

Anatomy of a cigarette

Cigarettes have come a long way from being a bit of paper rolled around chopped tobacco leaf. Here's a look at what's inside — and at what Philip Morris USA researchers are focused on as they delve deep into the science of smoking at their secretive new research and development center in Richmond.

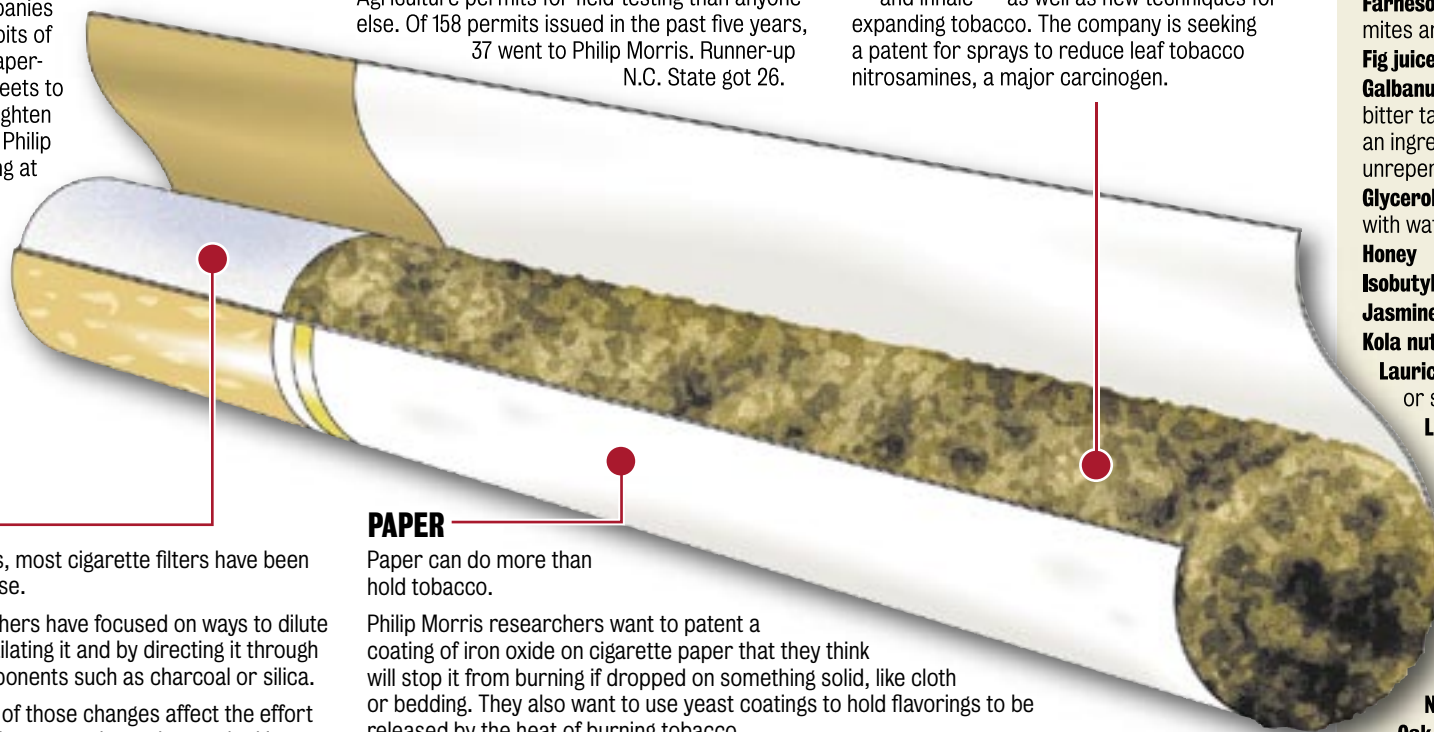
THE TOBACCO ROD

What smokers crave is the nicotine in tobacco. Burning tobacco to release nicotine generates toxins and cancer-causing compounds.

Cigarette companies use puffed-up bits of tobacco and paper-like tobacco sheets to cut costs and lighten smoke density. Philip Morris is looking at tobacco treatments and additives that might change

smoke chemistry — a futile effort, health advocates say — and is researching genetically modified tobacco, with more U.S. Department of Agriculture permits for field-testing than anyone else. Of 158 permits issued in the past five years, 37 went to Philip Morris. Runner-up N.C. State got 26.

Philip Morris also has applied for patents for treatments of sheet tobacco, adding glycerin as a way to make smoke moister and easier to filter — and inhale — as well as new techniques for expanding tobacco. The company is seeking a patent for sprays to reduce leaf tobacco nitrosamines, a major carcinogen.



FILTER

Since the 1950s, most cigarette filters have been plugs of cellulose.

Lately, researchers have focused on ways to dilute smoke, by ventilating it and by directing it through new filter components such as charcoal or silica.

Because many of those changes affect the effort needed to inhale, researchers also are looking at using tiny plastic bits that could be inserted in new-style filters so they feel like traditional ones.

PAPER

Paper can do more than hold tobacco.

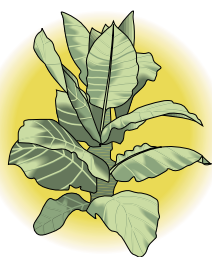
Philip Morris researchers want to patent a coating of iron oxide on cigarette paper that they think will stop it from burning if dropped on something solid, like cloth or bedding. They also want to use yeast coatings to hold flavorings to be released by the heat of burning tobacco.

Researchers also are exploring whether coatings of iron oxide and magnesium ammonium phosphate absorb some specific smoke toxins, though health advocates doubt targeting one hazard reduces overall danger.

TOBACCO

U.S. cigarettes are blends of these tobaccos. Smokers in Great Britain and Canada prefer 100 percent flue-cured tobacco, like the variety grown in Southside, which is why cigarettes sold there often are labeled "Virginia Cigarettes."

Flue-cured



Sometimes called "bright" tobacco, flue-cured is processed by heat in a special barn and has a relatively mild taste.

Burley



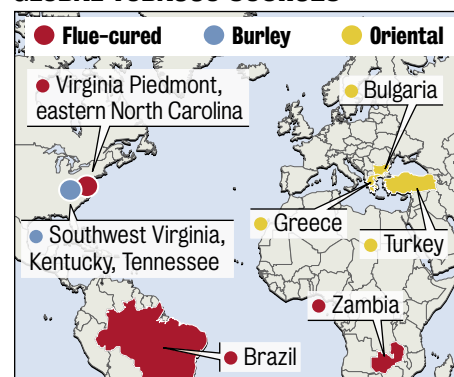
Burley is harsher with more of a nicotine kick.

Oriental



Oriental gives U.S.-style cigarettes a more complex flavor.

GLOBAL TOBACCO SOURCES



ADDITIVES

Here's an ABC of some additives that go into cigarettes — not all at one time — compiled from a list of 599 additives disclosed by tobacco-makers to the U.S. Health and Human Services Department:

Acetanisole Found in a glandular secretion of beavers that smells sweet and can taste like vanilla or cherry.

Ammonia Used in cleaning fluid. Makes eyes sting and can cause dermatitis.

Beet juice

Butyric acid Found in rancid butter, vomit and Parmesan cheese, it has an acrid taste but sweet aftertaste.

Caffeine

Capsicum oleoresin Active ingredient in pepper spray.

Chocolate

Cinnamon

Clover top

Diacetyl An artificial butter flavoring that can be hazardous when heated and inhaled over a long period.

Dill seed

Ethyl acetate A solvent.

Farnesol An alcohol that is also a natural pesticide for mites and is a pheromone for several insects.

Fig juice

Galbanum An aromatic gum, with a disagreeable, bitter taste. It is mentioned in the Jewish Talmud as an ingredient of incense included to be a reminder of unrepentant, deliberate sinners.

Glycerol A colorless, sweet liquid that bonds with water.

Honey

Isobutyl acetate A solvent used in lacquer.

Jasmine

Kola nut

Lauric acid A fatty acid that smells slightly of bay oil or soap.

Lemongrass

Magnesium carbonate A mineral used in flooring, fireproofing, cosmetics and toothpaste that may be a laxative in high doses.

Methoprene A hormone used in drinking water cisterns to control mosquitoes that spread malaria.

Nonanoic acid Used to make plasticized lacquer and as a herbicide.

Nutmeg

Oak chip

Oleic acid Emitted by the decaying corpses of some bees and ants to signal living workers to remove bodies from the nest.

Potassium sorbate A food preservative.

Rose

Rum

Skatole A compound generated in mammals' digestive tracts and in beets that has a strong fecal odor.

Soda ash (sodium carbonate) Used as a water softener and in making glass.

Tartaric acid Found in wine and bananas, it gives foods a sour taste and is used as an antioxidant.

Thiazole A flammable liquid used to make fungicides.

Urea A chemical used in fertilizer that can irritate the eyes, skin and respiratory tract.

Vanillin

Walnut hull extract

Wine

Xanthan gum A food additive used as a thickener.

Yeast