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Standard Guide for Screening and Training of Assessors and a General Approach for the Sensory Evaluation of Toothpaste Appearance, Flavor, and Texture¹

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1. Scope

1.1 This guide provides guidelines for the selection and training of expert assessors for the sensory evaluation of toothpaste. Sensory evaluation of toothpaste can be used to define the sensory attributes of toothpaste and then to measure these attributes quantitatively for the purposes of new product development, product optimization, competitive benchmarking, and claims substantiation.

1.2 A general framework for toothpaste descriptive analysis is provided to guide the reader in the design and execution (including sample preparation and presentation, facility and testing environment, and specific evaluation protocol) of toothpaste descriptive analysis evaluations.

1.3 This guide provides suggested protocols and approaches to the evaluation of toothpaste (dentifrice) and in no way excludes any alternate approaches that may be effective in providing such perceptual evaluations.

1.4 This guide does not address other oral care products including, but not limited to, whitening agents, oral rinses, mouthwashes, toothbrushes, dental flosses, denture adhesive, floss picks, or other oral care products.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

[E253 Terminology Relating to Sensory Evaluation of Materials and Products](#)

¹ This guide is under the jurisdiction of ASTM Committee E18 on Sensory Evaluation and is the direct responsibility of Subcommittee E18.07 on Personal Care and Household Evaluation.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[E1490 Guide for Two Sensory Descriptive Analysis Approaches for Skin Creams and Lotions](#)

[E2082 Guide for Descriptive Analysis of Shampoo Performance](#)

3. Terminology

3.1 *Sensory Attributes and Definitions*—Refer to Terminology [E253](#) for common sensory terms that may be applied to the evaluation of toothpaste.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *anise/licorice, n*—aromatics associated with sweet, spicy herbs containing anethole, for example, licorice gum and licorice candy.

3.2.2 *baking soda complex, n*—metallic, salty, mouth coating with radiating burn feeling, including mouth slip, for example, 0.1 % baking soda solution and unflavored seltzer water.

3.2.2.1 *Discussion*—The study designer may choose to separate this complex attribute into more granular attribute measures.

3.2.3 *bicarbonate feeling factor, n*—additionally can be recognized as the chemical feeling factor associated with sodium bicarbonate.

3.2.4 *brown spice, n*—bark, buds, flowers, roots, fruit, and secretions of plants used to create pungency, bite, or character in foods and aromatics associated with a range of earthy, musty, woody, sweet, warm, citrus, terpeney, sassafras, brown spices that can include bitter and numbing, for example, cinnamon, cardamom, clove, mace, coriander, and nutmeg, 0.1 % allspice solution, and strong cinnamon chewing gum.

3.2.5 *chalky feel, n*—textural perception of small particulates.

3.2.6 *chalky flavor, n*—aromatics associated with mineral salts such as chalk along with some cement-like and dusty notes, for example, chalk dust, milk of magnesia, calcium carbonate, and calcium oxide.

3.2.7 *earthy, adj*—aromatic associated with mushrooms, potatoes, and potting soil.

3.2.8 *foam*, *n*—characteristics of the bubbles produced during the use of the product and this may specifically include more granular measures such as:

3.2.8.1 *foam amount*,

3.2.8.2 *foam uniformity*, and

3.2.8.3 *denseness of bubbles produced*.

3.2.9 *green (viney)*, *n*—aromatic associated with plants, particularly with plant stems, for example, the aromatic associated with tulip stems.

3.2.10 *gritty*, *adj*—sensation of coarse, hard particles perceived in the mouth, for example, quick dissolving antacid (calcium carbonate) tablets and granulated sugar.

3.2.11 *menthol*, *n*—“green” aromatic with associated nasal pungency and cooling feeling factor (and burning at higher levels) while in the mouth, for example, menthol and eucalyptus cough drop and mentholated topical cough suppressant ointment.

3.2.12 *mint complex*, *n*—sum of the combination of several aromatics associated with mint such as wintergreen, spearmint, and peppermint.

3.2.12.1 *Discussion*—Other attributes associated with mint complex may include basic tastes and feeling factors such as: sweet, bitter, cooling, pungency, and menthol, all of which are rated separately.

3.2.13 *overall impact*, *n*—sum total of the sensory impressions (sensations) of the sample in the mouth that includes aromatics, basic tastes, and feeling factors.

3.2.14 *peppermint*, *n*—aromatics associated with peppermint leaves.

3.2.14.1 *Discussion*—Other associated characteristics with peppermint typically include sweet, mint, cooling, green notes, bitter, and pungency, all of which are rated separately. Noncategory examples of peppermint include peppermint gum and candies.

3.2.15 *peroxide*, *n*—aromatic associated with hydrogen peroxide; can include astringency, soapy, prickly, vinyl impression, soured, and metallic taste and aftertaste, for example, 1:4 dilution hydrogen peroxide.

3.2.16 *pins and needles/numbing/stinging*, *n*—feeling factor associated with a sharp, stinging sensation that can be intense and includes a decrease or loss of sensation (numbing) often as a result of intense carbonation and a reaction to strong flavoring oil, essence, or extracts, for example, rinsing the oral cavity with hydrogen peroxide and then expectorating.

3.2.17 *slick*, *adj*—measure of the lack of resistance to tongue movement across the surface of the teeth.

3.2.18 *soapy aromatic*, *adj*—aromatics associated with lipolyzed milk solids, hydrolyzed vegetable fat, tallow-notes, or hydrolyzed animal fat, or combinations thereof.

3.2.19 *soapy mouthfeel*, *adj*—alkaline and slippery feel on the soft tissues of the mouth.

3.2.20 *spearmint*, *n*—aromatics associated with spearmint.

3.2.20.1 *Discussion*—Other associated characteristics with spearmint typically include sweet, bitter, green notes, and

cooling (though typically not as intense as peppermint), all of which are rated separately, with slightly less burn than peppermint.

3.2.21 *thymol-eucalyptol*, *n*—aromatics associated with the aroma of eucalyptus trees that include piney/rosemary and phenolic/medicinal.

3.2.22 *toothpaste*, *n*—powder, paste, gel, or liquid for cleaning the teeth with the primary clinical benefit being the prevention of dental caries.

3.2.22.1 *Discussion*—Toothpaste products may or may not contain a form of fluoride as the common active ingredient and are generally intended for application with a toothbrush or similar device.

3.2.23 *unripe (green) fruit*, *n*—aromatic associated with underdeveloped fruit, for example, green bananas.

3.2.24 *warming*, *v*—perception of chemical heat associated with substances such as brown spice and low levels of capsaicin.

3.2.25 *wintergreen*, *n*—combination of several sweet aromatics associated with the mint family having some green and menthol aromatics along with a methyl salicylate aromatic sensation.

3.2.25.1 *Discussion*—Other associated characteristics with wintergreen typically include warming, low-level burning, and cooling, which are rated separately. Noncategory example: wintergreen breath mints and typical bismuth subsalicylate stomach remedies.

4. Summary of Guide

4.1 The development of expert descriptive sensory capability for the evaluation of toothpaste requires a very specific and deliberate approach to not only the evaluation of the product itself but also to the recruitment and training of potential evaluators for the evaluation of toothpaste. This guide provides approaches for the recruitment, screening, training, and final selection of panelists to evaluate the intensity and time course of the sensory physical characteristics of toothpaste.

4.2 Additionally, several approaches to the expert descriptive analysis of consumer products have been developed, each with its own particular strengths and drawbacks. Two of the most common approaches are the common application and use of toothpaste through the typical toothbrushing process using a toothbrush.

4.3 An alternate approach to the evaluation of some attributes of toothpaste that has been published in the sensory literature is the sampling of the product from a spoon.³ This approach provides a mechanism for flavor, chemical feeling factor, and some mouthfeel characteristics without the concomitant irritation of the oral tissues that can accompany the use of a bristled toothbrush.

4.4 Specifics around the approaches for toothpaste evaluation are left to the reader as varied and equally valid descriptive analysis protocols can be developed.

³ Hightower, C. A., and Chambers, E., “Descriptive Analysis of Toothpaste Flavor and Texture Using Two Sampling Methods: Brushing Versus Spoon Tasting,” *Journal of Sensory Studies*, Vol 24, No. 3, 2009, pp. 301–316.

5. Significance and Use

5.1 The approaches to the evaluation of toothpaste recommended in this guide can be used to assess the sensory characteristics of toothpaste when dispensed, in use, and after use. This guide is meant to address the evaluation of a standalone toothpaste product and does not address packaging, product/package interaction, dispensing, appearance, or overall effect or benefit of the product. The procedures outlined in this guide are to be used by assessors that have been specifically screened for sensory and descriptive ability and have been trained in the evaluation of toothpaste. The procedures described in this guide can be used to guide product development within a manufacturer and can be used to communicate information regarding the product to the consumer through the media or on product packaging.

5.2 Additionally, language and ideas from two additional ASTM sensory guides (Guides **E1490** and **E2082**) as well as the *Lexicon for Sensory Evaluation: Aroma, Flavor, Texture, and Appearance* (DS72)⁴ are used throughout this guide.

6. Panel Selection and Training

6.1 *Objective*—To select and train a panel of 10 to 15 judges to evaluate sensory properties before, during, and after usage of toothpaste using descriptive analysis methods that quantify sensory attributes over time. For any particular study or evaluation, a smaller subset of these panelists may be used to generate data depending on project needs or objectives or both.

6.2 *Assessor Selection*—The following will cover points specific to toothpaste assessors. For more general considerations in the recruitment of a descriptive analysis panel, reference *ASTM STP 758*.⁵

6.2.1 Assessors are recruited from within a company or the local community. The choice to use employees allows a company to have the assessors on site and keep proprietary information confidential. The use of local community residents provides a smaller risk to panelist attrition both on a daily basis and longer term.

6.2.2 A large group of candidates are recruited from the local community by contacting community groups, posting on bulletin boards, websites, placing newspaper ads, or other such ways to communicate such as exploring social media. Candidates from within the company are contacted by interoffice memo, e-mail, company newsletter, or notices posted on regular and electronic bulletin boards. Management encouragement and support is critical. Before the prescreening questionnaire, candidates should be informed of the time commitment for training, potential duration of the panel, use of the panel, and expectation of each panelist relative to the responsibilities of the panel. The prescreening questionnaire is recommended for determining current product usage, oral care habits, availability, interest, and their ability to articulate perceptions.

6.3 *Prescreening Questionnaire*—The prescreening questionnaire should cover the following topics:

6.3.1 *Screening Questions Specific to External Panelists:*

6.3.1.1 *Availability*—Available for all mandatory training and 80 % or more of practice sessions. Be clear on exactly what the time commitment is.

6.3.1.2 *Clarification to the Candidate of the Scope and Expectation of the Role*—This is a standalone job/role with no expected addition to further company employment (if recruited externally). This is a part-time role without expectation to an increase in hours. Additionally, hours are based on study needs and are not guaranteed. Working in a group dynamic and group environment is essential. In regard to training, practice, validation, and long-term commitment, willingness to step outside of the oral comfort zone (trying things that they would not normally try, unusual flavors, sensation, textures, and strengths) is critical.

6.3.1.3 If products or materials used in training contain alcohol, caffeine, animal products, processed foods, and so forth, it is recommended that this be disclosed to potential panelists.

6.3.1.4 *Questions to Ascertain General Health and Condition*—Generally exclude potential panelists with food allergies, diabetes, hypertension not managed by medication (less than 140/90), on medications that noticeably affect their ability to smell/taste, have serious chronic medical conditions (for example, cancer), are pregnant, or are lactating. Further medical history and current medication assessment can be conducted in cooperation with safety, regulatory, and legal partners. If the candidate's medical history is collected, ensure that this is acceptable from a Human Resources (HR) perspective and not subject to the Health Insurance Portability and Accountability Act of 1996 (HIPAA) (or similar) restrictions.

6.3.1.5 *Oral Health and Condition*—Health and condition of mouth and teeth, the presence or absence of dentures or partials, and age may be considered when recruiting assessors for a toothpaste product panel. Unless the product is formulated to address denture wearers, it is recommended that denture wearers not be included in sensory toothpaste evaluations. It is also recommended that individuals who have chronic oral conditions, periodontal disease, excessive fillings, orthodontia, fewer than 80 % of their natural teeth, sensitivity to ingredients commonly included in toothpaste, and the presence of veneers be excluded. Individuals with food allergies should also be excluded. Issues such as tooth sensitivity, recent dental or oral surgery, tobacco use, and bridgework should also be considered when selecting assessors.

6.3.1.6 *Commitment—Training, Practice, Ongoing (Overall Length of Commitment)*—Amount of time invested in the candidate should balance with the amount of time the candidate delivers.

6.3.1.7 *Verbal Articulation (Gauged from Written Questions)*—The objective should not be called out to the panelist. If prescreening is done online, be very careful not to include questions in an online screener that can be answered through an internet search. Be very careful of how the question is asked and ensure that the answer will meet the objective. (Consider asking in this question the habits and practices of

⁴ *Lexicon for Sensory Evaluation: Aroma, Flavor, Texture, and Appearance*, DS72, ASTM International, West Conshohocken, PA, 2011.

⁵ *Guidelines for the Selection and Training of Sensory Panel Members, STP 758*, ASTM International, West Conshohocken, PA, 1981.