THE ACRYLAMIDE CONTENT OF SMOKELESS TOBACCO PRODUCTS

Kevin McAdam[1]*, Harriet Kimpton[1], Carl Vas[1], David Rushforth[1] and Brad Rodu[2],

[1]British American Tobacco, Group Research & Development, Regents Park Road, Southampton, SO15 8TL, United Kingdom

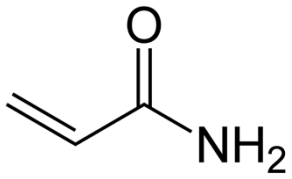
[2]Clinical Translational Research Building, University of Louisville, Louisville, Kentucky 40202, United States

*Correspondence: kevin_mcadam@bat.com

Poster: **POS2-9** at SRNT Annual Meeting, February 5-8, 2014, Seattle, WA, USA

Introduction:

Acrylamide has been identified as a cause for concern within the public health community following its identification in cooked foods. It has been classified by IARC as Group 2A (probably carcinogenic to humans), with sufficient evidence of carcinogenicity in animals.



A limited number of studies have reported its presence in tobacco and in cigarette smoke. However, little information is available concerning its presence in Smokeless tobacco products (STPs) other than values for its concentration in three US snus products, two US moist snuff products, two US novel STPs and two Swedish snus products.

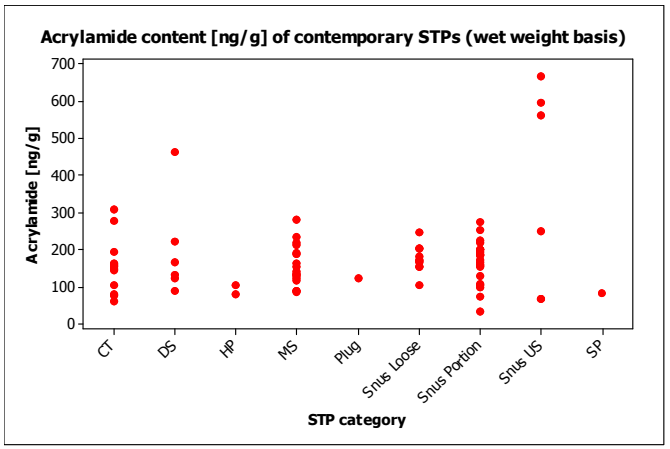
In order to understand the potential for STPs to act as a source of acrylamide exposure we have measured acrylamide contents in a wide range of contemporary STPs.

Materials and Methods:

78 smokeless tobacco products were sampled from the US and Swedish markets in 2010, covering the major STP categories. The products sampled represented 85-90% market share for these categories in both countries.

The method used to measure Acrylamide followed the technique reported by Wu et al (Wu, Joza and Rickert, "Determination of Acrylamide in Tobacco Smoke and Smokeless Tobacco Products by LC Tandem Mass Spectrometry, 62nd Tobacco Science research Conference Septermber 2008). Briefly the technique involved water extraction of STPs, filtration, washing with non-polar solvent, centrifuging, two stage SPE clean-up prior to analysis using HPLC with water and methanol as mobile phases, and detection using an API 3000 mass spectrometer.

Results and Discussion:



- The measurements showed acrylamide to be present in all samples analysed; the levels in one product were too low to be quantified (>15ng/g but <50ng/g).
- Quantified acrylamide contents ranged from 62 – 666 ng/g wet weight basis – a 10-fold range in the STPs examined.
- There were few differences between STP categories other than some high values with US Snus and Dry Snuff products.
- For comparison purposes literature values are:
  - Moist snuff – 87-180 ng/g
  - US snus – 70-83 ng/g
  - Strips – 126 ng/g
  - Sticks – 367 ng/g
  - Swedish snus – 740-2516 ng/g

  - Potato crisps – 600-2000 ng/g
  - French fries – 300-700 ng/g
  - Breakfast cereal – 50-250 ng/g

Differences between manufacturers

Within STP categories differences were observed in the acrylamide contents from different manufacturers. These may be explained by considering the factors influencing acrylamide formation in foods:

- There is a wide variation in the levels of acrylamide reported in different food categories, as well as in different brands of the same food category – similar to these findings for STPs.
- Acrylamide is generally viewed as being formed in Maillard reactions when food or plant materials are heated to 120°C and above (acrylamide has not been identified in uncooked or boiled foods). The levels of acrylamide in foods increase with increasing temperature and heating time.
- The formation of acrylamide has been suggested to arise from reactions of asparagine and reducing sugars (such as glucose or fructose), reactions of acrylic acid or acrolein with ammonia, a suggestion supported by observations that addition of ammonium carbonate to baked foods can lead to increased acrylamide formation.

Consequently, differences in chemical contents of tobacco used by manufacturers, combined with individual thermal approaches to processing, can possibly result in the observed variation in acrylamide levels in STPs.

Daily acrylamide exposure from STP consumption

Using the mean acrylamide content for Swedish snus of 170ng/g, combined with a daily consumption of 14g for pouched snus and 32g for Loose snus, and an estimate for the amount extracted during use of 33% gives estimates of daily intake of 0.8 and 1.8 µg/day for Pouched and Loose Snus respectively. These compare to daily dietary acrylamide exposure values for Australia, Europe and the US of 6-84 µg/day. Exposure through use of Swedish Snus is therefore likely to be small in comparison to dietary exposure. Exposure from other STP product types will also depend upon their usage patterns and behaviours (for which there is a shortage of quantitative data) in addition to their acrylamide contents.

Conclusions:

Acrylamide is a toxicant that is present in many contemporary STPs, with contents varying by a factor of more than 10 between different STPs. The observed variation probably arises from differing concentrations of precursors within the STPs, as well as differences in tobacco processing temperatures and times amongst manufacturers. Estimates suggest that exposure from use of Swedish Snus is small in comparison to the level of dietary exposure in developed countries.

www.bat-science.com

Conflict of interest Statement:
Funded by British American Tobacco (BAT). Three of the authors (KM, HK and CV) are employees of British American Tobacco. Brad Rodu's research is part funded by unrestricted grants from Tobacco Manufacturers (including BAT) to the University of Louisville.