



What can we learn about setting performance standards for tobacco products from differences in their design, contents, and emissions?

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Memorial Day Weekend, 1995



The New York Times

VOL. CXLIV... No. 50,074

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NEW YORK, SATURDAY, MAY 27, 1995

It reports the greater New York metropolitan area

60 CENTS

Tobacco Giant Recalls 8 Billion Faulty Cigarettes ***Chemical Contaminants Found in Filters***

By GLENN COLLINS

The Philip Morris Companies yesterday announced a \$100 million recall involving more than eight billion filter cigarettes.

The timing of the announcement was dictated, Mr. Morgan said, by "the fact that we realized we couldn't identify the location of all of the defective cigarettes."

Nevertheless, analysts and executives

Philip Morris said "a small percentage" of three billion cigarettes manufactured from May 16 to May 19 had been affected. But given the complexities of the tobacco distribution system, it said it could not

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Recall of Philip Morris Cigarettes, May 1995–March 1996

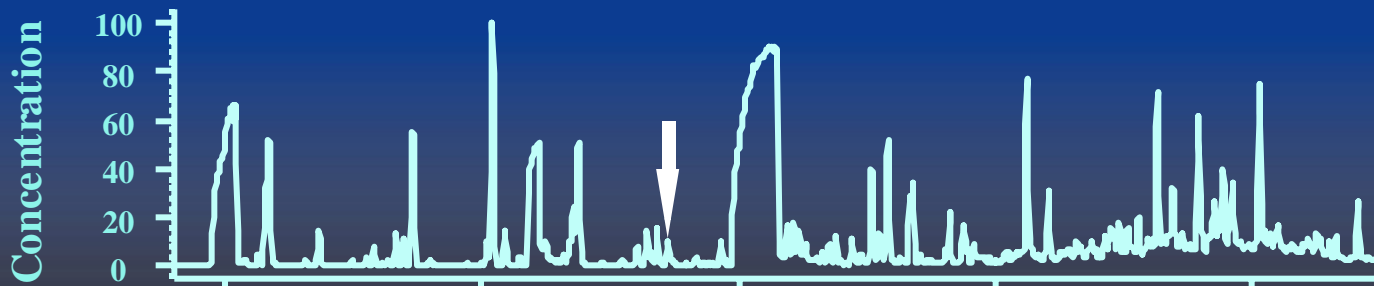
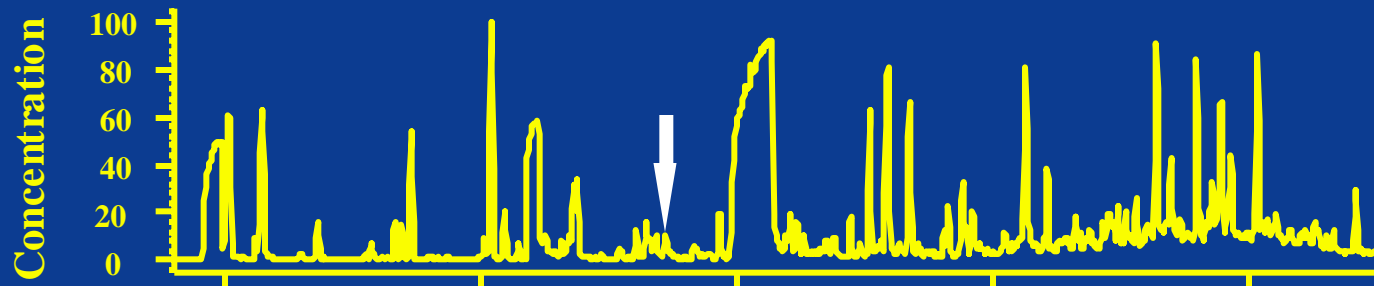
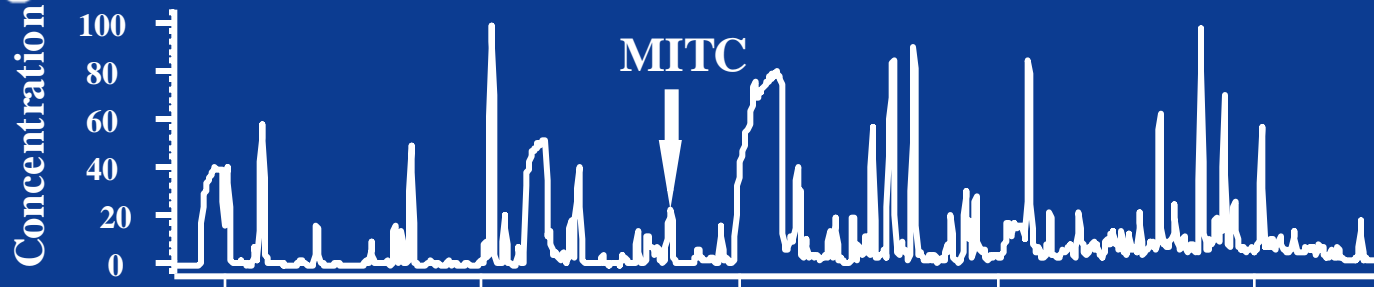
On May 26, 1995, Philip Morris U.S.A.* announced a voluntary recall of 36 cigarette product lines (approximately 8 billion cigarettes) because, during production, the company detected unusual tastes and peculiar odors and identified methyl isothiocyanate (MITC) in the cigarette filters. During June 6–8, 1995, public health officials in Minnesota, Oregon, and Texas requested CDC's assistance in investigating consumer health complaints associated with smoking Philip Morris cigarettes near the time of the recall. This report summarizes CDC's ongoing investigation, which suggests that prolonged cigarette smoking caused most of the health complaints; in addition, the investigation has not identified a distinguishing chemical characteristic of the recalled cigarettes.

***Use of trade names and commercial sources is for identification only and does not imply endorsement by the Public Health Service or the U.S. Department of Health and Human Services.**

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Total ion chromatograms of volatile compounds in Philip Morris cigarettes



Retention time (min)

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Lessons Learned



Performance standards were focused on smoke taste and not chemical composition or adulteration

Tobacco companies knew more about their competitors' products

The product standards were not satisfactorily addressing the toxicity of the product that was on the market



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Tobacco-Specific Nitrosamines



TSNAs are known carcinogens formed from the reaction of nicotine and related alkaloids and nitrogen oxides

TSNA levels in bright (flue-cured) tobacco are influenced by exposure of tobacco to nitrogen oxides during curing

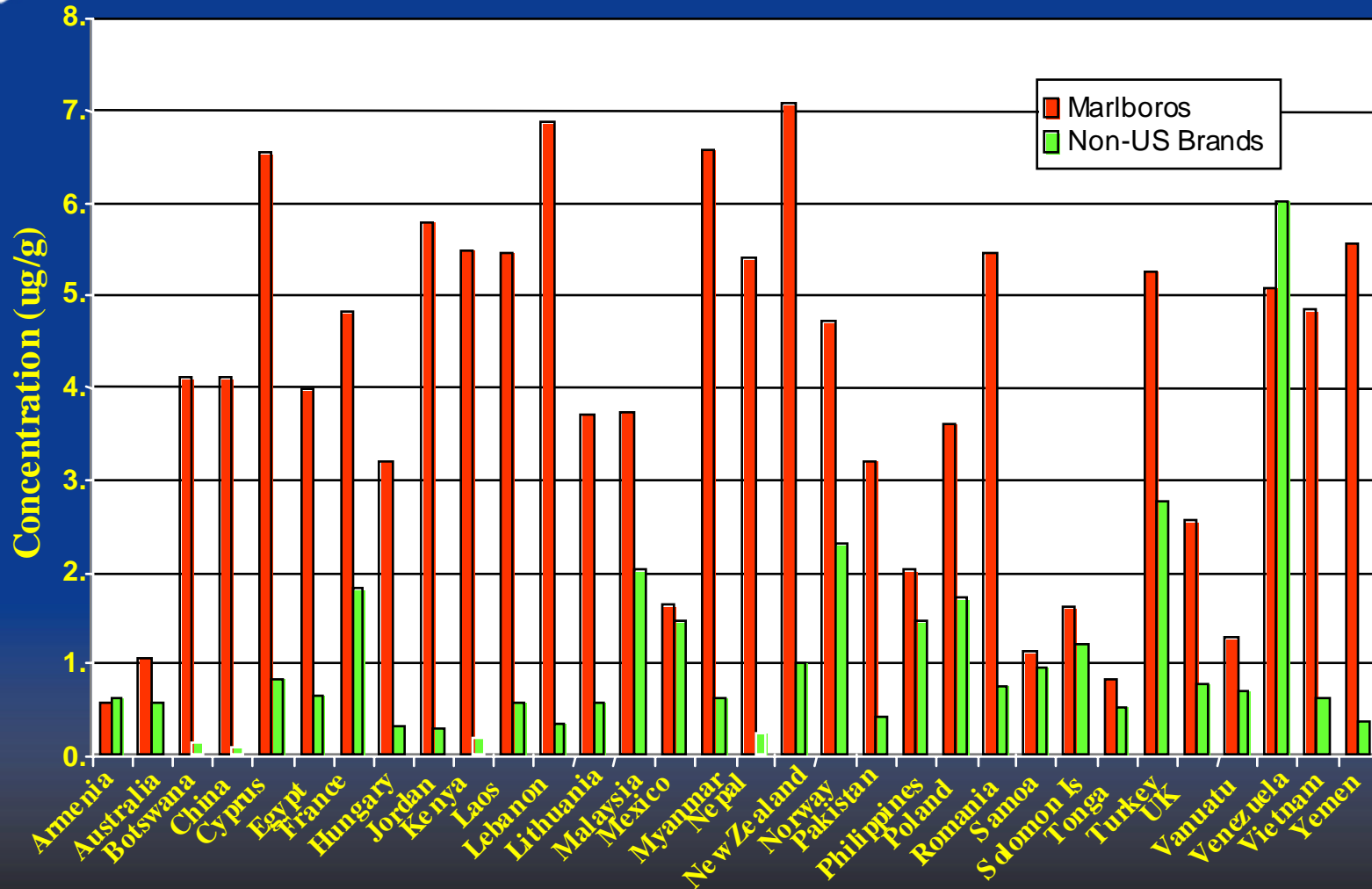
TSNA levels result from microbial action during Burley tobacco curing

Some TSNAs may be formed during smoking and depend on nitrate levels in the tobacco

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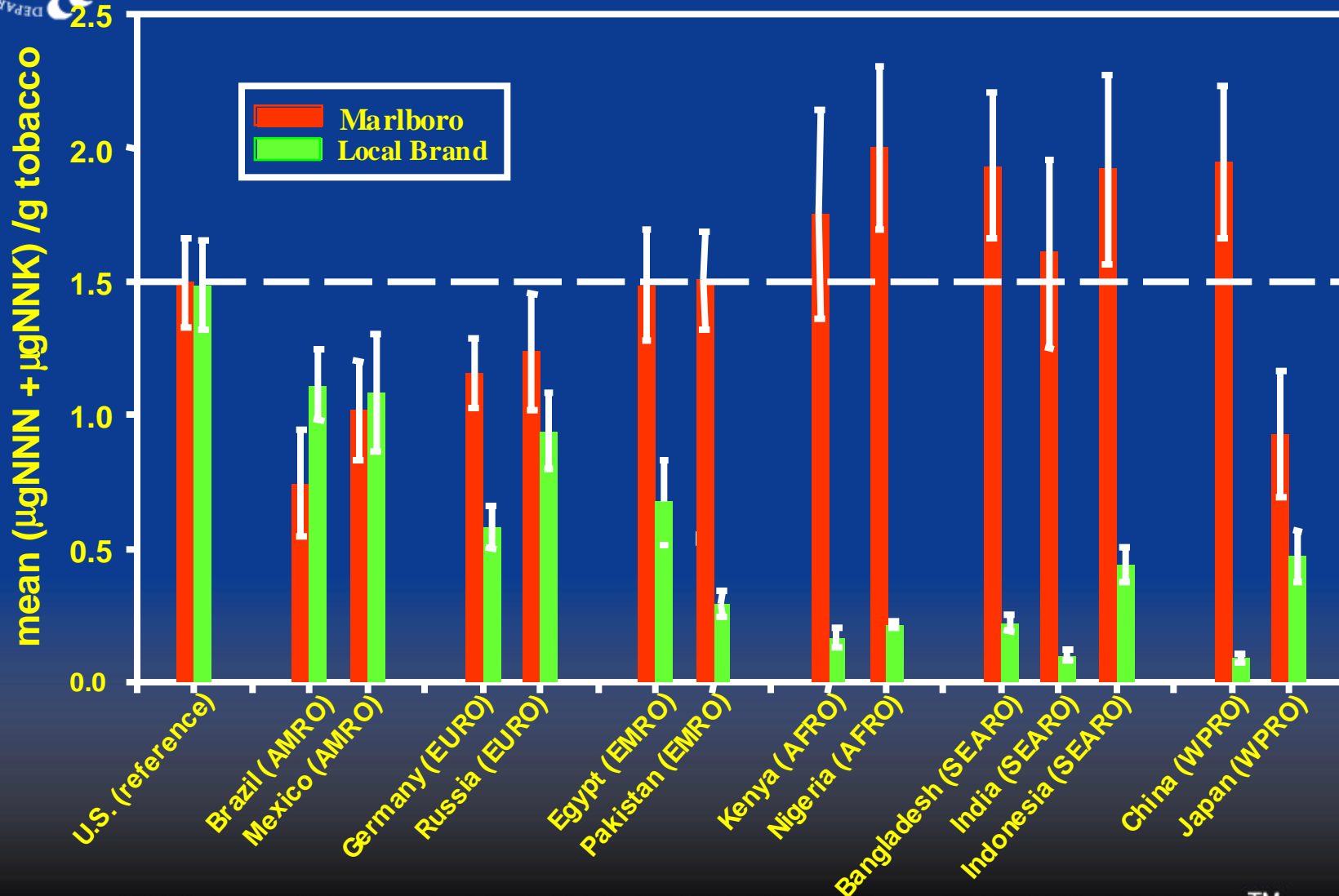
Carcinogenic Nitrosamines in Tobacco



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Mean levels and 95% confidence intervals of tobacco-specific nitrosamines in Marlboro and popular non-U.S. brands by WHO regions and countries – counterfeits removed



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Cigarettes may contain a mix of tobacco types



Typical
US blend:

Bright (30-40%)

Burley (20-30%)

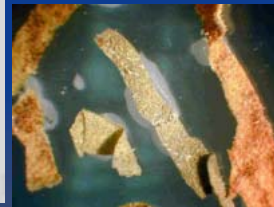
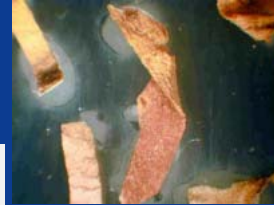
Stems (2-10%)

Oriental (10-15%)

Recon

(Bandcast 5-15%

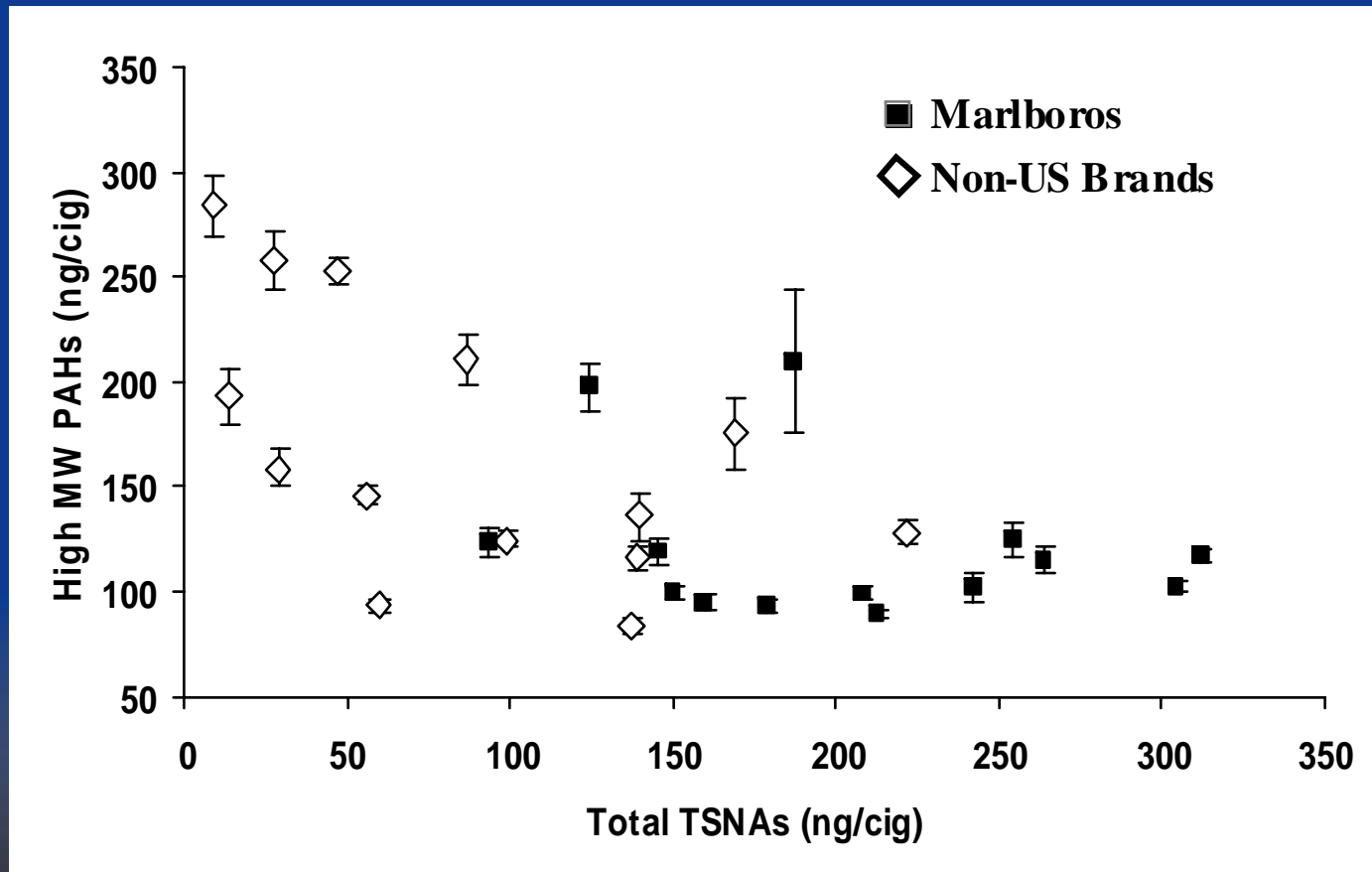
Paper recon 5-15%)



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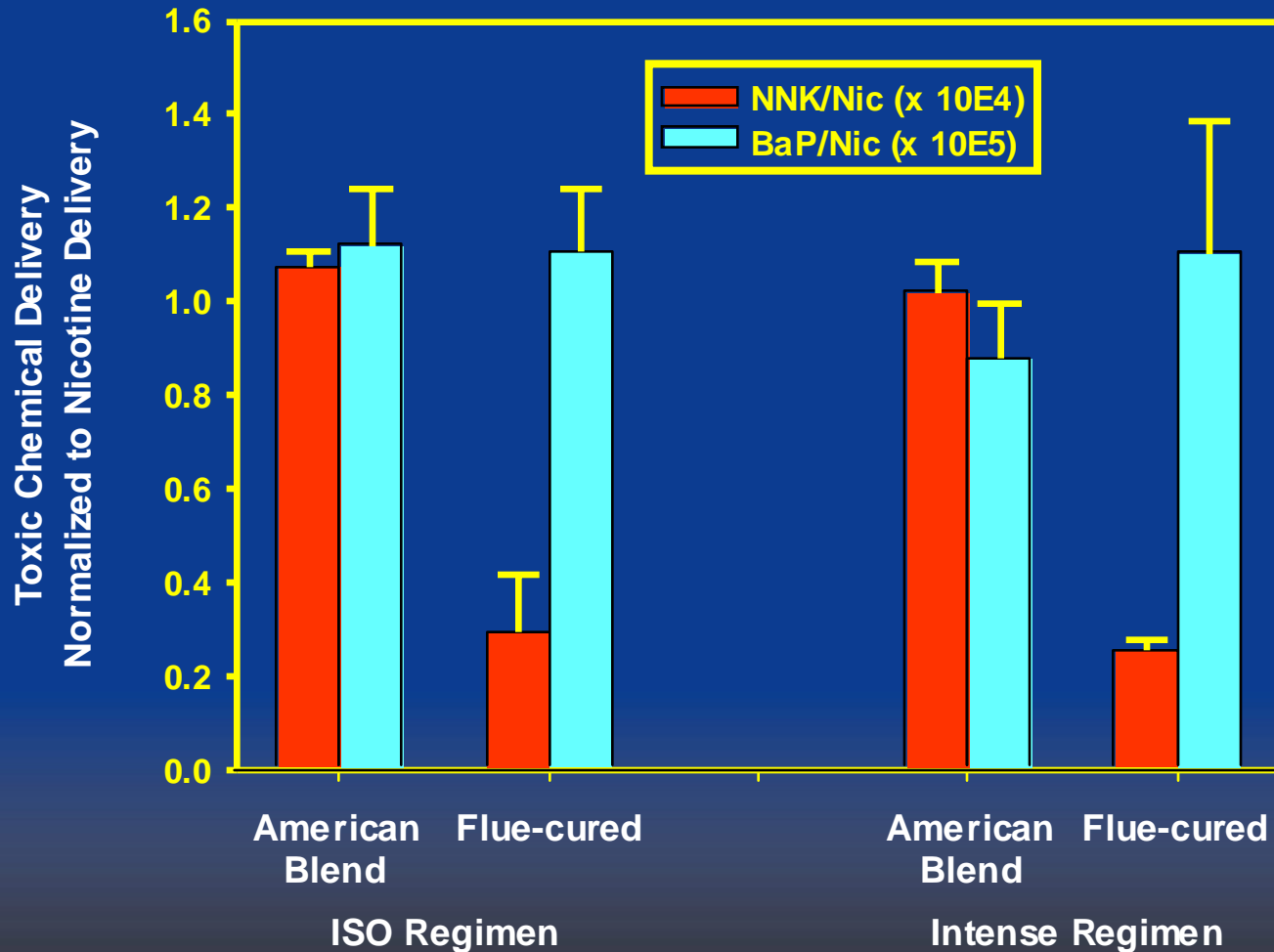
Polyaromatic Hydrocarbons and Tobacco-specific Nitrosamines



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Polyaromatic Hydrocarbons and Tobacco-specific Nitrosamines



Source: Counts et al. Smoke composition and predicting relationships for international commercial cigarettes smoked with three machine-smoking conditions. Regul Toxicol Pharm 2005;41:185-227.

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Volatiles in Smoke

Considered by some investigators to be the class of chemicals of most concern

Cancer

1,3-Butadiene
Acrylonitrile
Acetaldehyde
Benzene

Lung Disease

Acrolein
Acetaldehyde
Formaldehyde

Heart Disease

Cyanide
Benzene

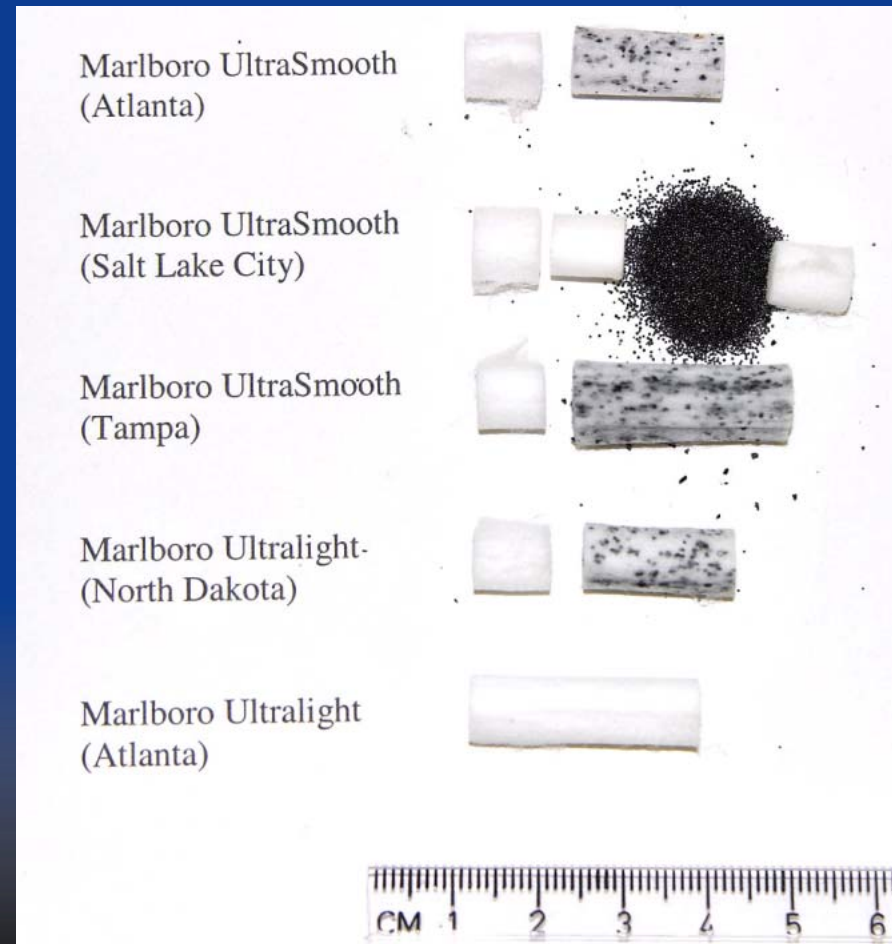
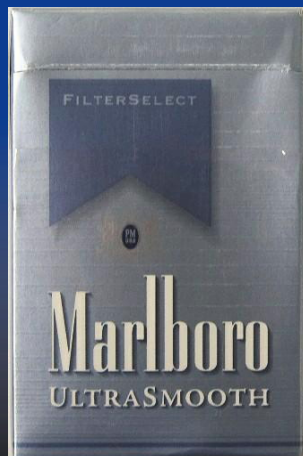
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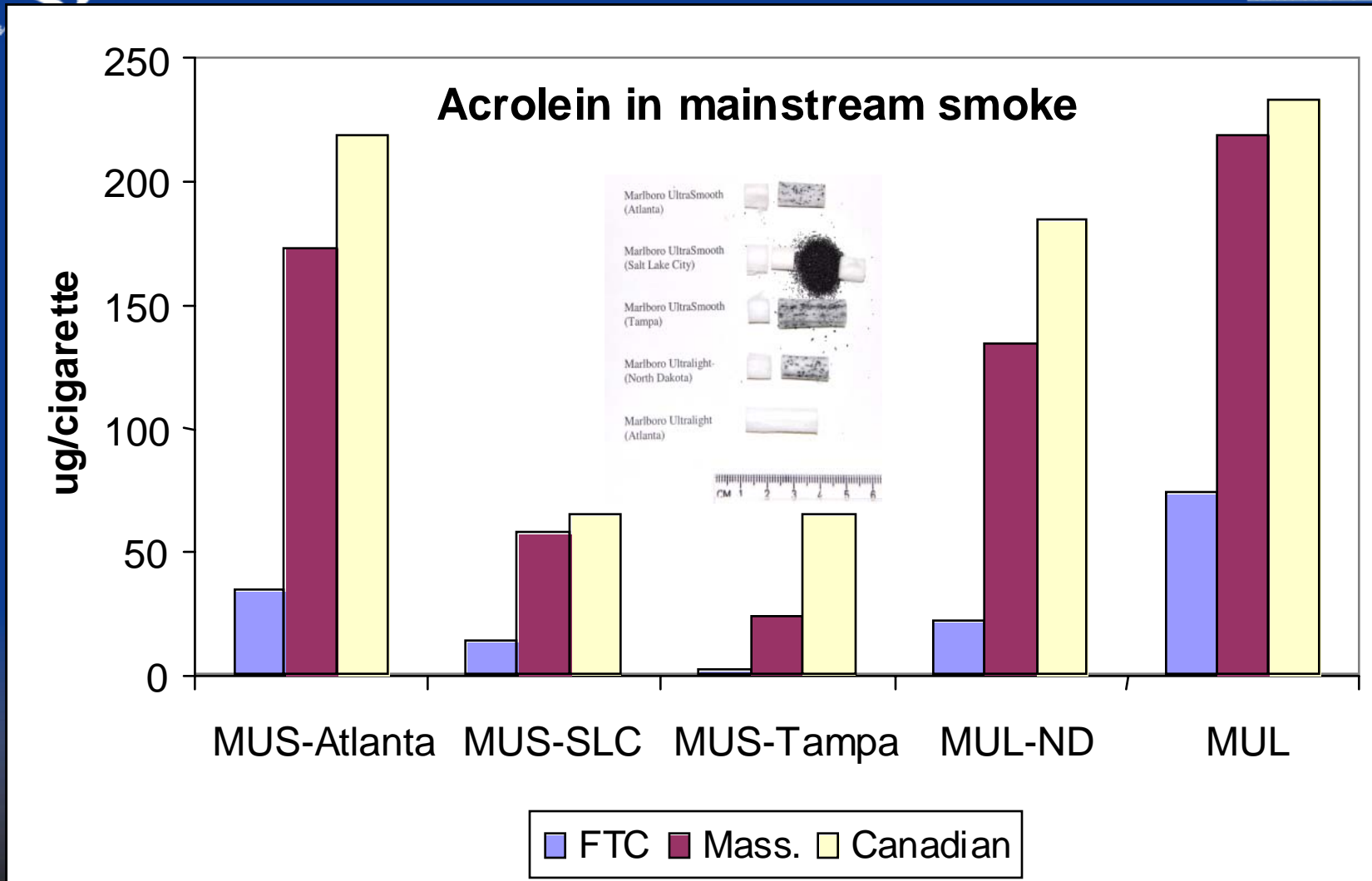
Different charcoal filter designs for Marlboro UltraSmooth cigarettes

Philip Morris' SCoR
(Selected Constituent
Reduction) Program

Targeting Volatile
Smoke Components



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Ventilation decreased machine-measured delivery of tar and nicotine

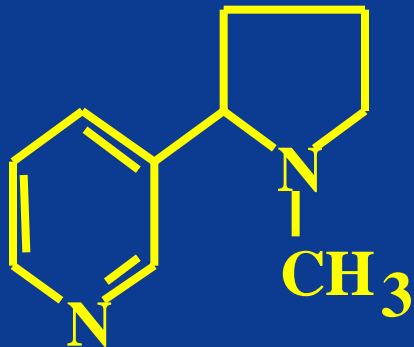


Smokers can alter the way they smoke to get higher delivery of tar, nicotine and other toxic emissions

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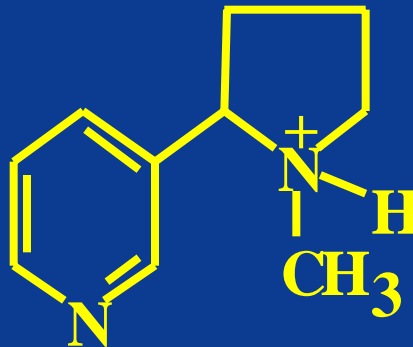


Nicotine can exist in different charged states



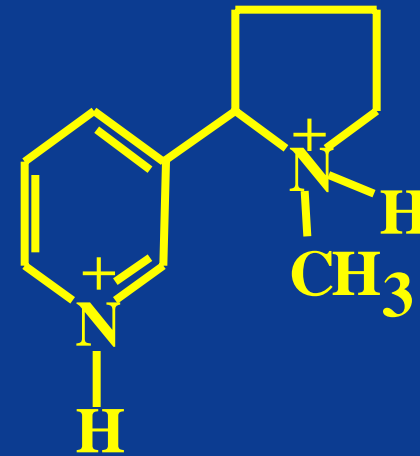
**Unprotonated (Free)
Nicotine**

**Vapor Phase
Readily Absorbed
Harsh to Mucous
Membranes**



**Protonated
Nicotine**

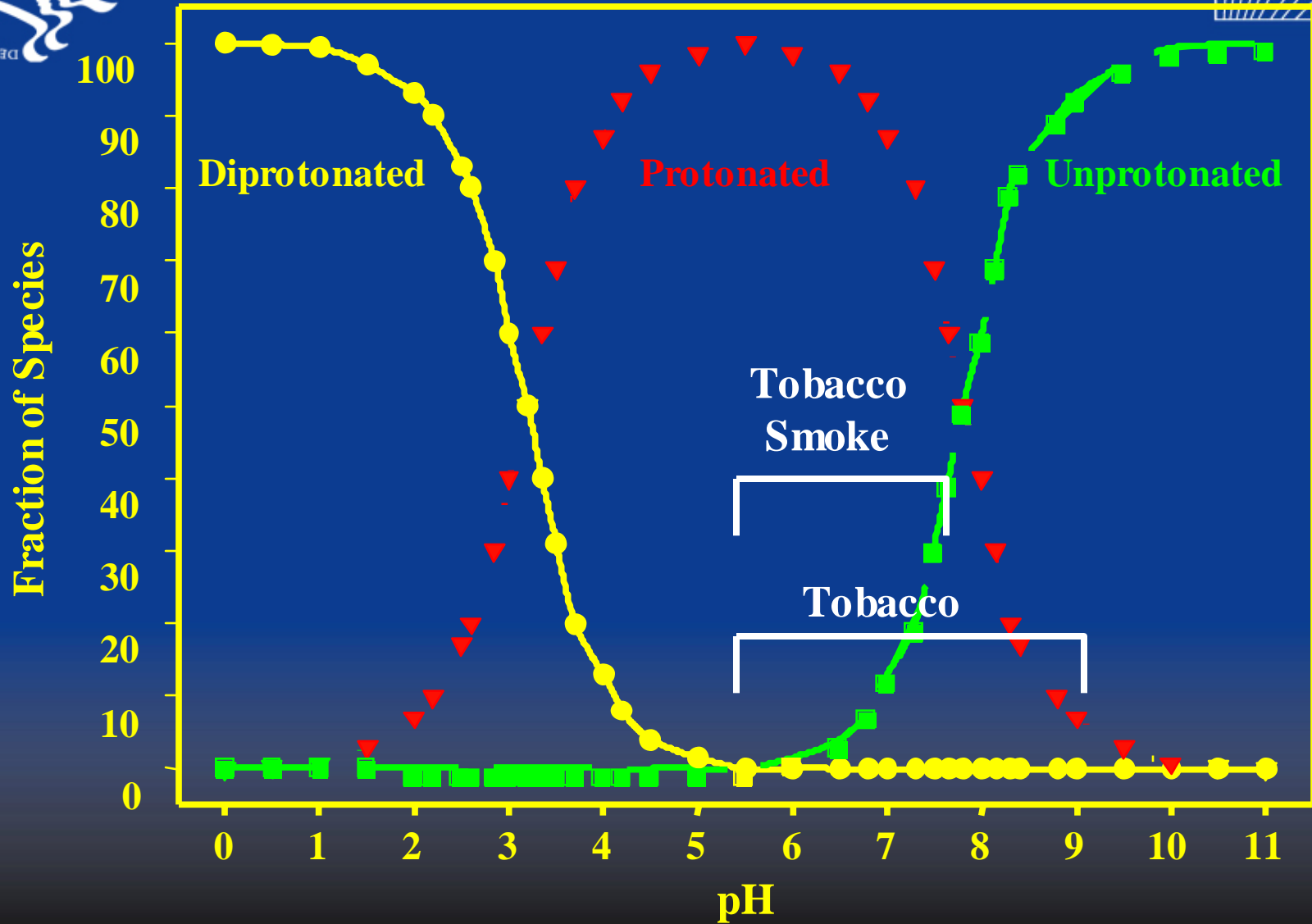
**Particulate Phase
Slowly Absorbed
Less Harsh to
Mucous Membranes**



**Diprotonated
Nicotine**

**Not Present in
Tobacco or
Tobacco Smoke**

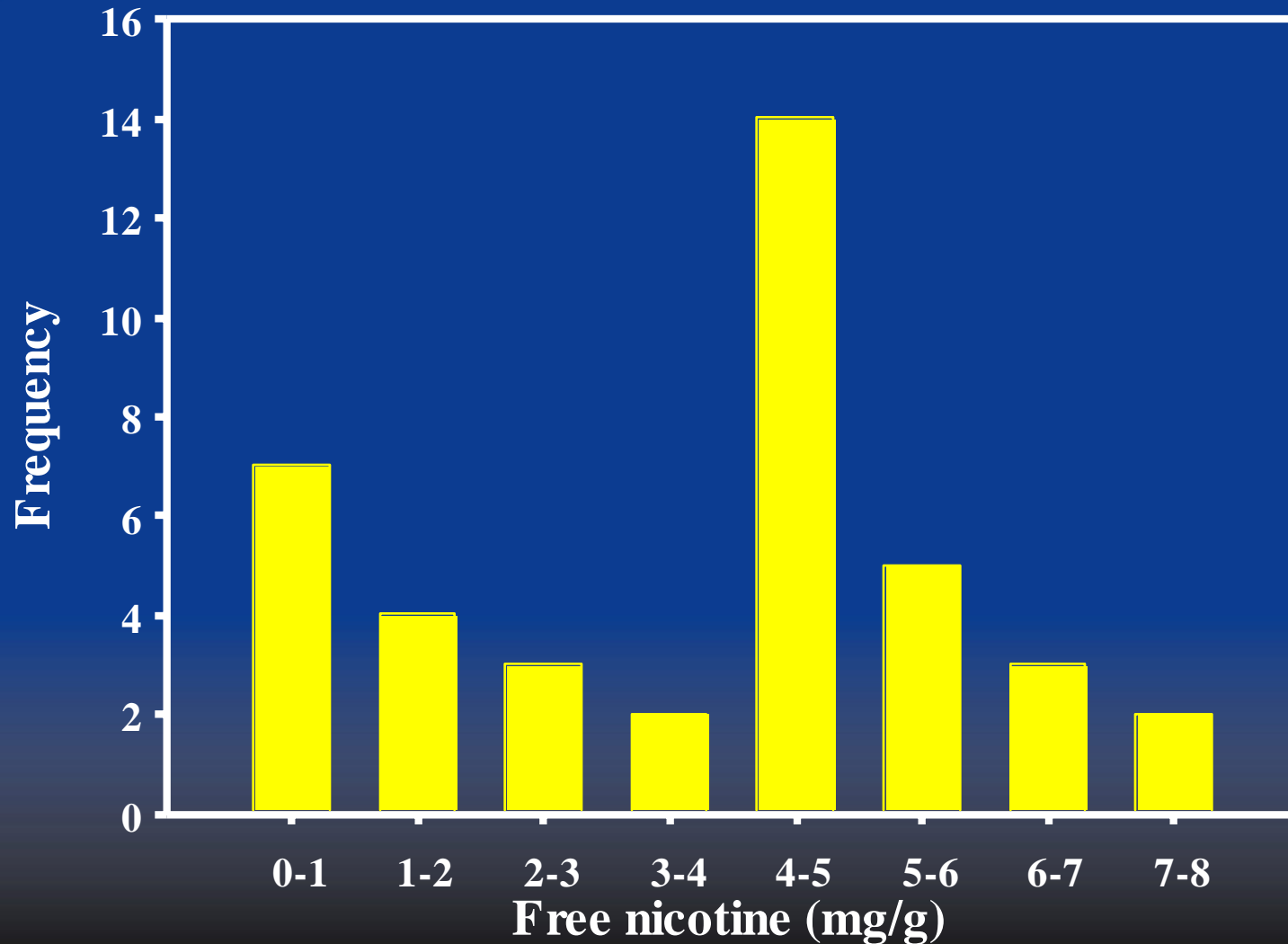
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Free nicotine in U.S. smokeless tobacco (n=42)

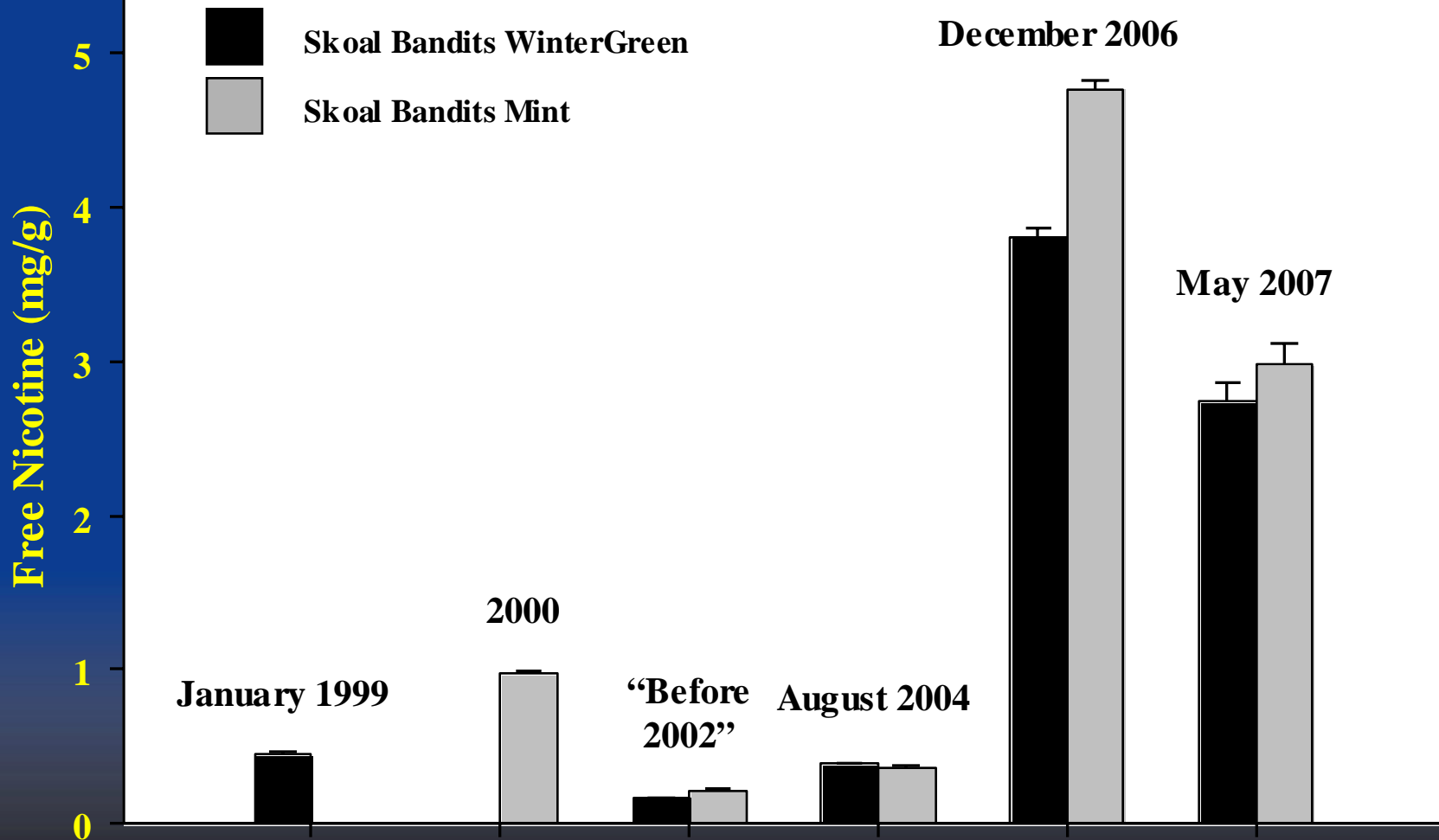


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Skoal Bandits packaging from product purchased in August 2004 (top row) and December 2006 (bottom row).

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There are current technologies available which can reduce the emissions and contents of toxic and addictive chemicals in tobacco products.

Further research is still needed to determine to what degree product changes will impact morbidity and mortality from tobacco use.

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Carcinogenic Nitrosamines in Marlboro Cigarette Smoke



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