**BACKGROUND/RATIONALE**

- The last few decades have witnessed an increase in the use of new smokeless tobacco (ST) products such as snus and dissolvables.
- Rapid characterization of ST products is vital to understanding their popularity, consequences of use, and regulatory needs.
- This trial is 1 in a series of 3 that characterized the likelihood of adoption of several new and traditional ST products.

**RESEARCH QUESTION**

Based on subjective measures of liking, reduction in craving, and reduction in withdrawal, what is the likelihood of adoption of a variety of commercially available smokeless tobacco products?

**PARTICIPANTS**

- N=30 smokeless tobacco users (30 males)
- Mean age=22.2 yrs (SD=7.60)
- Mean length of ST use=21.72 mths (SD=15.01)
- Race: 90.0% White

**DESIGN**

- Within-subjects crossover trial
- 5 laboratory visits; order of visits randomized
- Products: 1. Skoal snuff, 2. Camel snus, 3. Ariva dissolvable tablet, and 4. Verve chewable disc were compared to 5. Nicorette lozenge (medicinal control product w/ low abuse potential)
- Differences between products in self-reporting of craving, reduced craving, and reduced withdrawal were measured
- Physicochemical characterization of products was conducted
- Outcome measures: change in subjective responses from pre- to post-product use

**NOTE:** Data on change in EEG response, attention (Oddball Task), and salivary HPHC were collected, but are not reported here.

**METHODS**

**Procedures at each of the 5 visits:**

- Baseline Questionnaires (Visit 1)
- Pre-product Questionnaires
- Product Use
- Post-product Questionnaires
- Urine drug test
- Sensory Evaluation Questionnaire
- Cigarette Evaluation Scale
- Nicotine Dependence Scale
- Demographics and Tobacco Use History
- Questionnaire on Smoking Urges (Brief)
- Minnesota Nicotine Withdrawal Scale
- Nicotine Dependence Syndrome Urges (Brief)
- Schuh-Stitzer Scale of Tobacco Use Urges
- Duke Sensory Questionnaire

**MEASURES**

**Product unit mass, pH, water, and nicotine content of smokeless products tested.**

<table>
<thead>
<tr>
<th>Product</th>
<th>Flavor</th>
<th>Mass (g) / Tablet</th>
<th>Moisture</th>
<th>pH</th>
<th>nicotine (mg)</th>
<th>unprotonated nicotine (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camel snus</td>
<td>Mellow</td>
<td>0.564</td>
<td>31.7</td>
<td>7.58</td>
<td>4.05</td>
<td>2.50</td>
</tr>
<tr>
<td>Ariva dissolvable tablet</td>
<td>White</td>
<td>0.296</td>
<td>4.04</td>
<td>6.75</td>
<td>1.30</td>
<td>0.67</td>
</tr>
<tr>
<td>Verve chewable disc</td>
<td>Blue Melt</td>
<td>0.491</td>
<td>7.88</td>
<td>7.58</td>
<td>0.00</td>
<td>0.24</td>
</tr>
<tr>
<td>Skoal snuff</td>
<td>Classic</td>
<td>1.499</td>
<td>53.5</td>
<td>7.45</td>
<td>16.4</td>
<td>3.37</td>
</tr>
<tr>
<td>Nicorette lozenge</td>
<td>Original</td>
<td>1.258</td>
<td>2.18</td>
<td>7.87</td>
<td>1.73</td>
<td>1.26</td>
</tr>
</tbody>
</table>

**RESULTS**

- Repeated measures mixed model analysis
- Significant differences between 5 products in aversion (p<.001), reduced craving (p<.002), and satisfaction factors (p=.014), plus overall reinforcement (p<.001) *Skoal had significantly higher ratings than each of the other products (see Figure 1).
- Significant differences between 5 products in liking (p<.014), satisfaction (p<.002), nicotine content (p<.001), and strength of tobacco (p<.001). *Skoal had significantly higher ratings than each of the other products (see Figure 2).
- No significant differences between products in overall relief of craving or withdrawal (not shown).
- Skoal snuff produced highest ratings of liking, reduced craving, and reduced withdrawal; Camel snus 2nd highest.

**PRODUCES**

**Source:** Battelle Memorial Institute, Columbus, OH; n=5 replicates/product

**CONCLUSIONS**

- Diversity exists in the likelihood of adoption of the 5 ST products tested.
- Skoal snuff is the most likely of the 5 products to be used again.
- Total and unprotonated nicotine content and moisture level may contribute to likability; (Skoal and Camel products had greatest nicotine and moisture levels).
- Future studies should explore the roles that nicotine content, flavors, and moisture play in product likeability, initiation, continued use, and exposure to harmful constituents.

**ACKNOWLEDGEMENTS**

Research reported in this publication was supported by grant number SR21DA030622 from NIH/National Institute on Drug Abuse. The content is solely the responsibility of the authors and does not necessarily represent the official views of NIH/NIDA. The authors have no conflicts of interest.