B. Cole P000920

Tobacco Chemists' Research Conference

INSTRUCTIONS FOR THE PREPARATION OF ABSTRACTS

NOTE: The abstract must contain a meaningful summary of the material to be presented. It must include the objectives of the research efforts, the methods used, and the results obtained. The editorial committee reviews and accepts papers based on the abstract. Very short or vague abstracts will not be accepted.

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Approaches to Characterizing Smoke from New Cigarette Designs - A Product Evaluation Strategy. Michael F. Borgerding. R. J. Reynolds Tobacco Company, Winston-Salem, NC 27102-1487.

New cigarette components and cigarette designs such as new carbon filters, experimental tobacco blends, and cigarettes which primarily heat, rather than burn, tobacco continue to be developed. An extensive chemical analysis program has been applied to evaluate and characterize cigarette smoke from some of these new cigarettes

This paper will review typical chemical analyses which may be applied to mainstream or sidestream smoke to evaluate new cigarette designs. The role of gross measures (measures based upon a chemical or physical property of smoke total particulate matter), aggregate chemical measures (measures based on a summary chemical response from more than one smoke constituent) and specific compound determinations (quantitative measures of individual smoke constituents) within the context of the analysis program will be addressed. Additionally, study designs for comparing smoke from different cigarettes will be presented. Cigarettes from the current US market, control cigarettes pertinent to the study and University of Kentucky reference cigarettes are each useful for assessing smoke from a new cigarette design. Products chosen to study, including a new carbon filter design, an experimental tobacco blend, and a cigarette that primarily heats, rather than burns, tobacco will be described.

1. The abstract should be 180-225 words in length and be included in the space designated above. IN ADDITION TO THE PRINTED COPIES, THE ABSTRACT MUST BE SUBMITTED AS BOTH A WORD PROCESSING FILE AND AN ASCII (TEXT) FILE ON DISKETTE. Label the diskette with the principal author's last name and specify the word processing package used.

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6. The maximum presentation time is 15 minutes, with 5 minutes for discussion.

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Approaches to Characterizing Smoke from New Cigarettes - A Product Evaluation Strategy

Michael F. Borgerding

R. J. Reynolds Tobacco Company

Current Product Development Efforts

- New carbon filter design
- Experimental Blend
- Cigarette which primarily heats tobacco

Product Evaluation Strategy to Characterize Smoke from New Cigarette Designs

The Opportunity

Product Evaluation Study Design Components

- Cigarettes of Interest
- Chemical Analyses

Each Study Design will be Different

Study design depends upon the nature of the cigarette or cigarette component which is of interest

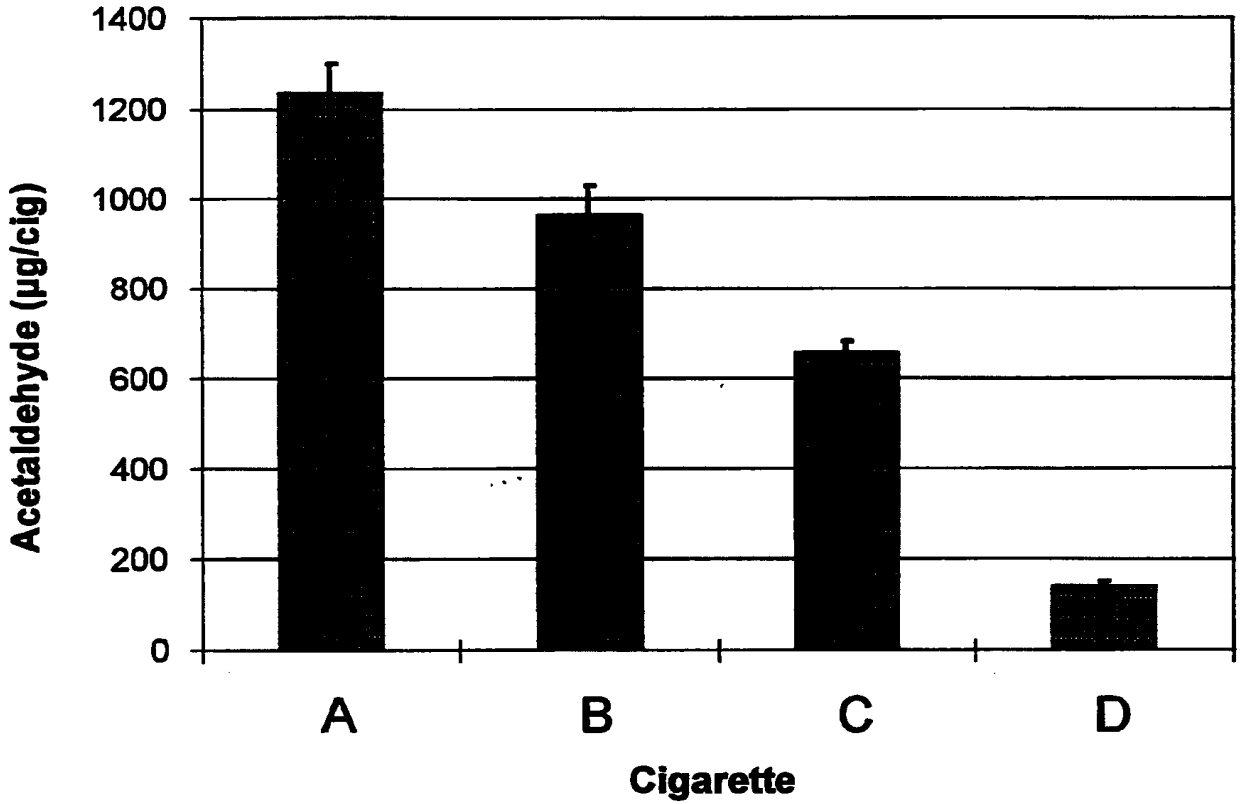
Potential Products for Study

- New Products
- Appropriate Control Cigarettes
- Cigarettes from the U.S. Market
- Kentucky Reference Cigarettes

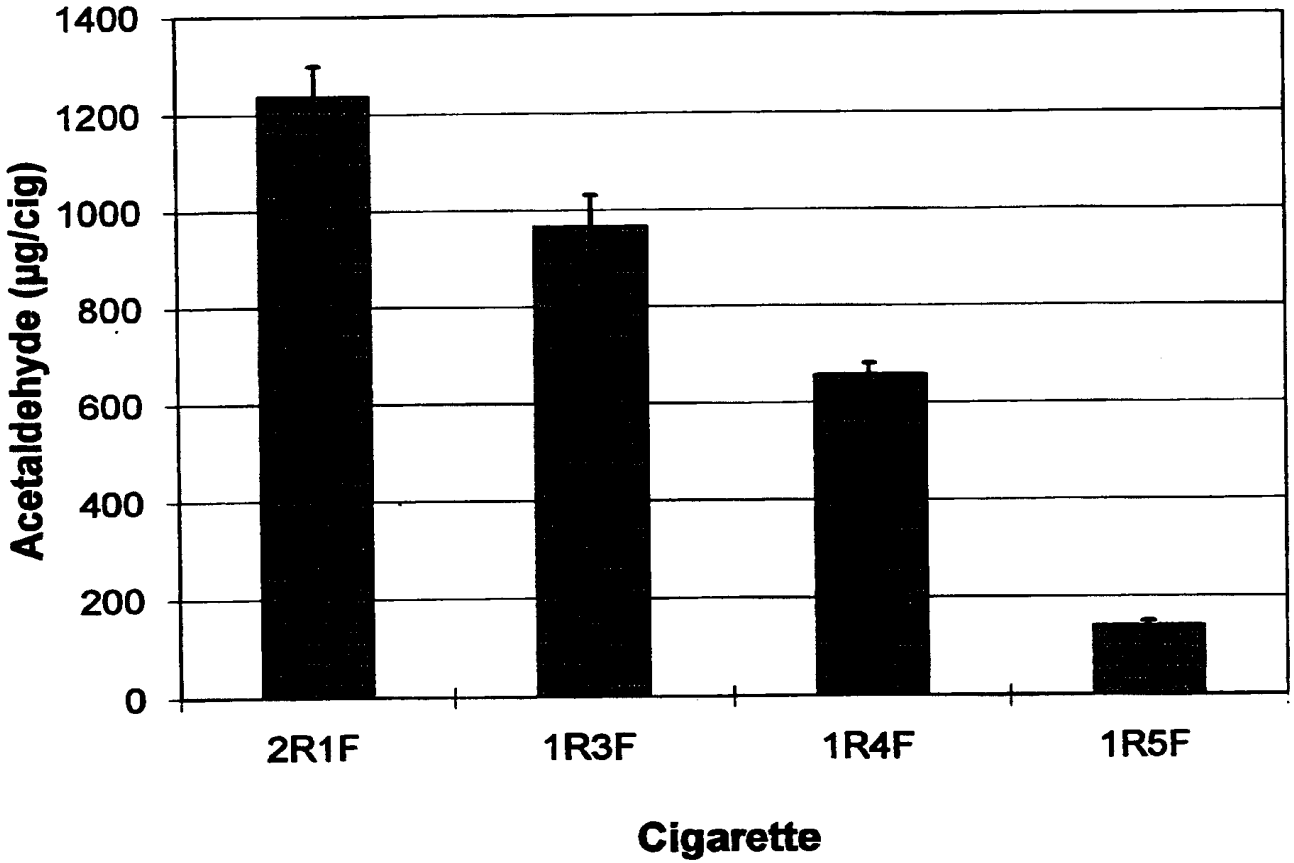
Choice of Products

- Equivalent "tar" comparison
- Comparison of multiple "tar" categories

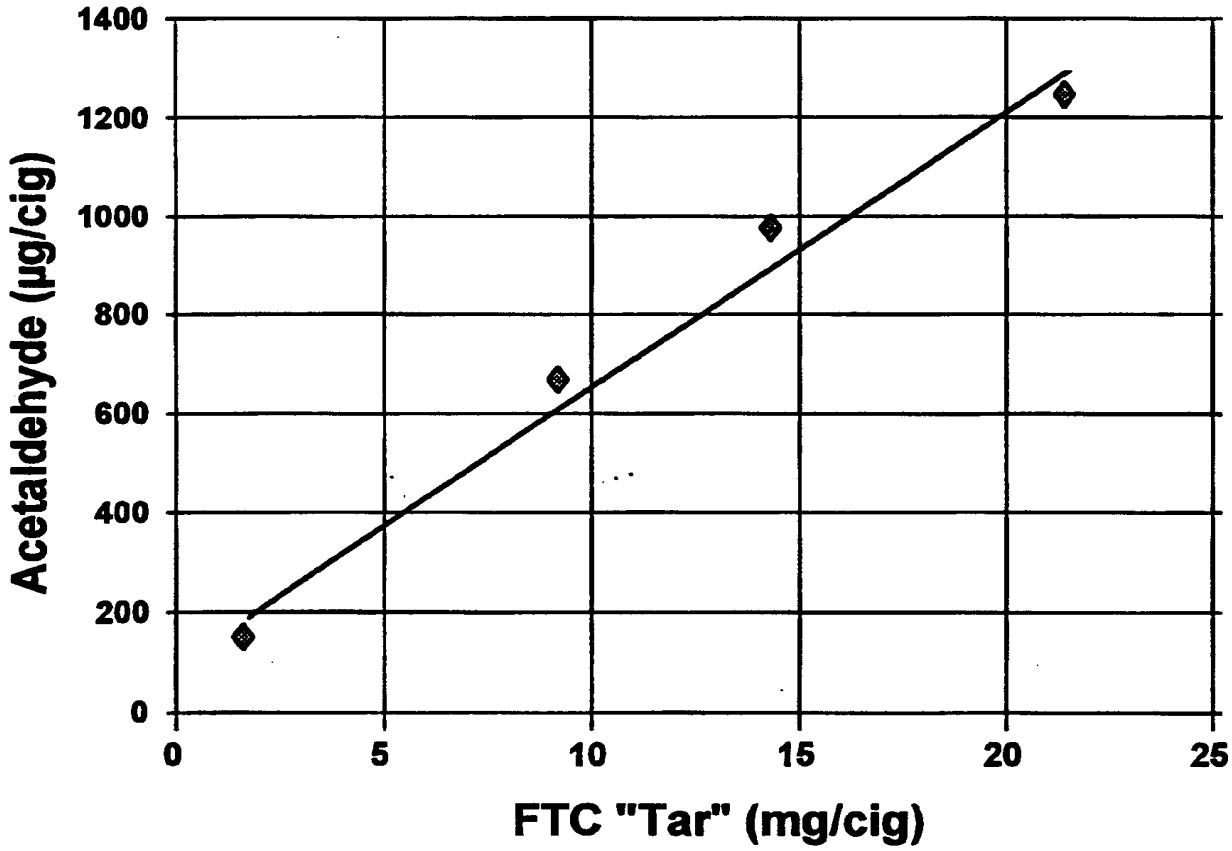
Acetaldehyde Yield of Four Cigarettes



Acetaldehyde Yield of Kentucky Reference Cigarettes



Kentucky Reference Cigarettes
(Acetaldehyde Yield vs. "Tar")



Potential Smoke Streams for Study:

- Mainstream Smoke
- Sidestream Smoke
- Environmental Tobacco Smoke

Chemical Analysis Categories

- Standard Measures (FTC)
- Gross Measures
- Aggregate Chemical Measures
- Specific Compound Determinations

Standard Measures

- FTC Method
  - "tar"
  - nicotine
  - puff count
  - carbon monoxide

Should these Cigarettes be Compared?

Are Standard Smoke Yields Equivalent?

Gross Measures

Measurements based on a chemical or physical property of smoke total particulate matter

Examples of Gross Measures

- Elemental Composition (C,H&N)
- UV Absorption
  - Spectrophotometric "tar"
- Thermogravimetric Analysis
  - volatility
  - stability
- Materials Balance Assessment
- Visual Comparison

Aggregate Measures

- Addresses an open ended question
- Collective response from many compounds, rather than single chemical
- Comparative measure

Aggregate Chemical Measures

- Chromatographic Profiling
  - Vapor Phase
    - Number of Peaks
    - Total Peak Response
  - Particulate Phase
    - Number of Peaks
    - Total Peak Response
- Vapor Phase Free Radicals

Specific Compound Determinations

- "Target Compound" Determinations
  - Closed ended question
  - Determine amounts of specific chemicals
  - Absolute measures

"Target Compounds" Studied

- Product assessment strategy may include ~ 20 - 30 specific chemicals or "Target Compounds"
- Compounds Studied Based on Literature
  - US Surgeon General's Report
  - IARC Monograph
  - Consumer Product Safety Commission

Potential "Target Compounds"

- Carbonyls
  - Formaldehyde
  - Acetaldehyde
  - Acetone
  - Acrolein
- Hydroxybenzenes
  - phenol
  - cresols
  - catechol
  - hydroquinone

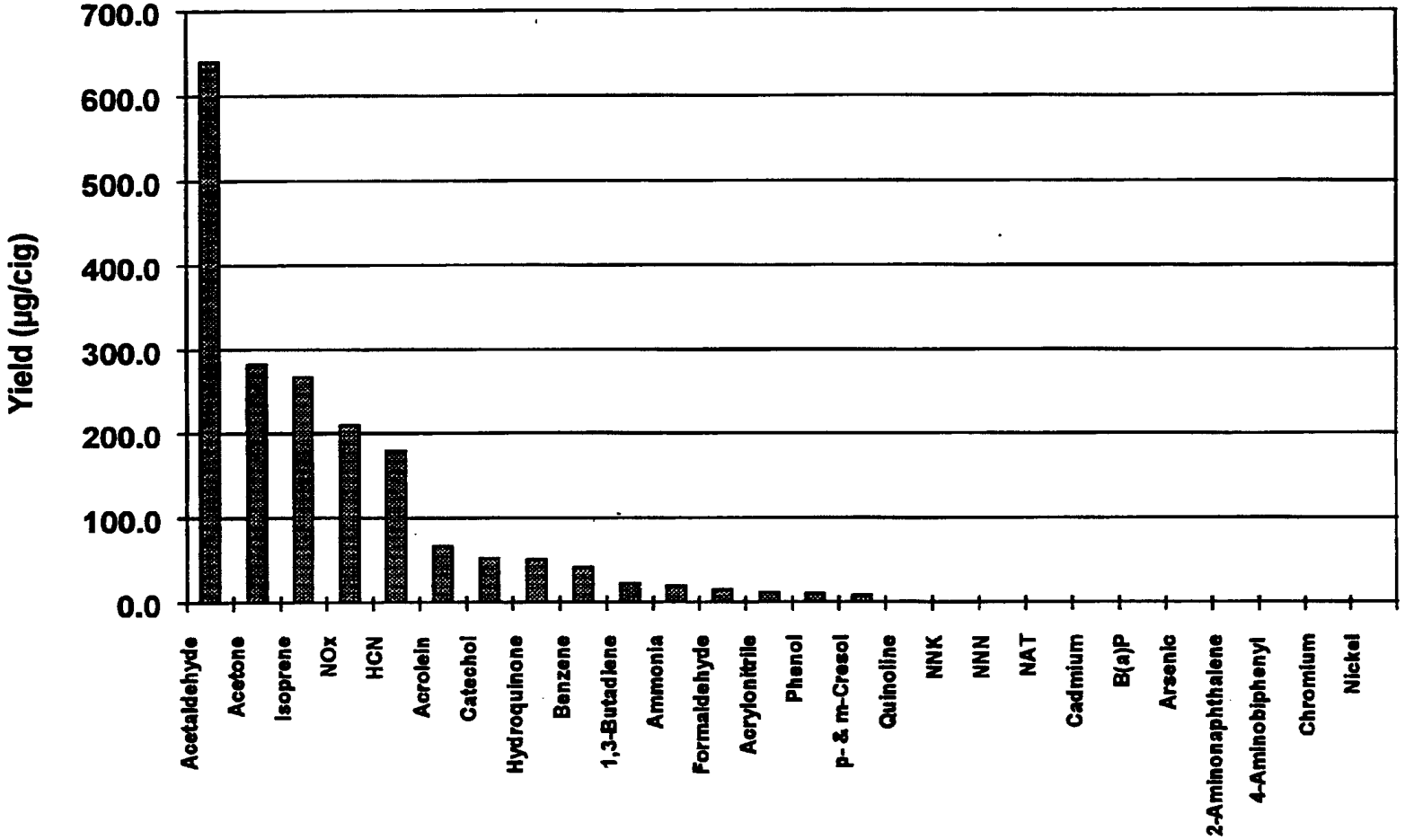
Potential "Target Compounds"

- Aromatic Amines
  - 2-aminonaphthalene
  - 4-aminobiphenyl
- TSNAs
  - NNN
  - NAT
  - NNK
- Inorganic
  - Arsenic
  - Nickel
  - Chromium
  - Cadmium

Potential "Target Compounds"

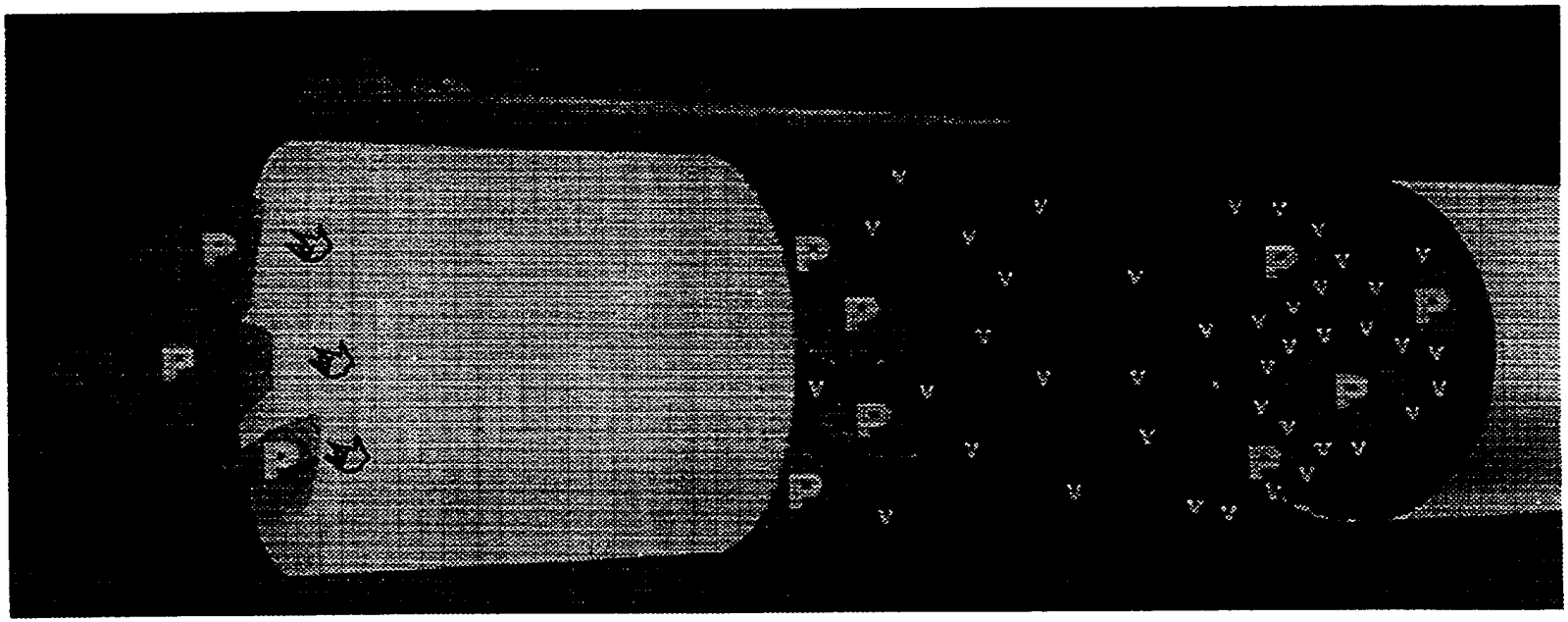
- PAH
  - Benzo(a)pyrene
- Aza-arenes
  - Quinoline
- Misc. Organic
  - Benzene
  - Acrylonitrile
- Miscellaneous
  - Ammonia
  - Nitrogen Oxides
  - HCN
- Unsat. Hydrocarbons
  - Isoprene
  - 1,3-butadiene

Relative Target Compound Yields



EXP-C Study

New Carbon Filter



P = Particulate Phase
V = Vapor Phase

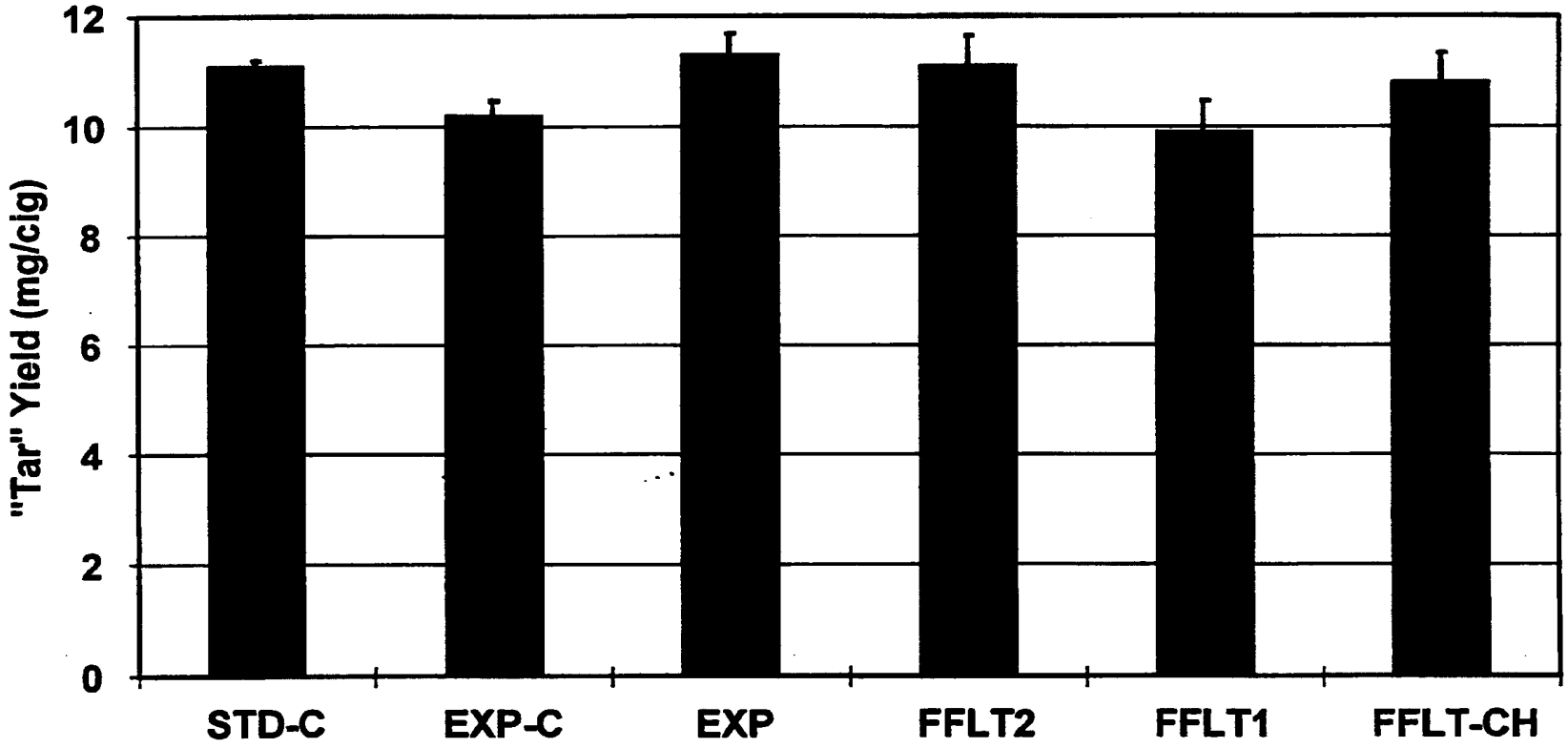
EXP-C Study
Test Cigarettes

STD - C	Standard U.S. Blend Carbon Scrubber Filter
EXP - C	Experimental Blend Carbon Scrubber Filter
EXP	Experimental Blend Standard CA Filter

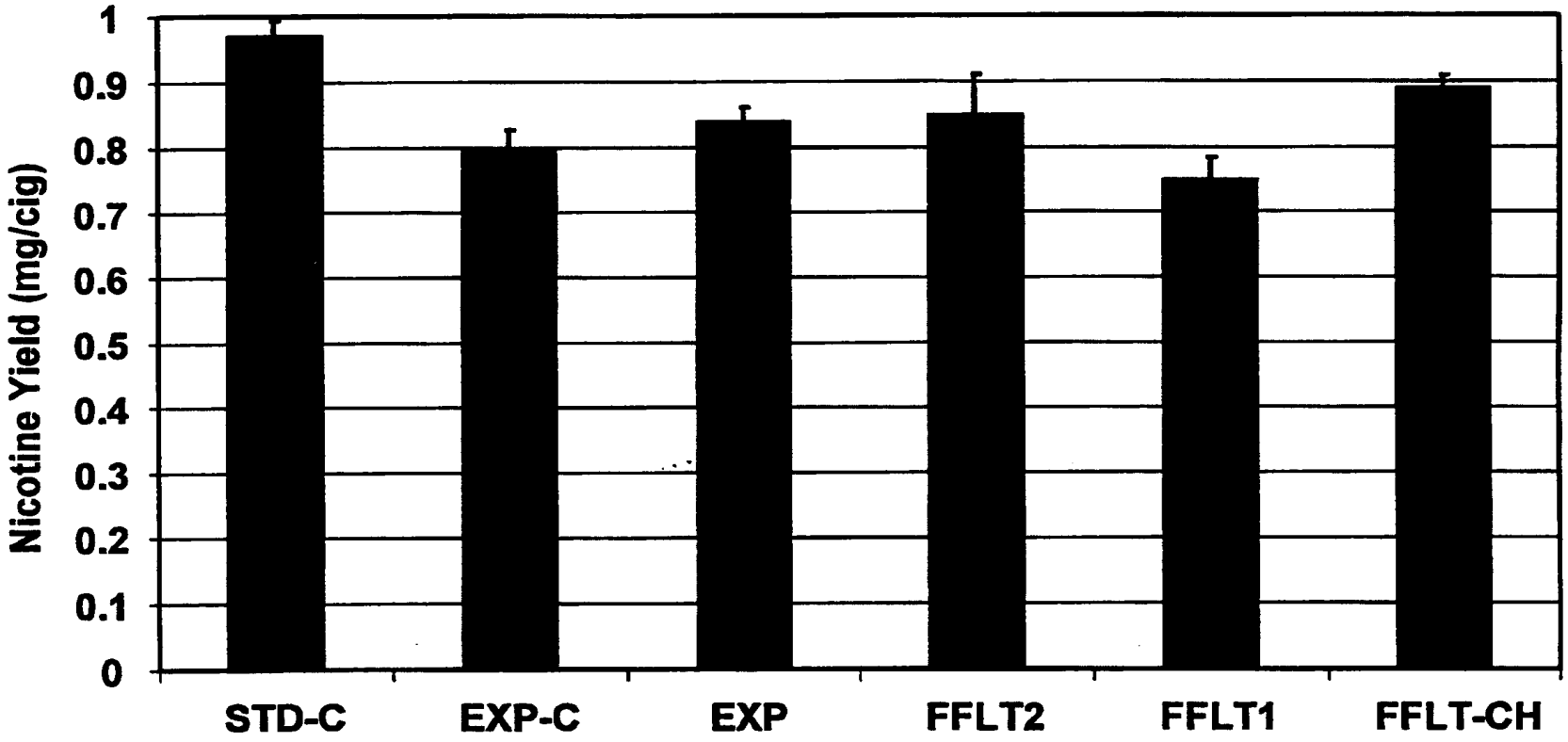
EXP-C Study
Purchased from U. S. Market

FFLT - 2	A Leading "Light" Cigarette
FFLT - 1	A Leading "Light" Cigarette
FFLT - CH	Charcoal Filter "Light" Cigarette

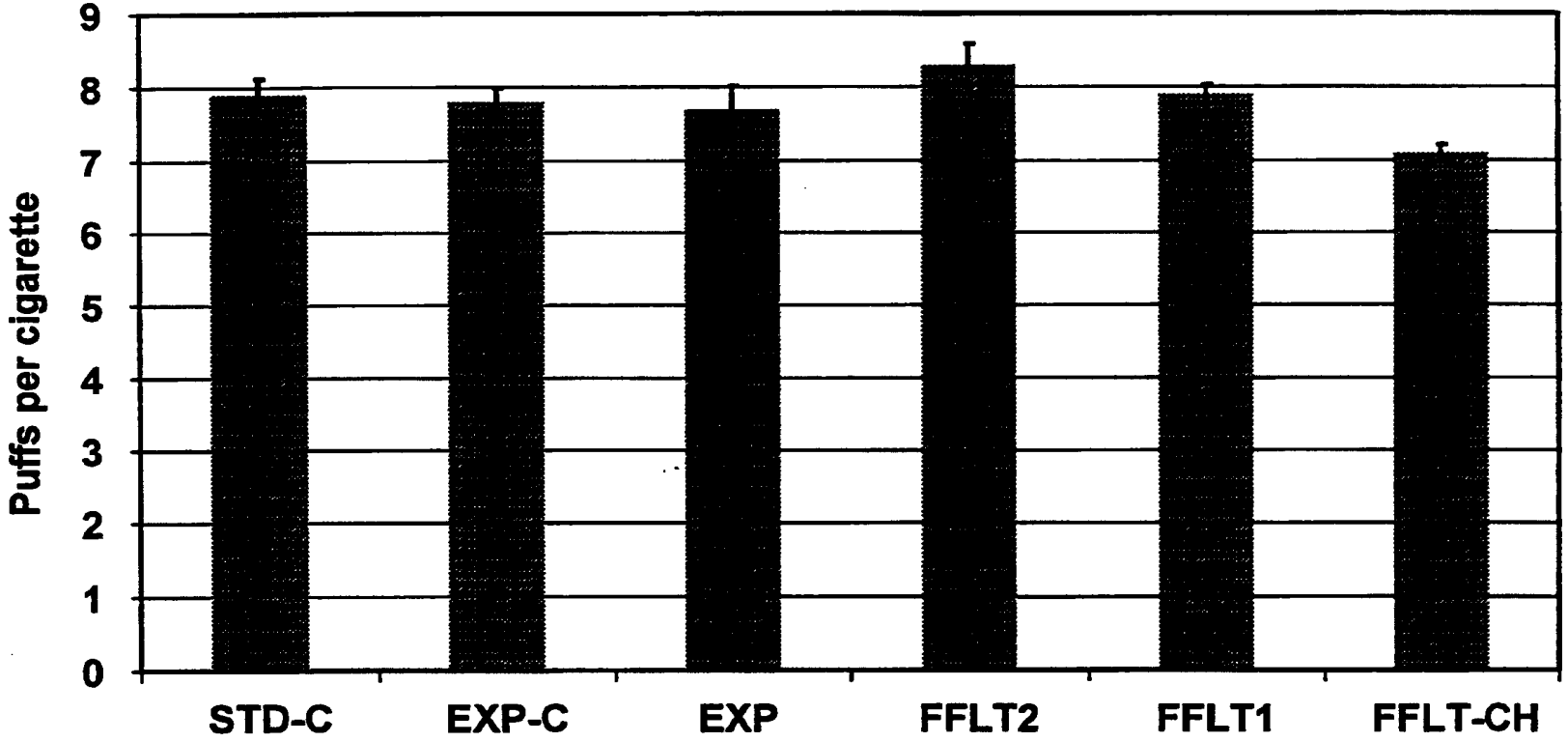
EXP-C Study - FTC "Tar" Yields



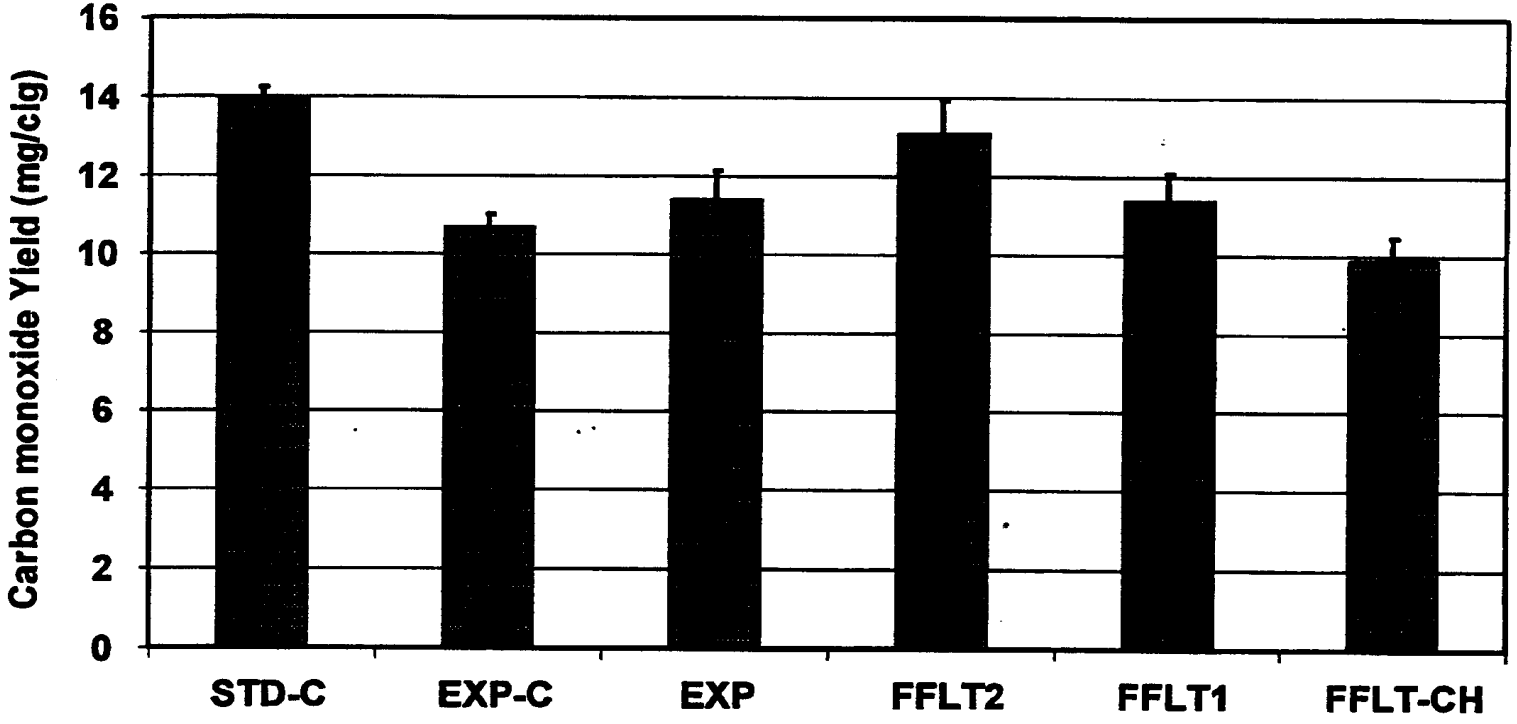
EXP-C Study - FTC Nicotine Yields



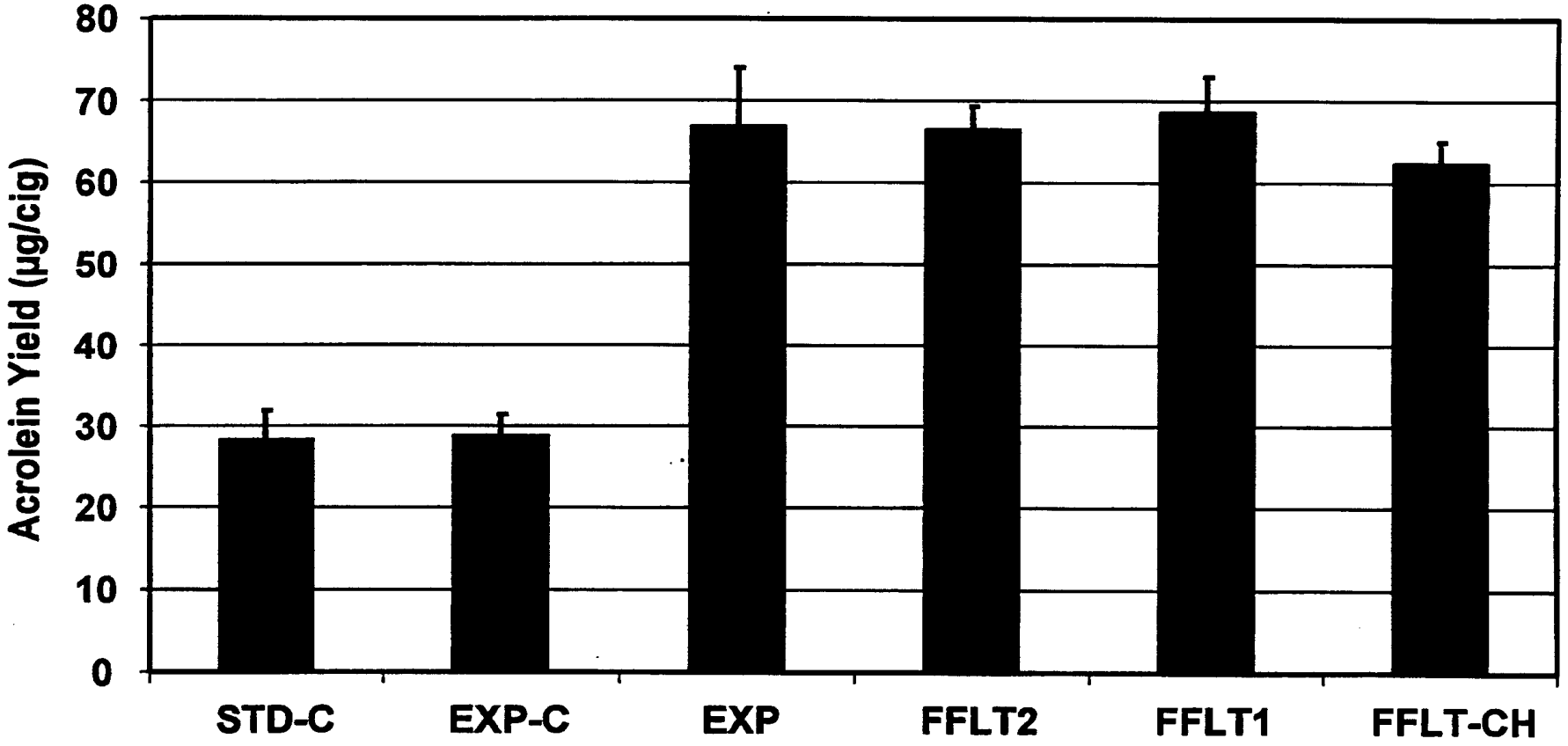
EXP-C Study - FTC Puff Count



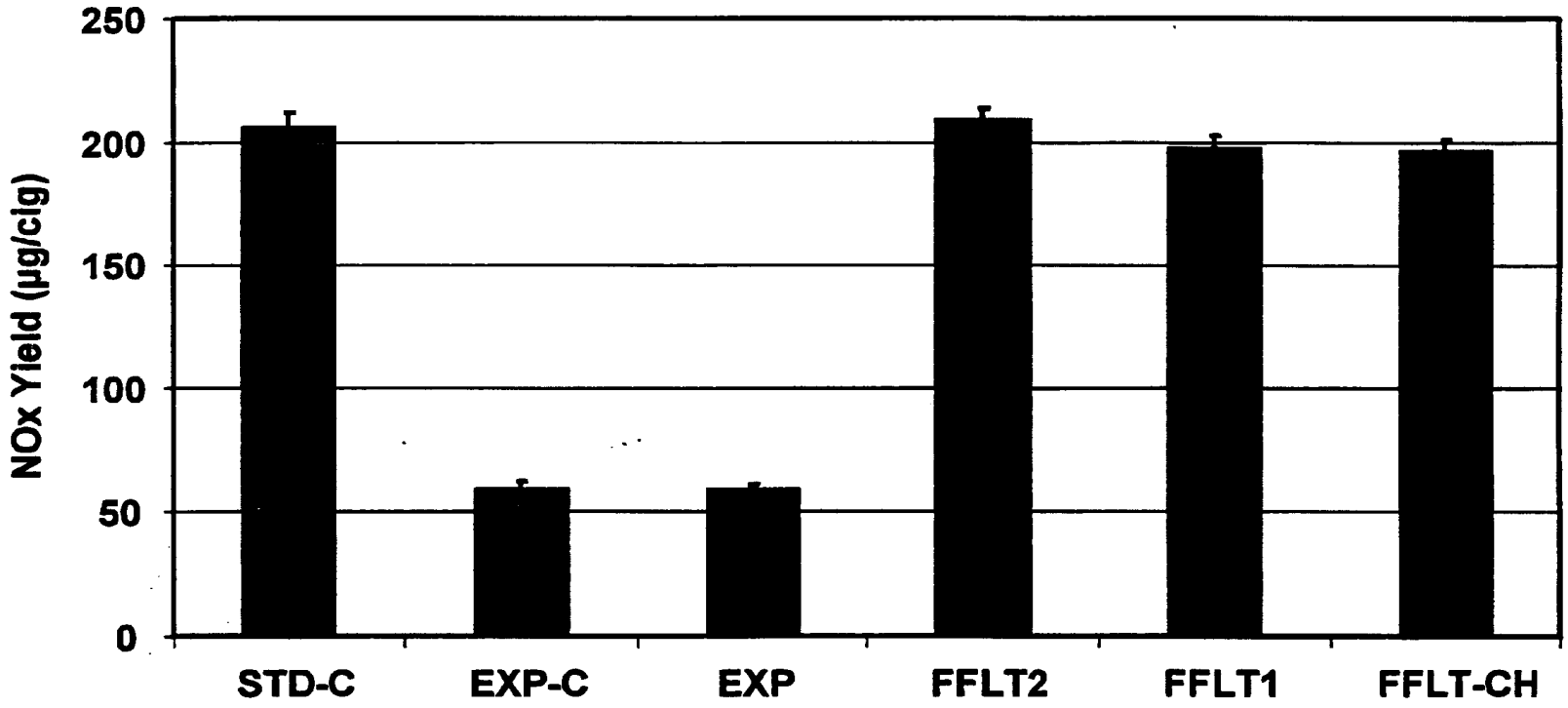
EXP-C Study - FTC CO Yields



EXP-C Study - Acrolein Yields

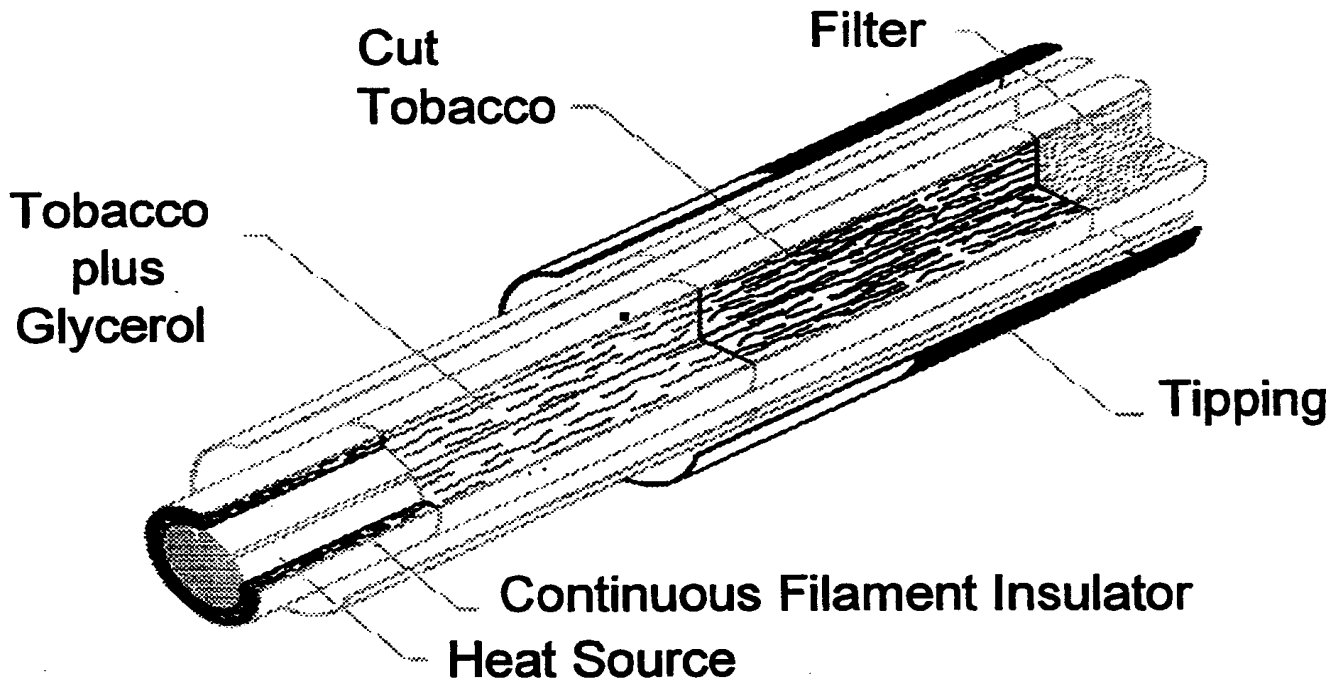


EXP-C Study - NO_x Yields



TOB-HT Study

Cigarette That Primarily Heats Tobacco (TOB-HT)



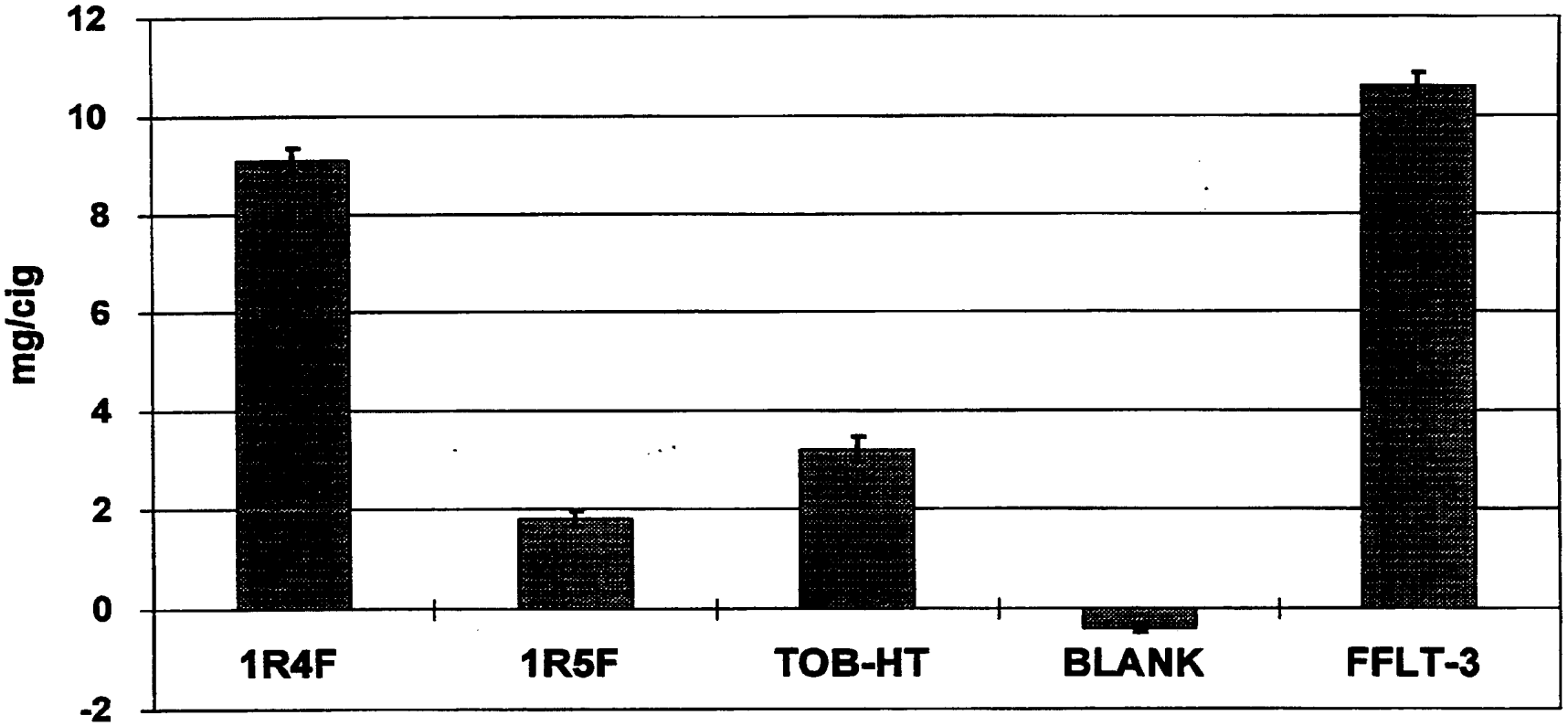
TOB-HT Study
Test Cigarette / Blank

TOB - HT	A Cigarette which Primarily Heats Tobacco
Blank	Smoke collection and analysis conducted with empty smoke machine ports

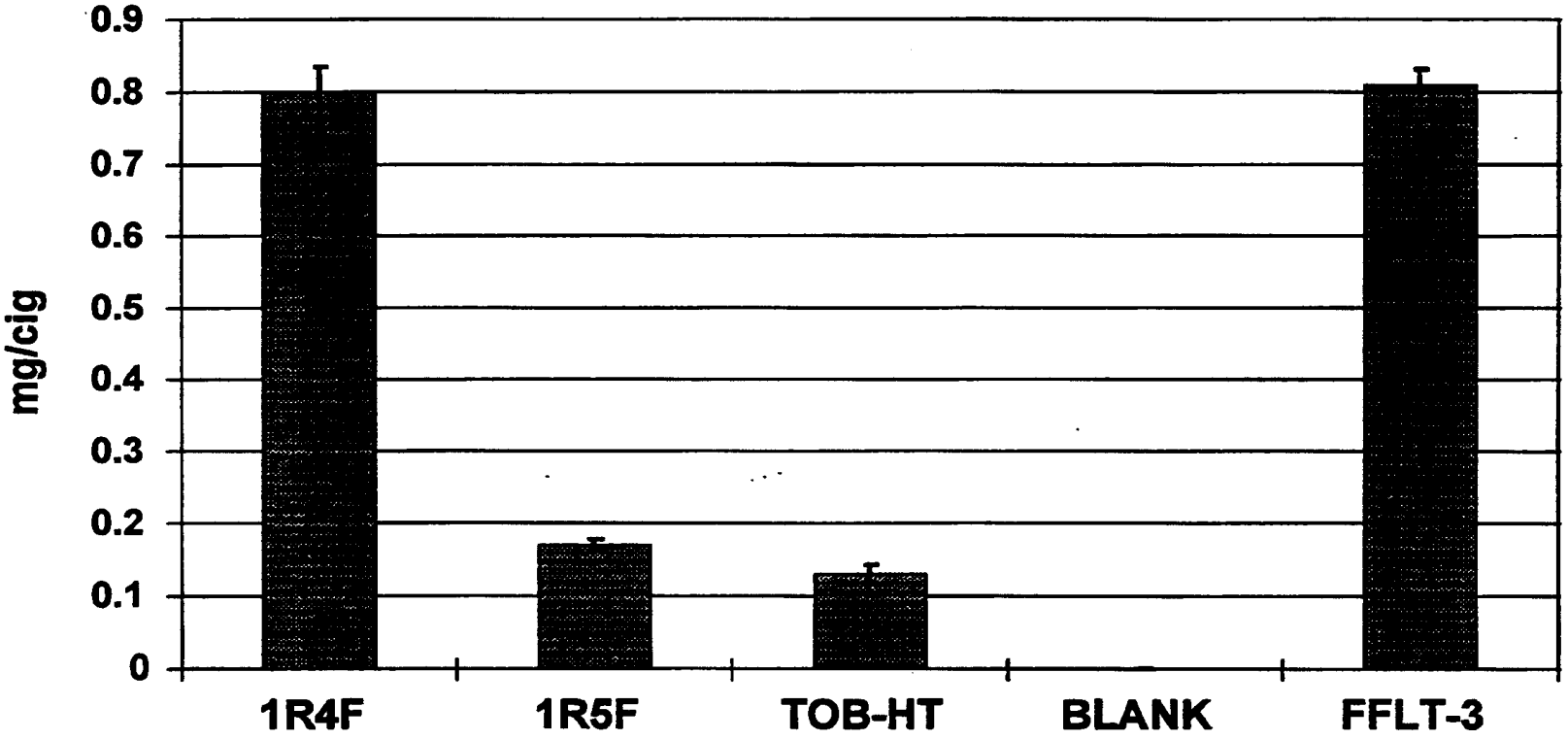
TOB-HT Study
Kentucky Ref. / U. S. Market Cigarettes

1R4F	KR "Light" Cigarette
1R5F	KR "UltraLight" Cigarette
FFLT - 3	A Leading "Light" Cigarette

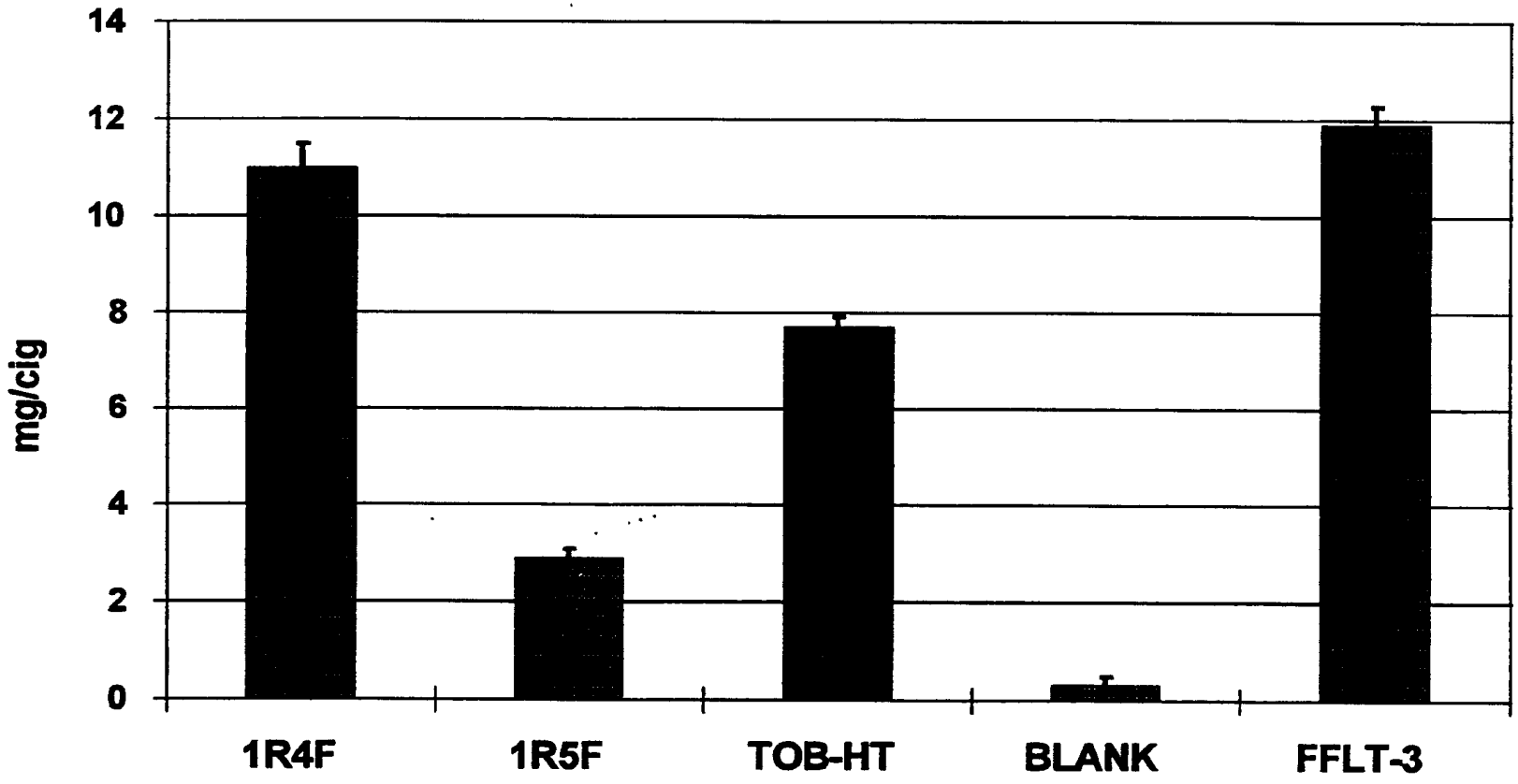
TOB-HT Study - FTC "Tar" Yields



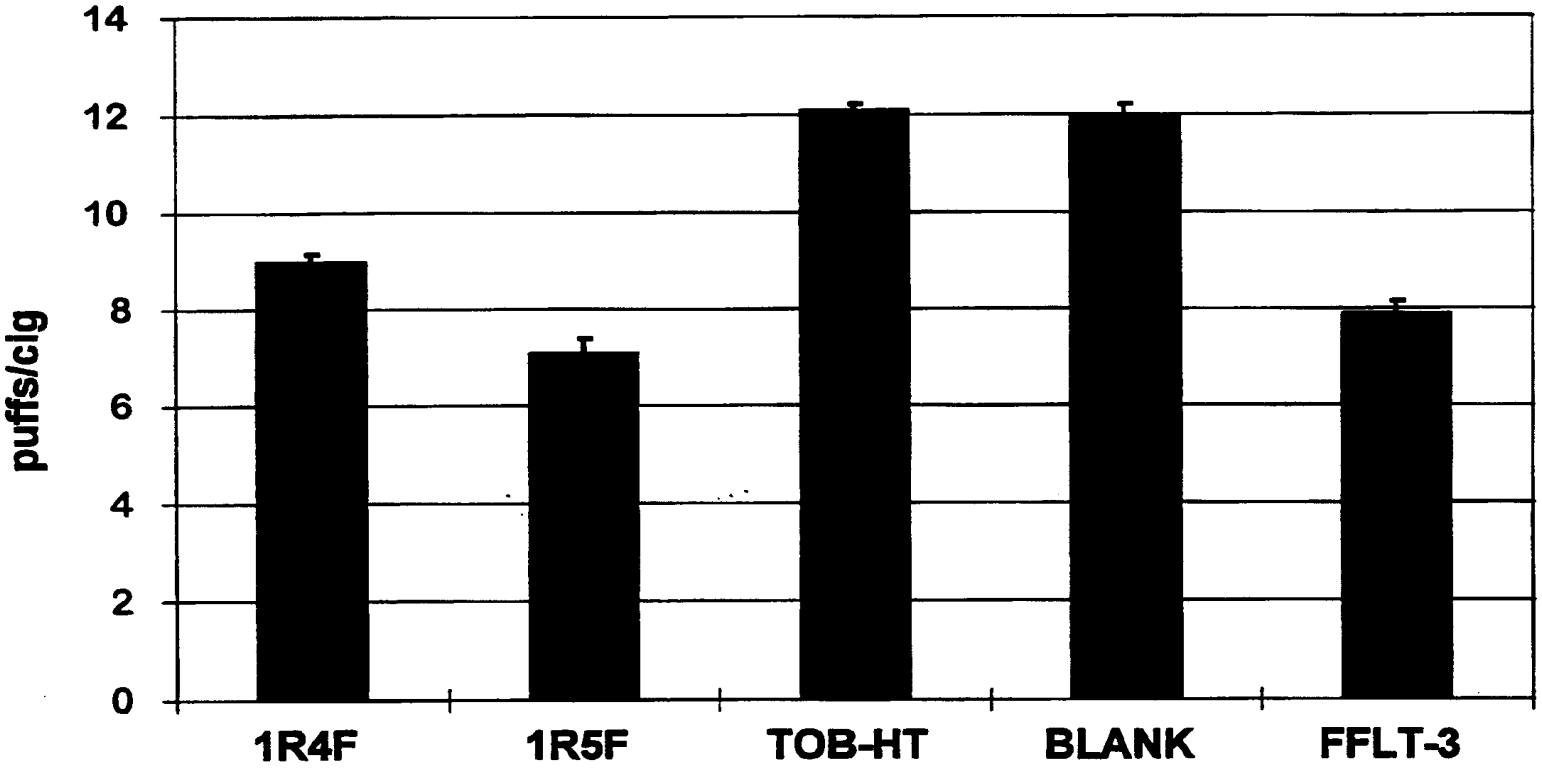
TOB-HT Study - FTC Nicotine Yields



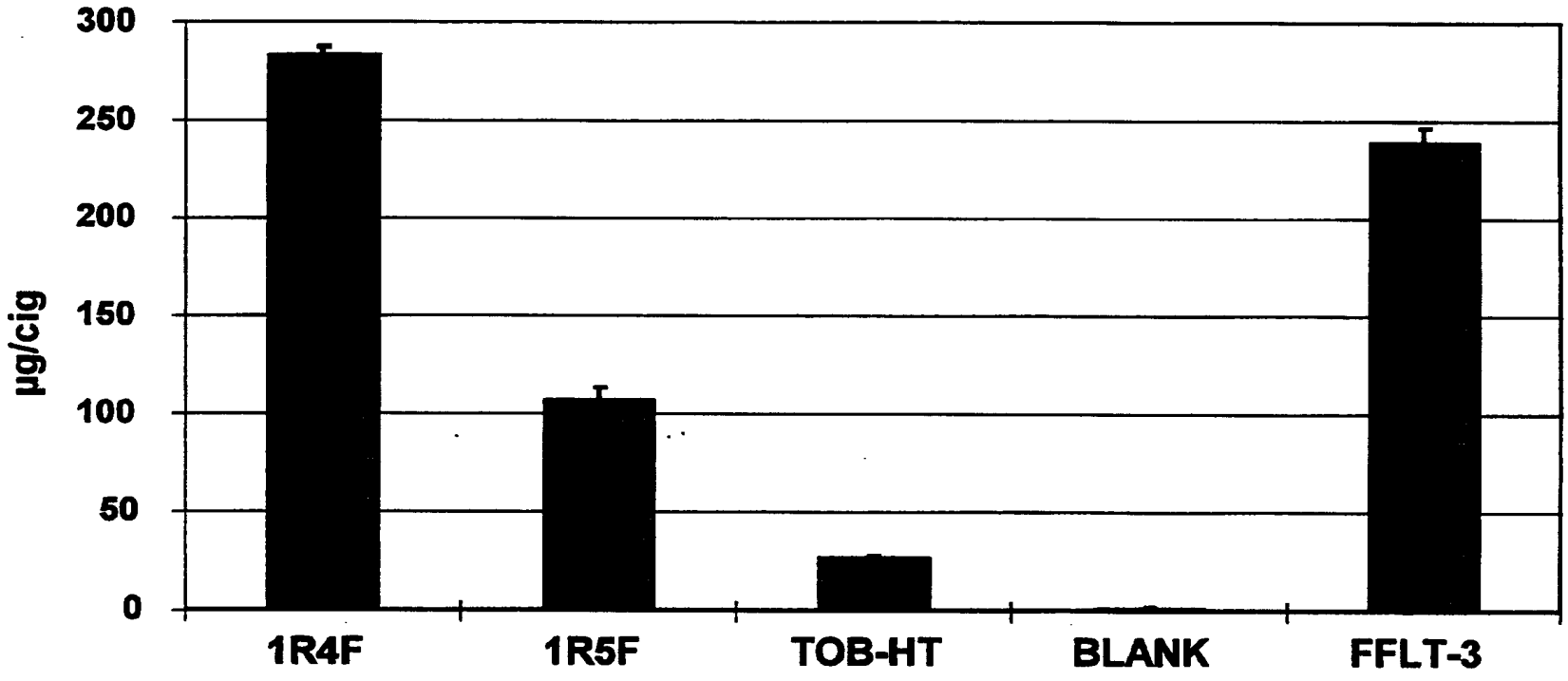
TOB-HT Study - FTC CO Yields



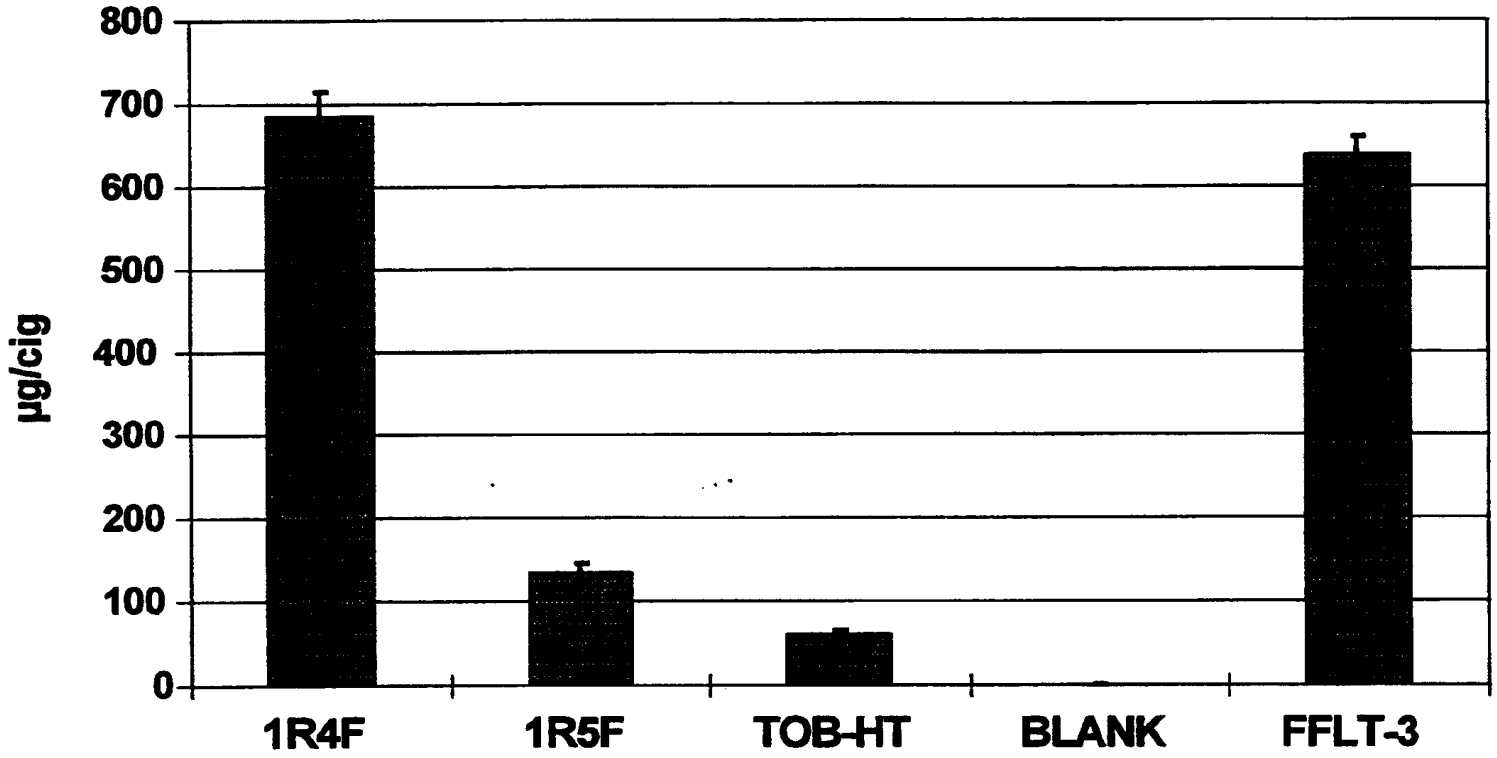
TOB-HT Study - FTC Puff Count



TOB-HT Study - NO_x Yields



TOB-HT Study - Acetaldehyde Yields



Summary

- Components of Product Evaluation Strategy Presented
- Different Types of Chemical Analysis Provide Complementary Information for Evaluating New Cigarette Designs

Summary

- Each Study will be Different
  - Cigarette Design under Study
  - Chemical Questions Posed

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