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# UNLIKE COMBUSTIBLE CIGARETTES, NON-COMBUSTIBLE TOBACCO AND NICOTINE PRODUCTS DO NOT CAUSE ENAMEL DISCOLORATION IN VITRO

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Harm Reduction and Engagement

# CONFLICT OF INTEREST STATEMENT

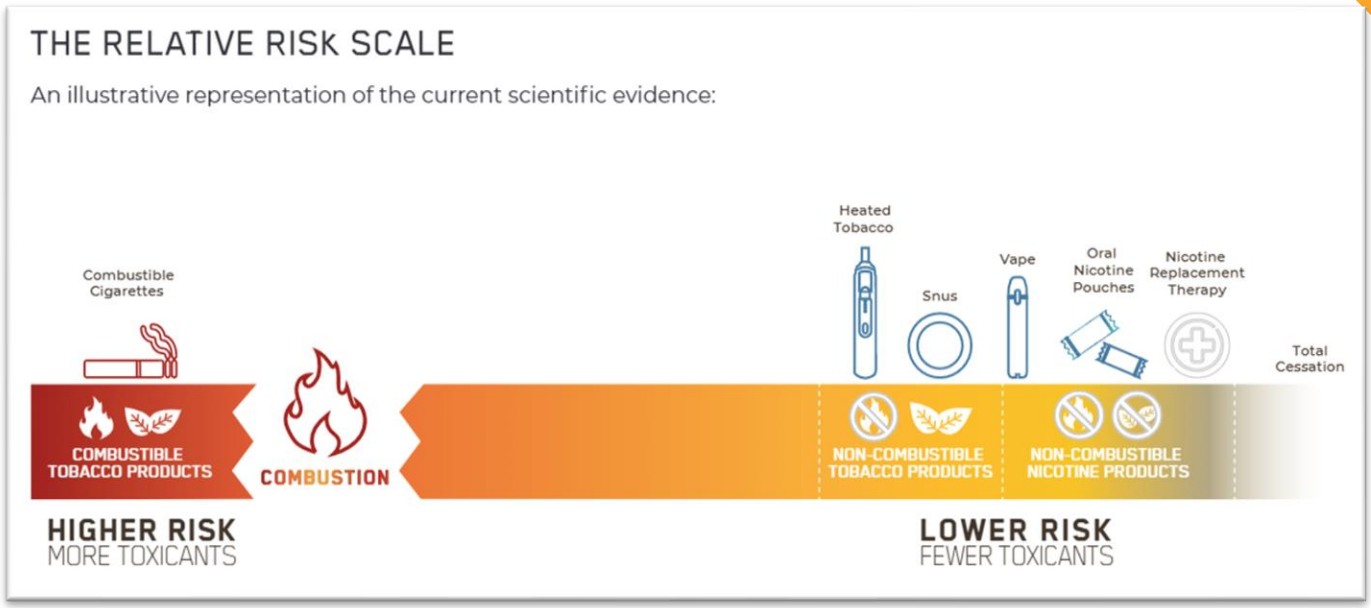
- I am a paid employee of Imperial Brands PLC
- The study described within this presentation was solely funded by Imperial Brands PLC
- Imperial Brands PLC and its subsidiaries manufacture the nicotine-based products utilised in this presentation and are not currently available for sale in the USA
- Sample generation was performed by Imperial Brands PLC, whilst experimental work and statistical evaluation was carried out by Intertek CRS
- The views expressed in the document are those of the author and do not necessarily reflect the opinions of Imperial Brands PLC

# BACKGROUND

The scientific substantiation of non-combustible next generation nicotine delivery products (NGPs) has predominately focused on the potential of these products to display reduced harm properties.

An emerging area of substantiation which appears to have relevance with consumers is the impact of NGPs compared to cigarettes on a cosmetic basis (not safety or disease endpoint focus).

A rapid exploratory *in vitro* test was explored to determine the teeth staining impact of cigarettes, coffee, red wine, and NGPs



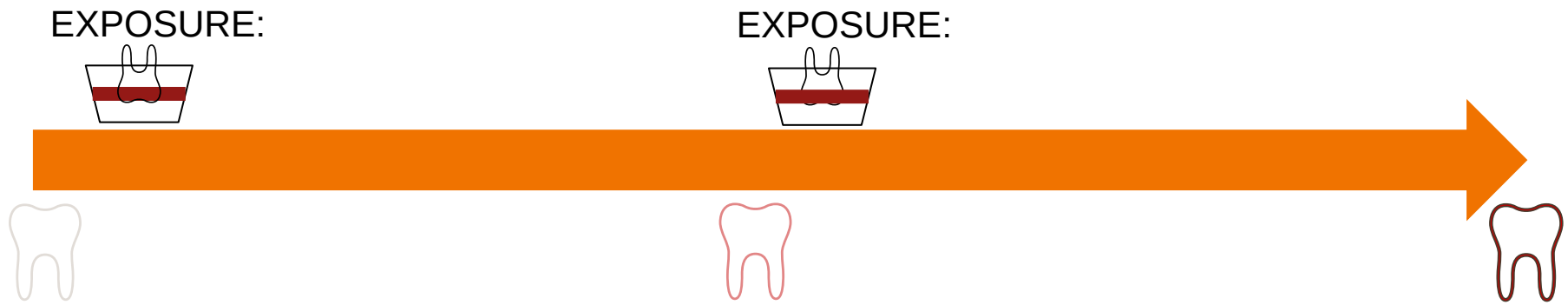

*For more details see: https://imperialbrandsscience.com/blog/introducing-the-relative-risk-scale/*


*Adapted from: Carey CM. Tooth whitening: what we now know. J Evid Based Dent Pract. 2014 Jun;14 Suppl:70-6. doi: 10.1016/j.jebdp.2014.02.006. PMID: 24929591*

# STUDY

- In the present study we used enamel blocks from adult donors to determine the staining potential of combustible cigarettes and NGPs
- Using teeth from consenting Adult donors, in compliance with the Human Tissue Authority requirements

# STUDY OVERVIEW:




**BASELINE**:

- Teeth photographed
- Teeth Colour measurements (CM-700d Konica Minolta Spectrophotometer)

**7- DAYS:**

- Teeth photographed
- Teeth Colour measurements (CM-700d Konica Minolta Spectrophotometer)

**14- DAYS:**

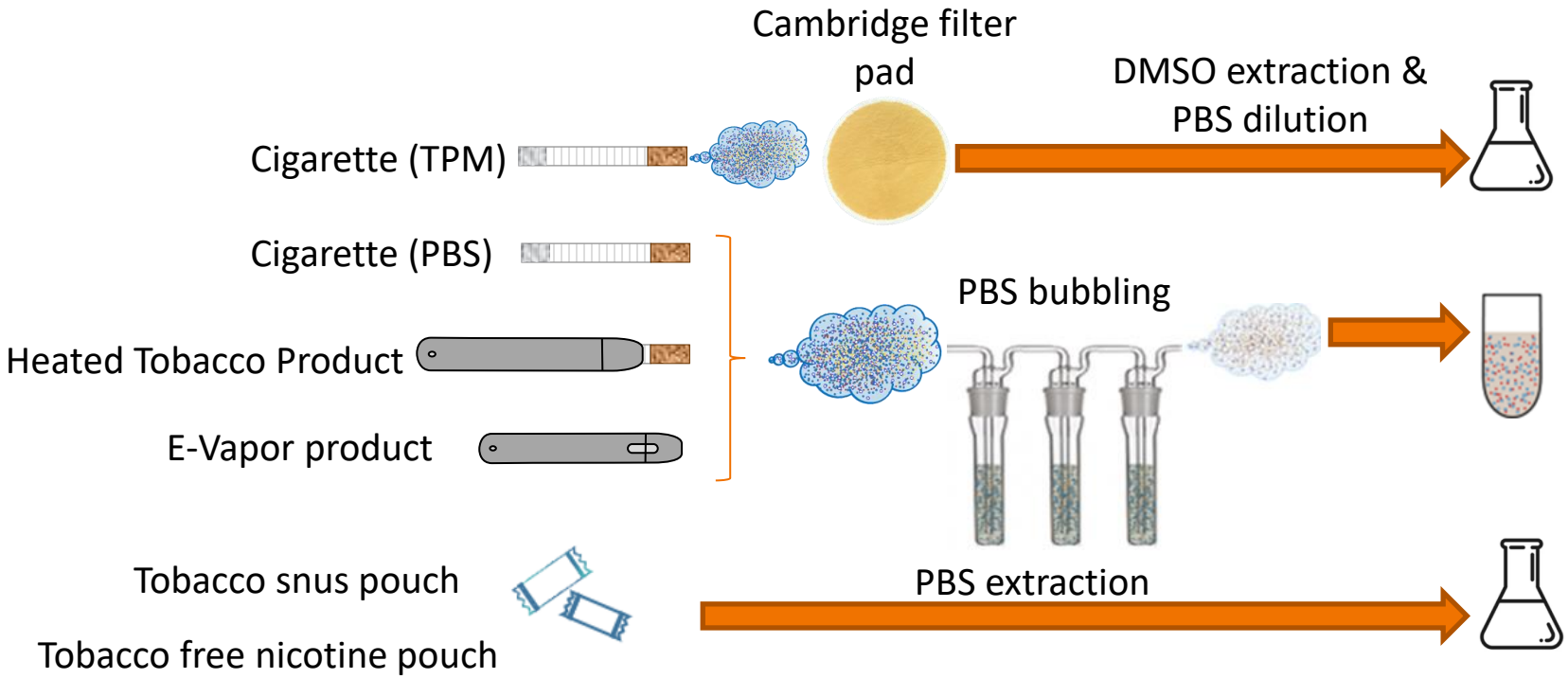
- Teeth photographed
- Teeth Colour measurements (CM-700d Konica Minolta Spectrophotometer)

# TEST SAMPLES

## COMPARATOR PRODUCTS:

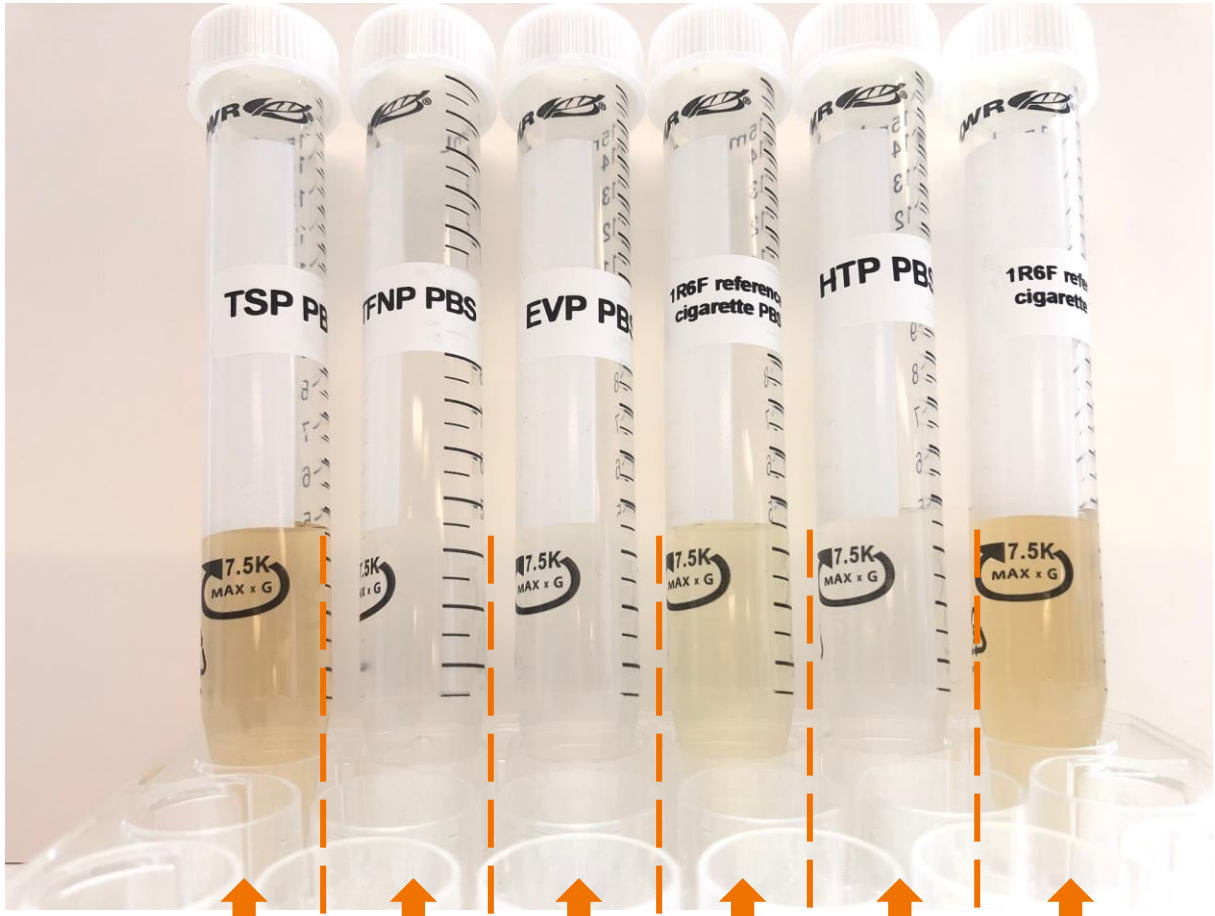
- Instant coffee (1.8g in 200ml boiled water)
- Red wine (neat)

## EXPOSURE METHODOLOGY FOR COMBUSTIBLE AND NON-COMBUSTIBLE PRODUCTS:




Phosphate Buffered Saline (PBS) was used as a surrogate for saliva

# TEST SAMPLES CHARACTERISATION AND APPEARANCE




| Test sample | Tobacco snus pouch | Tobacco free nicotine pouch | E-Vapor Product | 1R6F Combustible cigarette (PBS) | Heated Tobacco product | 1R6F Combustible cigarette (TPM) |
|---|---|---|---|---|---|---|
| **Optical Density ($OD_{400}$)** | 0.089 | 0.001 | <0.001 | 0.079 | 0.01 | 0.301 |

Optical Density $OD_{400}$
(a measure of how much Particulate Matter present)

All test samples were diluted to achieve a common nicotine level (50µg/ml)

Therefore, we can conclude that nicotine is not driving the colouration of the samples



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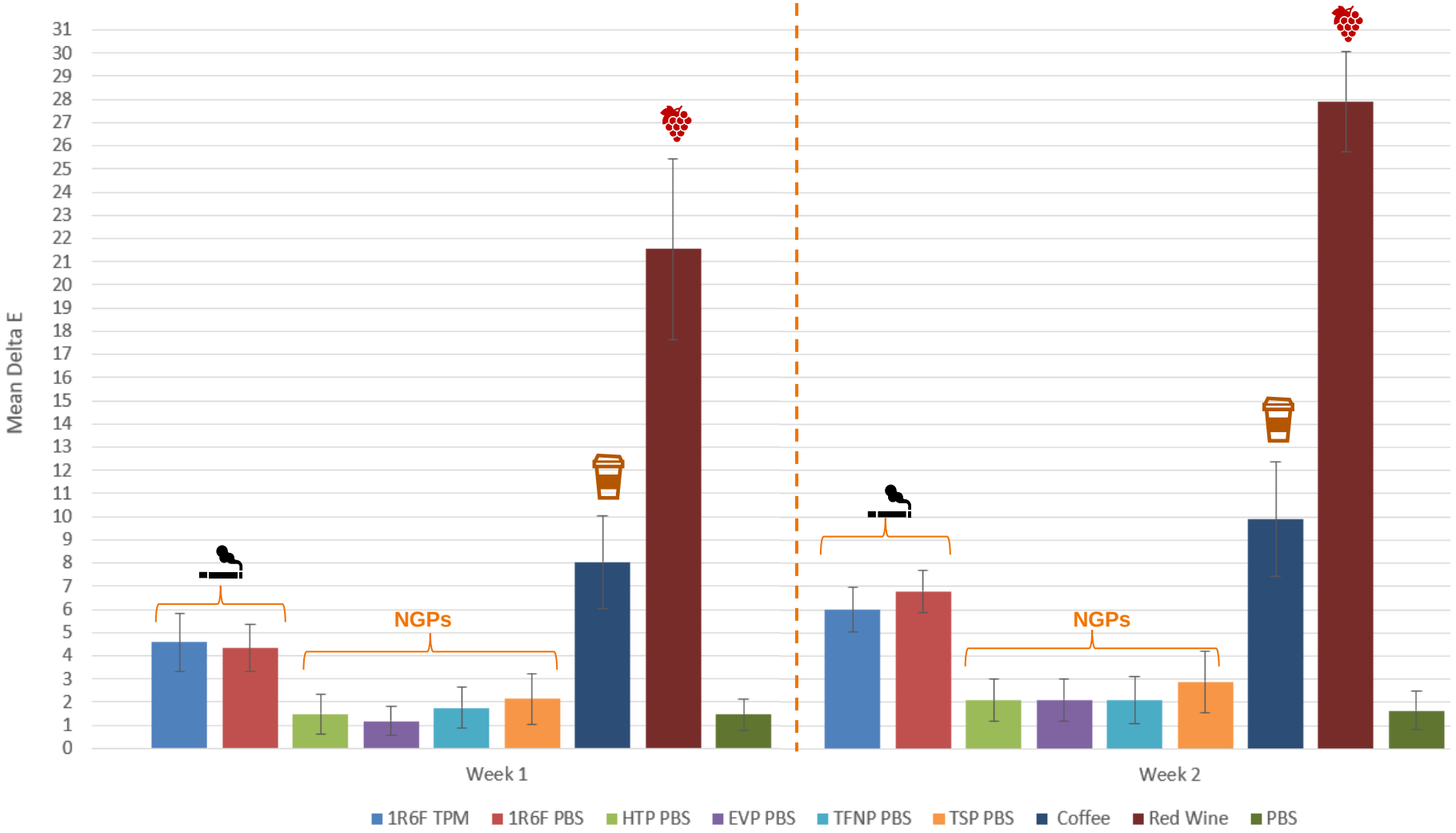
# RESULTS: TOOTH COLOUR MEASUREMENTS OVER TIME FOR TEST ARTICLES (MEAN TOTAL COLOUR CHANGE: DELTA E)




$$\Delta E = \sqrt{((\Delta L^*)^2+(\Delta a^*)^2+(\Delta b^*)^2)}$$

(ΔL*) = Mean Change in Lightness

(a*) = Mean Change in Green to Red Hue

(b*) = Mean Change in Blue to Yellow Hue

*Taken from: https://sensing.konicaminolta.us/us/products/cm-700d-spectrophotometer/*

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# RESULTS: TOOTH COLOUR MEASUREMENTS OVER TIME FOR TEST ARTICLES - 14 DAY REPRESENTATIVE SAMPLES


*A General linear model ANOVA was used to assess differences in delta E values between the products. Values are compared at a significance level (α) of 0.05. Post-hoc Tukey adjustment for pairwise comparisons was used.

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# CONCLUSIONS

Red wine, coffee and combustible cigarette samples caused a statistically significant discolouration of enamel blocks

No statistically significant discolouration of enamel blocks were determined for Heated Tobacco, EVP, Tobacco snus pouches or Tobacco free nicotine pouches when compared to PBS (negative control)

The results from this study suggest that next generation nicotine delivery products will exhibit a marked reduction in tooth staining potential when compared to combustible cigarettes

However, longer term studies may be required utilising pre-clinical and clinical assessments to fully verify the finding of this study and to understand the lifestyle factors that may also impact staining levels



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# THANK YOU FOR YOUR ATTENTION


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**Intertek CRS**
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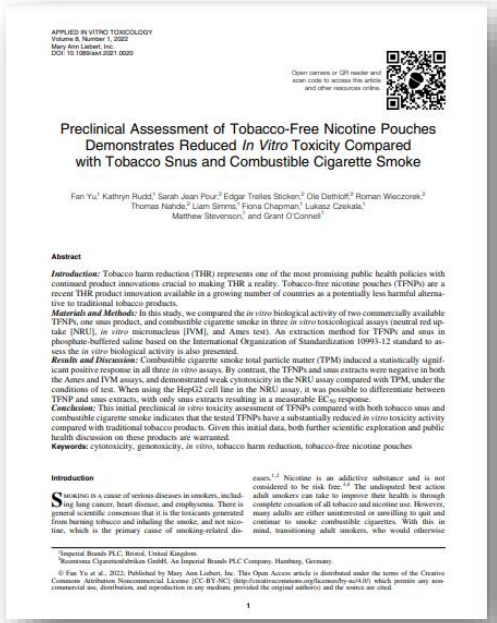
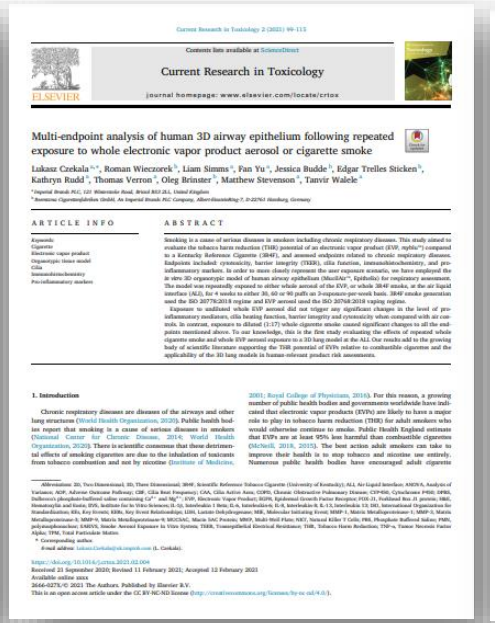
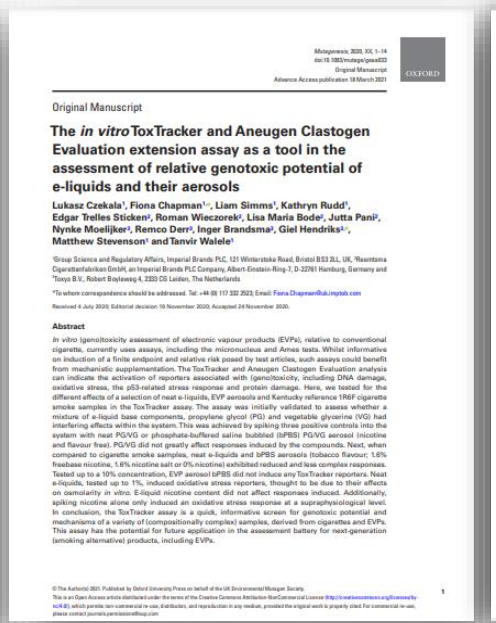
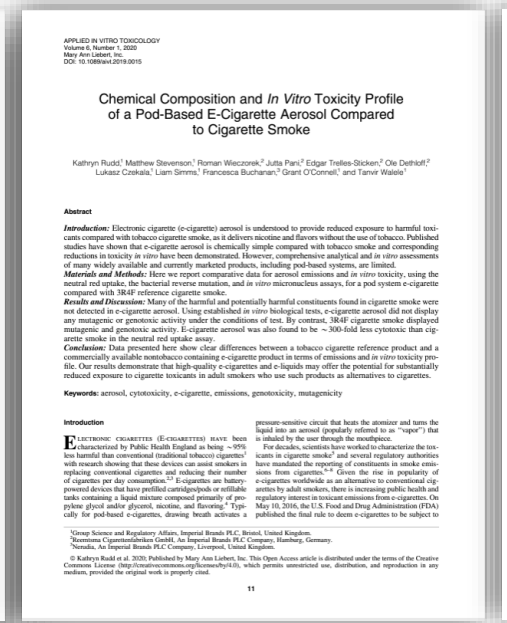

Preclinical Assessment of Tobacco-Free Nicotine Pouches Demonstrates Reduced *In Vitro* Toxicity Compared with Tobacco Snus and Combustible Cigarette Smoke


Multi-endpoint analysis of human 3D airway epithelium following repeated exposure to whole electronic vapor product aerosol or cigarette smoke


The *in vitro* ToxTracker and Aneugen Clastogen Evaluation extension assay as a tool in the assessment of relative genotoxic potential of e-liquids and their aerosols


Chemical Composition and *In Vitro* Toxicity Profile of a Pod-Based E-Cigarette Aerosol Compared to Cigarette Smoke


Multiple endpoint *in vitro* toxicity assessment of a prototype heated tobacco product indicates substantially reduced effects compared to those of combustible cigarette