



NIH Toolbox  
Assessment of Neurological and Behavioral Function

## Taste Perception

Susan E. Coldwell, PhD  
University of Washington

October 27, 2008



For more information, please visit [www.nihtoolbox.org](http://www.nihtoolbox.org)  
Richard C. Gershon, PhD, PI [gershon@northwestern.edu](mailto:gershon@northwestern.edu)

This study is funded in whole or in part with Federal funds from the Blueprint for Neuroscience Research, National Institutes of Health under Contract No. HHS-N-260-2006-00007-C

---

---

---

---

---

---

---

---

---

---

## Conceptual Definition



**For Toolbox, taste perception is defined as sweet, salty, sour, bitter, or umami tastes arising from either whole-mouth stimulation of taste receptors or regional stimulation of the front, sides, and rear of the tongue.**

---

---

---

---

---

---

---

---

---

---

## Taste Team Members



- Linda Bartoshuk, University of Florida
- Gary Beauchamp, Monell Chemical Senses Center
- Paul Breslin, Monell Chemical Senses Center
- Susan Coldwell, University of Washington
- Valerie Duffy, University of Connecticut
- James Griffith, Northshore University Health System
- Lloyd Hastings, Osmic Enterprises
- Howard Hoffman, National Institute on Deafness and Other Communication Disorders
- Julie Mennella, Monell Chemical Senses Center
- Michael O'Mahony, University of California at Davis
- Marcia Pelchat, Monell Chemical Senses Center
- Gregory Smutzer, Temple University

---

---

---

---

---

---

---

---

---

---

## Assessment Types Considered



- ◆ Sensitivity
  - Detection threshold
  - Discrimination ability (forced choice, ranking)
  - Intensity ratings
- ◆ Hedonic (liking) evaluation
  - Ranking
  - Two-alternative forced choice
- ◆ Taste identification
- ◆ Anatomic
- ◆ Genetic

---

---

---

---

---

---

---

---

## Assessment Types Selected



- ◆ Sensitivity
  - Detection threshold
  - Discrimination ability (forced choice, ranking)
  - Intensity ratings
- ◆ Hedonic (liking) evaluation
  - Ranking
  - Two-alternative forced choice
- ◆ Taste identification
- ◆ Anatomic
- ◆ Genetic

---

---

---

---

---

---

---

---

## Other Considerations



- ◆ Region to test (whole mouth vs. localized)
- ◆ Quality to assess (bitter, sweet, sour, salty, umami)
- ◆ Delivery mechanism to use
- ◆ Chemicals to use in testing
- ◆ Concentrations to use in testing

---

---

---

---

---

---

---

---

## Toolbox Considerations



- Assessment of young children will likely need to focus on hedonics
- Population norms, reliability and validity are available for very few measures in taste
- There are none to few widely accepted measures
- Liquid stimulus delivery preferred to dry presentation

---

---

---

---

---

---

---

---

## Measures Selected



- Taste Intensity Assessments
  - Taste Intensity (whole mouth)
  - Regional Taste Sensitivity (front and rear)
  - PROP Taste Intensity
- Sweet Taste Preference
  - Ranking or a Two-Alternative Forced Choice method

---

---

---

---

---

---

---

---

## Taste Intensity (Whole Mouth)



- Selected the General Labeled Magnitude Scale (gLMS)
- Sweet (Sucrose)
- Salty (Sodium Chloride)
- Bitter (Quinine HCl)
- Sour (Citric Acid)

---

---

---

---

---

---

---

---

## Taste Intensity (Whole Mouth)



Adapting from the protocol developed for the Beaver Dam Offspring Study (Karen Cruickshanks, PI)

- Liquids instead of filter paper
- PROP assessed separately
- Modified instructions
- Development work being conducted by Valerie Duffy

---

---

---

---

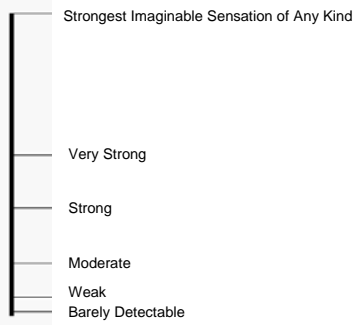
---

---

---

---

## General Labeled Magnitude Scale



---

---

---

---

---

---

---

---

## Like vs. Dislike for Young Children



---

---

---

---

---

---

---

---

## Validation of Intensity Test



- Zero, 0.1 M, and 0.32 M NaCl will be presented in testing
- Assess for differential ratings to these three levels of salt solution
- For child testing, sucrose should be liked and quinine disliked

---

---

---

---

---

---

---

---

## Regional Taste Sensitivity



- Using the gLMS scale
- Rating 1 mM quinine HCl applied to tongue tip
- Rating 1 mM quinine HCl applied to the rear of the tongue
- Method currently used by Valerie Duffy
- Some validity data exist for this type of measure

---

---

---

---

---

---

---

---

## PROP Taste Intensity Test



- gLMS scale
- Rating of a control taste strip
- Rating of a strip with 400 nmoles PROP

---

---

---

---

---

---

---

---

## Validation of PROP Test



- Will correlate with filter paper method
- ~70% to 75% of the population should discriminate between control and PROP

---

---

---

---

---

---

---

---

## Sweet Taste Preference



- Ranking of five solutions considered
- Short version of the two-alternative forced choice tracking method proposed
- Reliability of the short version being assessed with existing data (Julie Mennella)
- Some validity data exist for these types of measures



---

---

---

---

---

---

---

---

## Summary



- Selected three intensity measures
  - Taste Intensity (Whole Mouth)
  - Regional Taste Sensitivity
  - PROP Taste Intensity
- Sweet Taste Preference
  - Using existing data to make a recommendation on method

---

---

---

---

---

---

---

---



**NIH Toolbox**  
Assessment of Neurological and Behavioral Function

## “Building the Toolbox: Taste Perception”

Susan E. Coldwell, PhD  
University of Washington

October 27, 2008



For more information, please visit [www.nihtoolbox.org](http://www.nihtoolbox.org)  
Richard C. Gershon, PhD, PI [gershon@northwestern.edu](mailto:gershon@northwestern.edu)

This study is funded in whole or in part with Federal funds from the Blueprint for Neuroscience Research, National Institutes of Health under Contract No. HHS-N-260-2006-00007-C

---

---

---

---

---

---

---

---

---

---