Nicotine Content ≠ Nicotine Uptake: Understanding the Difference

Nicotine pouches have been coming under attack in recent months in response to concerns over nicotine levels and claims that pouches contain 15 times more nicotine than a cigarette.

These reports are very misleading, not least because journalists are clearly conflating nicotine content with nicotine uptake, leading consumers to believe that they will take up all the nicotine in the pouch.

Pouches and cigarettes are very different. Cigarettes deliver nicotine very quickly via the lung within seconds of inhaling the smoke, whereas pouches are placed in the mouth, where uptake occurs more slowly. Pouches must therefore contain more nicotine to pack a similar punch (a requirement if people are to use pouches instead of smoking).

Cigarettes contain between 8 and 20mg of nicotine. This would make pouches with an upper limit of 20mg per pouch equivalent in terms of content but not necessarily uptake. A 20mg per pouch limit would, however, allow for a rate of nicotine uptake that is equivalent to an average cigarette.

This upper limit of 20mg per pouch has been rubber stamped by the Swedish Institute for Standards and seems to be working well.

"Reduced risk products are only as good as consumers' willingness to use them instead of cigarettes. If no one uses them, there is no point. This is why they must deliver nicotine in a way that is competitive with a cigarette, the most effective nicotine delivery system created to date," said Dr Marina Murphy, Senior Director of Scientific Affairs at Haypp Group.

NICOTINE CONTENTS (WHAT GOES INTO THE PRODUCT)
Pack of 20 Cigarettes
There is up to 400mg of nicotine in a 20-pack of cigarettes (assuming between 8 and 20mg per cigarette)
Can of 20 Nicotine Pouches
400mg/can (assuming 20mg/pouch)
One e-cigarette
40mg per e-cigarette (limit of 20mg/ml and 2ml)

The amount of nicotine is one of many factors determining uptake

Nicotine uptake is determined by several factors including nicotine content, product format, pH, moisture levels and individual differences.

- **Nicotine Content:** More nicotine means more can be extracted from the pouch and absorbed by the user. This nicotine needs to free to be extracted, however.

- **pH:** pH refers to the level of acidity – it is a measure of how many protons (hydrogen ions) there are in a substance. In nicotine pouches, pH determines the form that the nicotine takes and how available it is for adsorption.
    - When pH is low, the nicotine will be bound to a proton and is less available for adsorption.
    - When the pH is higher, the nicotine is not bound to any protons and free and is, therefore, more available for adsorption in the mouth.
    - Compounds like sodium carbonate and sodium bicarbonate can be added to nicotine pouches to adjust pH.
    - The use of pH modifiers can therefore help in terms of achieving greater extraction with less nicotine.

Determining a Limit for Nicotine

The German Federal Institute for Risk Assessment (BfR) examined existing studies and data on pouches and assessed them in combination with experimental studies of their own. BfR's scientific opinion is that a 16.6mg product can deliver a similar amount of nicotine as a cigarette. But their calculations are based on a 70% extraction rate. Extraction levels vary hugely however and be as low as 15% and averaging about 50%. In addition, pouches are less efficient than cigarettes at delivering nicotine – so they need more nicotine to match a cigarette.

A level of 20mg of nicotine per pouch is therefore more likely to provide parity with a cigarette and allow for variations in product, nicotine extraction rates and differences in individual consumers. This is in line with the view of the SIS (Swedish Institute for standards): *'The maximum total nicotine allowed per consumable shall be 20mg*.