Flavours are an important part of the vaping experience. However, ingredients with potential toxicological concern have been identified. Case studies are presented. Robust flavour risk assessments are required to fully characterise potential risks in e-liquids.

### Our Robust Flavour Stewardship Approach

- E-liquid ingredients as well as e-cigarette vapour are assessed.
- Only pharma and food grade ingredients are recommended for use to minimize the risk of contamination.
- Ingredients with particular toxicological concerns are excluded.
- Maximum use levels for all ingredients are determined by scientific data.

### Case Study 1: Citric Acid

- Citric acid thermally degrades to respiratory sensitising acid anhydrides.
- On inhalation, these chemicals can trigger mild to severe allergic reactions.
- Acid anhydrides were detected in cigarette product, but not in a modern open tank product.

We recommend screening for acid anhydrides before commercialising e-liquids containing citric acid.

### Case Study 2: Cocoa Extract

- Protein allergens might be present.
- Exposure to very low levels can produce asthma-like symptoms.
- Proteins shown to transfer into the aerosol. Just 25ppm of protein leads to exposure levels 250-fold higher than what we think would be safe.

Protein-containing extract is NOT recommended as an e-liquid flavour.

### Case Study 3: Diacetyl/Acetoin

- Diacetyl is associated with decline in lung function (‘popcorn lung’).
- Acetoin has been used as an alternative to diacetyl.
- Acetoin in nicotine containing e-liquids converts to diacetyl over time.

Acetoin is a precursor to diacetyl and should NOT be used as a flavour ingredient.

### References

4. Vas, C., Waters, G., Sanchez, M., Costigan, S., McAdam, K. “Acetoin is a precursor to diacetyl in e-cigarettes liquids” Poster Presented at Global Forum on Nicotine, June 17–18, 2016, Warsaw, Poland.