds after the smoke is inhaled. Once it enters the bloodstream it can travel to the brain. American cigarettes contain about 9mg of nicotine, but much of that is burned off. A smoker gets about 1mg of nicotine from every cigarette. Smoking can be either stimulating or relaxing depending on the person’s mood, their history with nicotine, and the dose of nicotine.

Nicotine’s effects include increases in blood pressure and heart rate, constriction of arteries, and stimulation of the central nervous system. Other harmful chemicals and substances in cigarette smoke that are linked to lung cancer are tar, ammonia, carbon monoxide, oxides of nitrogen, and benzopyrene.

### Nicotine and the Brain

Nicotine activates several brain mechanisms by attaching to receptors on nerve cells, thus transmitting a chemical message much like neurotransmitters. There are several different types of nicotine receptors in the central nervous system. Today scientists are conducting research to track the function of each

receptor group and type. Scientists do know that nicotine causes a release of dopamine in the regions of the brain that control pleasure and motivation, which may explain the pleasurable sensations experienced by many smokers. Repeated exposure to nicotine results in the development of tolerance, the condition in which higher doses of a drug are required to produce the same initial stimulation. As smokers consume more cigarettes to achieve relaxing or stimulating effects, they may become dependent or addicted. Exactly how nicotine produces dependence and addiction is not clear. However, most people trying to quit smoking experience agitation and powerful nicotine cravings.