



A PRODUCT SURVEY OF 25 PIPE TOBACCOS PURCHASED FROM WEB-BASED MERCHANTS

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Outline for presentation

- Overview of pipe smoking in the USA
- Toxicology of pipe tobacco smoke
- Blends and ingredients of pipe tobaccos
- Differences: pipes/pipe tobacco smoking and cigarettes/cigarette smoking
- Pipe tobacco and the regulators
- Experimental results: Routine tobacco analytes, and HPLC scan techniques for pipe tobacco extracts
- Conclusions

Overview of pipe smoking in USA

- Pipe tobacco is the least used combustible tobacco product (Henley *et al.*, 2004)
- Prevalence of pipe tobacco use declined from 14% in 1965 to 2% in 1991 (Nelson *et al.*, 1996)
- Little interest by young adults in trying pipe tobacco smoking (Mays *et al.*, 2016)
- Estimate of overall use of ~ 2% with daily use of ~ 0.1% (Kasza *et al.* 2017); users may be older, more affluent (some pipe tobaccos cost > \$6 oz)

Toxicology of pipe smoke

- Rickert *et al.*, 2007, mutagenicity of tobacco smoke from pipes, cigarettes (rev/mg nicotine)
 - Pipe tobacco 1 TA98 + S9 10807, TA100 + S9 11035
 - Pipe tobacco 2 TA98 + S9 8509, TA100 + S9 13413
 - KY2R4F cig. TA 98 +S9 33681, TA100 + S9 10613
- Bilimoria *et al.*, 1973, inhibition of vinyl acetate polymerization by tobacco smoke (relative, lower inhibition is less toxic) flue-cured cigarette, 115; cigar, 90; pipe, 33

Blends and ingredients of pipe tobaccos

- Unlike US cigarettes, blends can also contain Latakia (fire-cured) and Perique tobaccos
- Can contain deer tongue (*Trilisa odoratissima*)
- Ingredients can include nothing but water and PG/VG all the way to heavily cased and flavored products with special processing
- Oven volatiles (moisture) often > 15%
- Preservatives (sorbate, benzoate) used for high moisture products

Differences: pipes, tobaccos, cigarettes

- US cigarette brands often similar with each other
 - Cigarette designs, papers, filters, adhesives similar
 - Blends, by-product usage and processing similar
 - Tobacco cut width generally 32 ± 1 cuts/inch
 - Flavorings and other tobacco ingredients similar
- Pipes and pipe tobaccos vary greatly
 - Pipe construction, and use affects smoke chemistry
 - Pipe tobacco cut style and cut width vary by brand, with some products sold as twists or flakes
 - Tobacco processing differs among brands and styles
 - Often small production runs and limited offerings

The regulators, pipes and pipe tobaccos

- Some no doubt would like to see analyses of pipe tobacco smoke for the same smoke toxicants as used for cigarette smoke
- However, there would be too many combinations of pipes and pipe tobaccos to test
 - Standard pipe, use with all tobaccos?
 - Standard pipe tobacco, use with all pipes?
 - What methods to use and who will develop them?
- Distinguish between “real” pipe tobacco and “pipe” tobacco sold for other purposes

Is there a better approach to regulation?

- Should we focus on the tobacco not the smoke?
 - Should regulators require same testing for pipes and pipe tobaccos as required for cigarettes?
 - Some tobacco analytes can be done effectively
 - Existing tobacco HPHC such as nicotine, heavy metals, TSNAs, B[a]P and other PAHs
 - Other tobacco analytes such as polyphenols, sugars, cocoa, and licorice can be obtained as methods have been reported
 - Would lack of knowledge of “ingredients formed during tobacco processing” force the need for smoke HPHC?
- Could a combination of routine analytes and chromatographic fingerprinting be the solution?

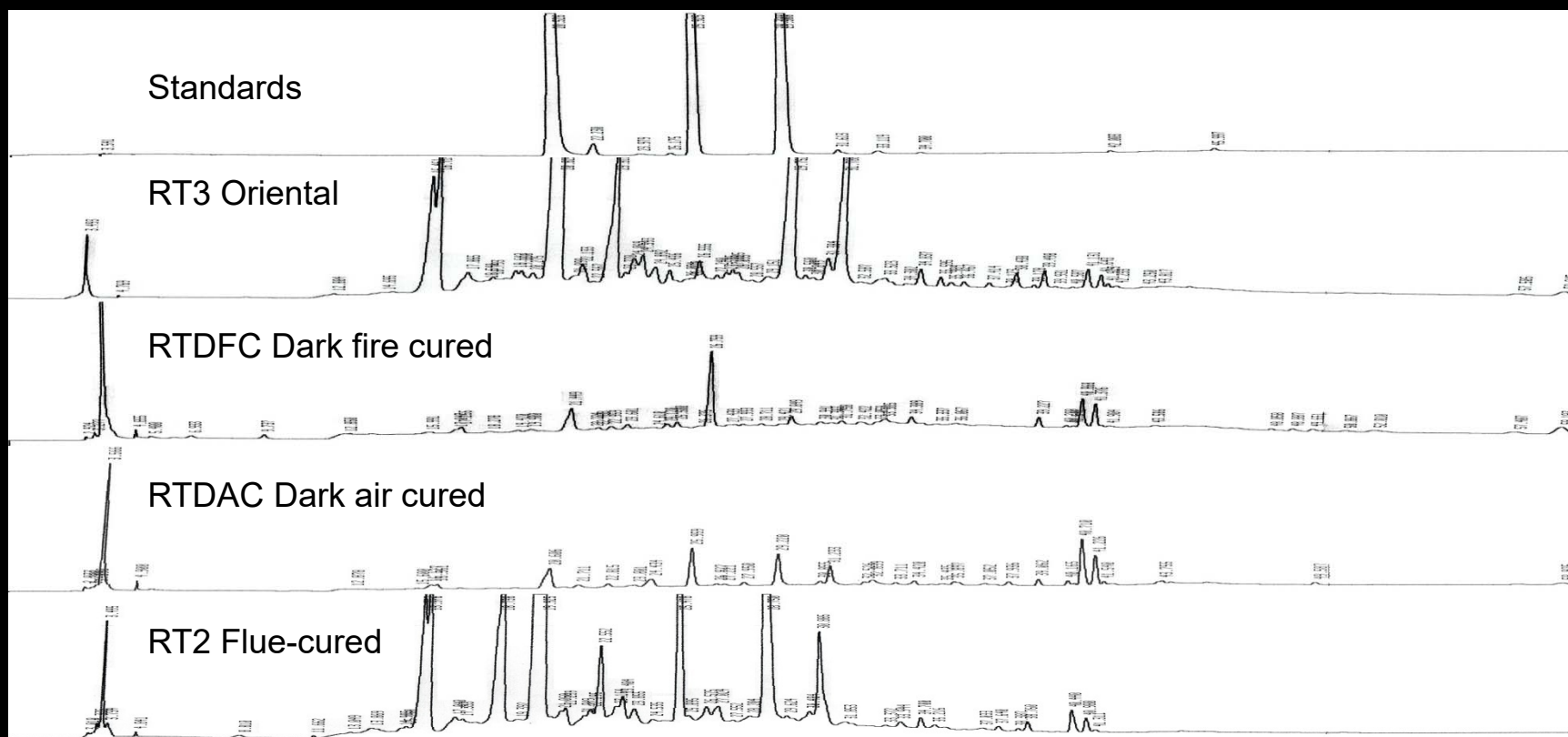
An experimental approach

- Samples included in this study
 - Raw tobaccos unique to pipe tobacco blends
 - University of Kentucky reference tobaccos
 - Over 30 brand-styles of pipe tobacco
 - Premium pipe tobaccos
 - So-called “drug store” pipe tobaccos (includes some famous brands formerly made by major cigarette companies)
 - Not representative samples
 - Routine tobacco analytes from commercial sources
 - HPLC scan techniques on methanol extracts of the tobaccos using typical polyphenol conditions at 280 nm and 340 nm detection

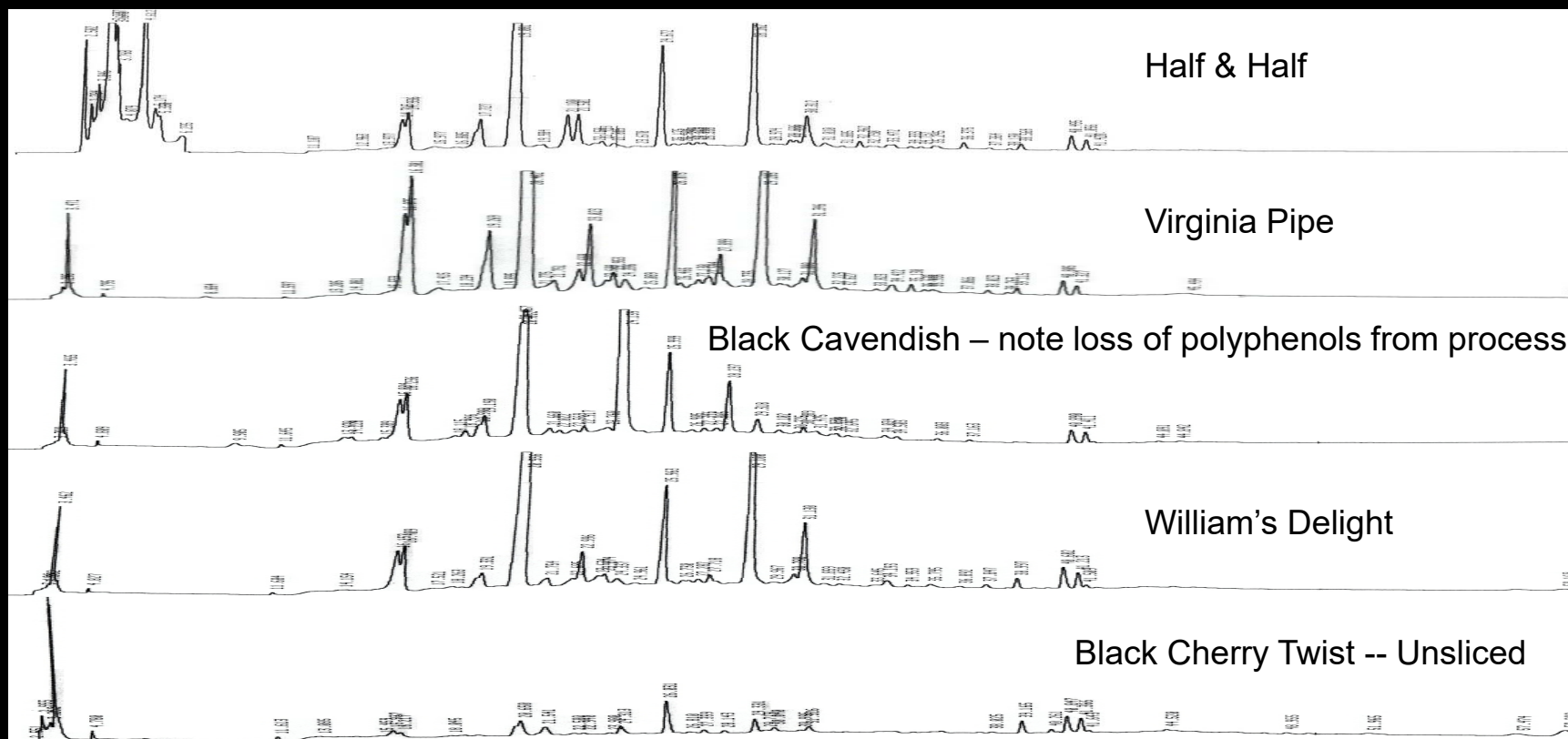
Routine tobacco analytes -- Example

Alkaloids	TSugar	RSugar	Nitrate	Chloride	Oven Volatiles	Sample ID
1.44	26.2	18.3	0.72	0.55	20.7	Half & Half Pipe Tobacco
1.36	15.7	14.0	0.68	0.66	28.4	303 Peaches & Cream
1.64	14.0	12.9	0.70	0.80	34.5	201 Black Cavendish
1.67	19.0	16.8	0.60	0.73	20.1	701 Virginia Pipe
1.38	7.74	6.81	0.76	1.04	15.2	William's Delight
1.63	8.38	7.68	0.61	0.94	17.0	London Dock
1.42	28.3	27.2	0.17	0.31	18.6	Dark Twist
1.90	19.1	17.8	0.37	0.56	20.4	Cube Gold
2.48	10.5	9.95	0.34	0.72	21.1	Gentleman Caller
2.53	4.84	4.00	0.41	0.40	13.0	Crooner
3.09	3.49	3.22	0.72	1.36	25.9	Brown No. 4
3.24	18.7	12.3	0.78	1.74	26.4	Black Cherry Twist Unsliced
2.96	26.7	15.4	0.84	1.50	27.1	Sweet Maple Twist

LC polyphenols at 340 nm detection



LC polyphenols at 340 nm detection



Can you spot the real pipe tobacco?



Conclusions

- Pipe tobaccos can be characterized on the basis of routine tobacco analytes and HPLC chromatographic fingerprinting
- Such data along with tobacco HPHC such as nicotine, heavy metals, and TSNAs should be sufficient for regulation
- This simplified approach makes sense considering the low prevalence of pipe tobacco smoking