Reference #1

Odor Sensitivity Test Kit
Information Page

Odor Sensitivity Test Kit

St.Croix Sensory, Inc.
800-879-9231
www.fivesenses.com

The Odor Sensitivity Test Kit is used to determine the olfactory threshold (odor sensitivity) of an individual to the standard odorant, 1-butanol.

St.Croix Sensory has adapted Sniffin' Sticks for the Odor Sensitivity Test Kit. Sniffin' Sticks are manufactured by Burghart GmbH, Department of Medical Technology (www.burghart.net).

The RED pens contain discrete amounts of 1-butanol in distilled water with less than 0.1% added preservatives (ethyl and propyl hydroxybenzoates). The BLANK pens contain distilled water with the preservatives.

St.Croix Sensory recommends replacing the Odor Sensitivity Test Kit after completing 50 tests or after a period of 6-months, which ever occurs first.

ATTENTION

- ✓ Use only for the designated purpose.
- ✓ Follow the test instructions carefully.
- ✓ Store pens at room temperature out of direct sunlight.
- ✓ Keep away from children.
- ✓ Do not touch the pen tips.
- ✓ In case of skin or eye contact with the pen tip, rinse the affected body part with water.

Reference #2

Odor Sensitivity Test Kit

Recording Page

Testing Record

Replace after completing 50 tests or after a period of 6 months.

	Date	Time	Initials		Date	Time	Initials
1				26			
2				27			
3				28			
4				29			
5				30			
6				31			
7				32			
8				33			
9				34			
10				35			
11				36			
12				37			
13				38			
14				39			
15				40			
16				41			
17				42			
18				43			
19				44			
20				45			
21				46			
22				47			
23				48			
24				49			
25				50			

Reference #3

Odor Sensitivity Test Kit

N-Butanol Concentration in Pens

Odor Sensitivity Test Kit
n-Butanol Concentration in Pens

Pen #	PPM N-Butanol *	criteria	Iowa DNR Inspectors Fig 3 **	SCS Laboratory Assessors Fig 4 **
15	0.01			
14	0.02	exclude		
13	0.04	**> 5% tile**		
12	0.08		X	X
11	0.16		X	X
10	0.32		X	**X**
9	0.63		X	**X**
8	1.25	**50% tile**	**X**	X
7	2.50		**X**	X
6	5.00		X	
5	10.00		X	
4	20.00			
3	40.00	**< 5% tile**		
2	80.00	exclude		

* Estimated n-butanol in air concentration of sniffing test kit pens.

** Lay, Alice M. and Charles M. McGinley, A Nasal Chemosensory Performance Test for Odor Inspectors, Proceedings of Water Environment Federation Odors and Air Emissions 2004, Bellevue, WA: 18-21 April 2004.

Reference #4

ANNEX A1. Safety Data for 1-Butanol, ASTM E544-10

8.2 *Procedure B*—When the diluent is water and the static-scale method is used, report the result as follows:

8.2.1 The odor intensity of the sample is equivalent to ___ ppm of 1-butanol in water, ___ °C, in the ASTM Odor Intensity Referencing Scale for Procedure B.

8.3 Report the standard deviation of the result (see 7.5), if it is calculated. Also report the number of panelists that participated.

8.4 Values that are reported in this manner permit the comparison of odor intensity measurements for the same material to be conducted in different locations by different panels, the comparison of odor intensities for samples which are not available at the same time, and the reconstruction of a reported odor intensity for an unknown material in other laboratories.

9. Keywords

9.1 *n*-butanol; supra threshold odor intensity

ANNEX

(Mandatory Information)

A1. SAFETY DATA FOR 1-BUTANOL

A1.1 *General*—1-butanol is a common chemical used as a solvent for fats, waxes, resins, gums, and varnishes. It is also used in the manufacture of lacquers, detergents, and rayon; in special cleaning applications; and as a fuel. It is not a listed carcinogen and it does not cause lasting damage in case of accidental moderate overexposure. If ingested it is metabolized in a manner analogous to that of ethanol. It is however an irritant for eyes, skin, and the respiratory tract. Prolonged inhalation or ingestion causes dizziness and narcosis. Accordingly, contact times and concentrations of exposure should under no circumstances exceed those required for the application of the method. Exposure to concentrations in excess of the ACGIH Ceiling Value should be avoided or, if deemed necessary, should be kept to a few seconds per exposure. Assessors who experience symptoms of uneasiness during the test should be allowed the choice of not completing it.

A1.2 *OSHA Requirement*—The Occupational Safety and Health Authority enforces a workplace TLV (Threshold Limit Value) of 100 ppm (300 mg/m^3). This refers to an 8-h time-rated average. To determine compliance in a workroom situation, air sampling should be conducted around the user at intervals during the work period, and the average exposure should be calculated.

A1.3 *ACGIH Recommendation*—The American Conference of Governmental Industrial Hygienists, Inc., 6500 Glenway Ave., Bldg. D-7, Cincinnati, OH 45211-4438, recommends a TLV-C (TLV-Ceiling) of 50 ppm (152 mg/m^3). The user should obtain the relevant documentation in full. A TLV-C is a momentary value; in a workroom situation, it signals the need to begin air sampling in order to monitor any exposure above this level.

A1.4 *Realistic Assessment*—Determine the number of seconds an assessor is exposed to each concentration, then calculate the 8-h time-rated average. Example: 1 min at 1000 ppm, 2 min at 500 ppm, 4 min at 250 ppm, total $1 \times 1000 + 2 \times 500 + 4 \times 250 = 3000$ ppm × min. or $3000/60 \times 8 = 6.25$ ppm over 8 h. An assessor performing 4 such assessments within the same 8-h period is exposed to an 8-h time-rated average of $4 \times 6.25 = 25$ ppm.

APPENDIXES

(Nonmandatory Information)

X1. SELECTION OF 1-BUTANOL AS THE REFERENCE ODORANT

X1.1 1-Butanol was selected as the reference odorant because:

X1.1.1 It is a common chemical and is readily available in 99+ mol % purity.

X1.1.2 It is non-toxic, except in multigram doses.

X1.1.3 It has good stability in the presence of air and water.

X1.1.4 Its odor is somewhat unrelated, so that its odor quality can be more easily ignored when comparing with other odors which may have different qualities.

X1.1.5 The majority of people do not object to sniffing it frequently when doing odor-intensity referencing.

Reference #5

Realistic Assessment of
N-Butanol Exposure During
Odor Sensitivity Testing

Realistic Assessment of n-Butanol Exposure During Odor Sensitivity Testing

Pen Level	PPM	Warm-up Round		Round 1		Round 2	
	n-Butanol	Seconds	PPM	Seconds	PPM	Seconds	PPM
15	0.01	3	0.01				
14	0.02						
13	0.04	3	0.04				
12	0.08						
11	0.16	3	0.16				
10	0.32						
9	0.63	3	0.63				
8	1.25						
7	2.5	3	2.5	3	2.5	3	2.5
6	5			3	5	3	5
5	10	3	10	3	10	3	10
4	20			3	20	3	20
3	40	3	20				
2	80						
			33.34		37.5		37.5

Calculate dosage: 3 X 33.34 plus 37.5 plus 37.5

3 X 108.34 equals 325 ppm - seconds

Convert to PPM over 8-hours

325 ppm divided by 60 x 60 x 8 equals 0.011 ppm

0.011 ppm 8-hour time-rated average Exposure

St.Croix Sensory, Inc. April 2012

Reference #6

MSDS Exemption (letter)
For Sniffin' Sticks Odor
Sensitivity Test Kit

St. Croix Sensory, Inc.
3549 Lake Elmo Avenue North
P.O. Box 313
Lake Elmo, MN 55042
Tel: 651-439-0177 Fax: 651-439-1065

21 July 2003

Re: **MSDS Exemption** for the Sniffin' Sticks Odor Sensitivity Test Kit

Thank you for your recent MSDS request concerning the Sniffin' Sticks Odor Sensitivity Test Kit distributed by St. Croix Sensory.

These felt tip pens contain n-butanol (1-butanol) as an odorant for testing the odor sensitivity (threshold) of individuals. These odor sensitivity test kits are exempt from the United States Occupational Safety & Health Association (OSHA) "Hazard Communication" Standard, 29 CFR 1910.1200.

Paragraph 1910.1200(b) lists the "Scope and Application" of this standard. Subsection 6 paragraph ix states that "This section [of OSHA rules] does not apply to:"

> Any consumer product or hazardous substance, as those terms are defined by the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, where the employer can show that it is used in the workplace for the purpose intended by the chemical manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended.

The Sniffin' Sticks Odor Sensitivity Test Kits are felt tip pens designed to emit a set concentration of n-butanol odorant. With the odor pens intact, the butanol is not available for ingestion. The small amounts of butanol contained inside the pen cannot cause any significant spill or other safety hazards.

ASTM International standard E544-99, "Standard Practices for Referencing Suprathreshold Odor Intensity," contains Annex 1, *Safety Data for 1-butanol,* which discusses the use of n-butanol in sensory testing and any concerns regarding health and safety:

> 1-butanol is a common chemical used as a solvent for fats, waxes, resins, gums, and varnishes...It is not a listed carcinogen and it does not cause lasting damage in case of accidental moderate exposure...It is however an irritant for eyes, skin, and the respiratory tract. Prolonged inhalation or ingestion causes dizziness and narcosis. Accordingly, contact times and concentrations of exposure should under no circumstances exceed those required for the application of the method.

The Sniffin' Sticks Odor Sensitivity Test Kits are a threshold test where, when following the test procedure as directed, the test subject will only be presented the butanol odorant slightly over their odor threshold. Furthermore, the test procedure requires a defined, short (4 second) sniffing time, which minimizes exposure. However, if any test subject complains of irritation of the nasal passages or headache, testing of the individual should be stopped, and the individual should be excluded from future sensitivity testing.

If you should need further information, please do not hesitate to contact St. Croix Sensory, Inc. at 800-879-9231.

Yours Truly,

Michael McGinley, P.E.
St. Croix Sensory, Inc.

Reference #7

1-Butanol Material Safety Data Sheet, ACC# 15400

Material Safety Data Sheet
1-Butanol

ACC# 15400

Section 1 - Chemical Product and Company Identification

MSDS Name: 1-Butanol
Catalog Numbers: S79930, S79930-1, S79930-2, S799302, S79932HPLC, S79932SPEC, A383-1, A383-4, A383J4, A383SK-1, A383SK-4, A384-1, A398-4, A399-1, A399-20, A399-4, A399-500, A39920001, A3994LC, A3994LOT001, A3994LOT002, A399J4, A399J500, A399S-4, A399S4001, A400-4, BP2603100, BP505-25, BP505-500, NC9708376, NC9830521, S75058, S79930-2MF*, S799302MF, XXA399200LI
Synonyms: Butanol; n-Butanol; Butan-1-ol; 1-Butanol; n-Butyl alcohol; 1-Butyl alcohol; Butyl hydroxide; 1-Hydroxybutane; Methylolpropane; Propylcarbinol; Propylmethanol.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
71-36-3	n-Butyl alcohol	> 99	200-751-6

Hazard Symbols: XN
Risk Phrases: 10 20

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colourless. Flash Point: 37 deg C. **Warning! Flammable liquid and vapor.** May be harmful if swallowed. May cause central nervous system depression. May cause adverse reproductive effects based upon animal studies. May cause liver and kidney damage. Causes severe eye and skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. Causes respiratory tract irritation. May be harmful if absorbed through the skin.
Target Organs: Blood, kidneys, central nervous system, liver, eyes, ears.

Potential Health Effects
Eye: Causes severe eye irritation. May cause corneal edema and inflammation. May cause lacrimation (tearing), blurred vision, and photophobia. Vapors appear to cause a special vacuolar keratopathy in humans.
Skin: Causes severe skin irritation. May be harmful if absorbed through the skin. Repeated or prolonged exposure may cause drying and cracking of the skin.
Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed

by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May be harmful if swallowed. Aspiration may be fatal. May be absorbed from the gastrointestinal tract.
Inhalation: Causes respiratory tract irritation. May cause cardiovascular disturbances, hearing abnormalities, central nervous system depression, muscle weakness, and possible death due to respiratory failure. May be absorbed through the lungs.
Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects. Prolonged exposure may cause liver, kidney, and heart damage. May cause damage to the auditory nerve (some hearing loss) and vestibular injury.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately. Wash mouth out with water.
Inhalation: Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Get medical aid. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Alcoholic beverage consumption may enhance the toxic effects of this substance. Persons with liver, kidney, or central nervous system diseases may be at increased risk from exposure to this product. Butanol is especially toxic if aspirated. Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. May be ignited by heat, sparks, and flame. Containers may explode when heated.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water. Cool containers with flooding quantities of water until well after fire is out.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as saw dust. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid contact with heat, sparks and flame. Do not ingest or inhale. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Store protected from explosives, organic peroxides, poisons, and radioactive materials.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
n-Butyl alcohol	(skin) - potential for cutaneous absorption; (C 50 ppm)	1400 ppm IDLH (10 percent lower explosive limit)	100 ppm TWA; 300 mg/m3 TWA

OSHA Vacated PELs: n-Butyl alcohol: C 50 ppm; C 150 mg/m3
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colourless
Odor: sweetish odor - putrid odor - fusel oil odor
pH: Not available.
Vapor Pressure: 6.5 mm Hg @ 25 deg C
Vapor Density: 2.6 (Air=1)
Evaporation Rate:0.46 (Butyl acetate=1)
Viscosity: 2.94 cP at 20 deg C
Boiling Point: 117.4 deg C
Freezing/Melting Point:-90 deg C
Autoignition Temperature: 343 deg C (649.40 deg F)
Flash Point: 37 deg C (98.60 deg F)
Decomposition Temperature: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 3; Reactivity: 0
Explosion Limits, Lower:1.4 vol %
Upper: 11.2 vol %
Solubility: Soluble.

Specific Gravity/Density:0.810 (Water=1)
Molecular Formula:CH3(CH2)2CH2OH
Molecular Weight:74.12

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials: Oxidizing agents, reducing agents, acid chlorides, alkali metals, aluminum, copper, copper alloys, halogens, organic peroxides, acid anhydrides, chromium trioxide, mineral acids.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 71-36-3: EO1400000
LD50/LC50:
CAS# 71-36-3:
Draize test, rabbit, eye: 2 mg Severe;
Draize test, rabbit, eye: 2 mg/24H Severe;
Draize test, rabbit, skin: 405 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rat: LC50 = 8000 ppm/4H;
Oral, mouse: LD50 = 2680 mg/kg;
Oral, rabbit: LD50 = 3484 mg/kg;
Oral, rat: LD50 = 790 mg/kg;
Skin, rabbit: LD50 = 3400 mg/kg;
Carcinogenicity:
CAS# 71-36-3: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: Mutation data has been reported.
Teratogenicity: Oral, rat: TDLo = 35295 mg/kg (female 1-15 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus) and Effects on Newborn - biochemical and metabolic.; Inhalation, rat: TCLo = 8000 ppm/7H (female 1-19 day(s) after conception) Specific Developmental Abnormalities - musculoskeletal system.
Reproductive Effects: Oral, rat: TDLo = 35295 mg/kg (female 1-15 day(s) after conception) Fertility - female fertility index (e.g. # females pregnant per # sperm positive females; # females pregnant per # females mated) and pre-implantation mortality (e.g. reduction in number of implants per female; total number of implants per corpora lutea)and post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Neurotoxicity: No information available.
Mutagenicity: Sex Chromosome Loss and Nondisjunction: Aspergillus nidulans = 7000 ppm.; Sex Chromosome Loss and Nondisjunction: Hamster, Lung = 100 mmol/L.
Other Studies: None.

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 1510-1730 mg/L; 96 Hr; Static bioassay at 24.7°C (pH 7.64)

flea Daphnia: EC50 = 1980-1983 mg/L; 48 Hr; Unspecified ria: Phytobacterium phosphoreum: EC50 = 2817-3710 mg/L; 5,30 min; Microtox test Release of n-butanol to soil may result in volatilization from the soil surface and biodegradation is expected to be significant. n-Butanol should not bind strongly to soil and so is expected to leach into groundwater. Release of n-butanol to water is expected to result in biodegradation and in volatilization from the water surface. Photooxidation by hydroxyl radicals is expected to be slow.
Environmental: When released to soil, substance is expected to biodegrade, leach to ground water or volatilize. In water, substance is expected to biodegrade or volatilize. Bioconcentration potential is predicted to be low. Soil Mobility: Substance is moderately to highly mobile (log octanol/ water partition coefficient=0.88).
Physical: Substance reacts in air with hydroxyl radicals (half-life=2.3 days).
Other: None.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 71-36-3: waste number U031; (Ignitable waste).

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	BUTANOL				BUTANOLS
Hazard Class:	3				3
UN Number:	UN1120				UN1120
Packing Group:	III				III
Additional Info:					FLASHPOINT 29 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 71-36-3 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

Section 302 (RQ)
CAS# 71-36-3: final RQ = 5000 pounds (2270 kg)

Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 71-36-3: acute, flammable.
Section 313
This material contains n-Butyl alcohol (CAS# 71-36-3, 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 71-36-3 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XN
Risk Phrases:
R 10 Flammable.
R 20 Harmful by inhalation.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.

WGK (Water Danger/Protection)
CAS# 71-36-3: 1
Canada
CAS# 71-36-3 is listed on Canada's DSL List. CAS# 71-36-3 is listed on Canada's DSL List.
This product has a WHMIS classification of B2, D2A.
CAS# 71-36-3 is listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 71-36-3: OEL-AUSTRALIA:TWA 50 ppm (150 mg/m3);Skin OEL-AUSTRIA :TWA 100 ppm (300 mg/m3) OEL-BELGIUM:STEL 50 ppm (152 mg/m3);Skin OEL-CZECHOSLOVAKIA:TWA 100 mg/m3;STEL 200 mg/m3 OEL-DENMARK:STEL 50 ppm (150 mg/m3);Skin OEL-FINLAND:TWA 50 ppm (150 mg/m3);STEL 75 ppm (225 mg/m3);Skin OEL-FRANCE:STEL 50 ppm (150 mg/m3) OEL-GERMANY:TWA 100 ppm (300 mg/m3) OEL-HUNGARY:TWA 100 mg/m3;STEL 200 mg/m3;Skin OEL-INDIA:TWA 50 ppm (150 mg/m3);Skin OEL-JAPAN:STEL 50 ppm (150 mg/m3);Skin OEL-THE NETHERLANDS:TWA 50 ppm (150 mg/m3);Skin OEL-THE PHILIPPINES:TWA 100 ppm (300 mg/m3) OEL-RUSSIA:STEL 50 ppm (10 mg/m3) OEL-SWEDEN:TWA 15 ppm (45 mg/m3);STEL 30 ppm (90 mg/m3);Skin OEL-SWITZERLAND:TWA 50 ppm (150 mg/m3);STEL 100 ppm;Skin OEL-TURKEY:TWA 100 ppm (300 mg/m3) OEL-UNITED KINGDOM:TWA 50 ppm (150 mg/m3);STEL 50 ppm;Skin OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 6/10/1999
Revision #5 Date: 7/10/2001

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Reference #8

A Nasal Chemosensory Performance Test for Odor Inspectors,

Alice M. Lay

A Nasal Chemosensory Performance Test for Odor Inspectors

Authored by:

Alice M. Lay
St. Croix Sensory, Inc.

And

Charles M. McGinley, P.E.
St. Croix Sensory, Inc.

Proceedings of
Water Environment Federation
Odors and Air Emissions 2004
Bellevue, WA: 18-21 April 2004

St. Croix Sensory Inc. / McGinley Associates, P.A.
P.O. Box 313, 3549 Lake Elmo Ave. N.
Lake Elmo, MN 55042 U.S.A.
800-879-9231
stcroix@fivesenses.com

A Nasal Chemosensory Performance Test for Odor Inspectors

Alice M. Lay
Charles M. McGinley, P.E.
St. Croix Sensory, Inc.
P.O. Box 313, 3549 Lake Elmo Ave. N.
Lake Elmo, MN 55042

ABSTRACT

Odors are the cause for most air pollution complaints by citizens. Common sources of community odors include the following types of facilities: wastewater treatment, composting, landfills and industry.

In communities across the country, odor issues are addressed in a variety of ways. Often odor regulations and ordinances place a limit on the strength of ambient odors. The strength of an odor in the ambient air is measurable using either a butanol intensity scale or a "scentometer" device. However, the odor inspector's olfactory sensitivity is a factor in measuring the odor strength in the ambient air.

"Sniffin' Sticks" is a commercially available test of nasal chemosensory performance based on pen-like odor dispensing devices. A modified version of the standard "Sniffin' Sticks" odor threshold test was developed and administered to 39 Odor Inspectors of a Regulation Enforcement Agency. The Odor Inspectors were assessed approximately once a month during the months of January to October, where the majority of individuals were tested eight times. A measure of central tendency and variation was calculated for each of the Regional Agency Offices (n=6). Also, the test was administered to 39 Trained Odor Assessors of an Odor Evaluation Laboratory. The Assessors were tested twice during a single month. It was found that the mean individual score from the Odor Inspector group was 7.33 (s^2=1.47). The mean individual score from the Odor Assessor group was 9.45 (s^2=1.17). A z-test of the comparison of population means (α=0.05) showed that the mean group scores were statistically significant, thus the two sample populations could not have been drawn from the same statistical population.

The purpose of a standardized nasal chemosensory test method is to determine the olfactory threshold of an individual or a group and compare this olfactory sensitivity data with other published normative values. This paper presents the findings from an initial test cycle in an ongoing study that will establish a reliable method for olfactory screening, provide olfactory threshold data for odor inspectors and assessors, and generated recommended performance criteria for odor inspectors, assessors and monitors.

INTRODUCTION

This paper presents a justification for a standardized method to test the nasal chemosensory performance of odor inspectors, odor investigators and odor monitors. A measurable element of an individual's chemosensory function is their odor detection threshold. An odor detection threshold is the point in which an observer becomes aware of an odorous substance (ASTM, 1997). Odor detection thresholds characterize an individual's and a group's sensitivity to odor. This characterization becomes essential in settings where individuals will be evaluating the strength of the odor in the ambient air and how it corresponds to the mandated acceptable levels of the odor. Thus, determining the sensitivity of the individual observing the odor is critical to support the accuracy of their assessment. A practice that describes a method of accurately obtaining the sensitivity of individuals and/or groups can be integrated into agencies with officers who serve as odor inspectors or into facilities with employees serving as odor monitors or complaint responders. Control of the test conditions and establishment of test criteria can generate data that is reliable and accurate. This data then serves as a reference for the reliability of the individual's ability to detect the odors they are observing. The test scores derived from olfactory screening are the most reliable when they are obtained following a standard test procedure.

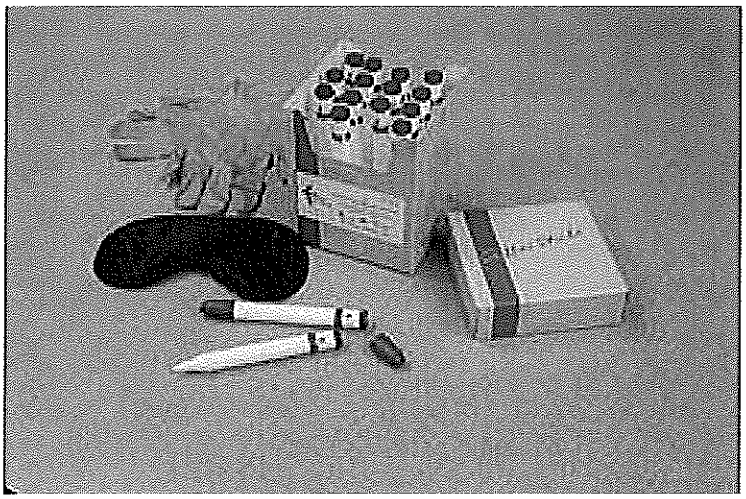
"Sniffin' Sticks" (Burghart) as an instrument for determining nasal chemosensory performance has been previously investigated. Many authors have described the routine use of these devices in medical clinics to determine olfactory capacities of patients (Hummel et al, 1997). In these studies, they have been effective in the measurement of individual olfactory threshold levels (sensitivity), using n-butanol as the reference odor. A multicenter investigation provided normative olfactory threshold values a large population of healthy subjects (n=551) in relation to different age group using the "Sniffin' Sticks" as the test instrument (Kobal, et al 2000). This previously published research supports using the "Sniffin' Sticks" as the test instrument for routine screening of nasal chemosensory performance in individuals who will be monitoring facility odors or enforcing odor limits.

It is assumed that olfactory sensitivity varies as a result of random fluctuations in factors such as alertness, attention, fatigue, health status and variability of presentation techniques (ASTM, 1997). Thus, the precision of the results of an individual's olfactory threshold may be based on 1) the number of times that the individual takes the test and, 2) the clarity of directions under which the test is operated. It is recognized that the amount of training an individual receives influences their detection threshold. Establishing the necessary test criteria for the method of sample presentation for threshold determination was conducted in the present study. The current study attempts to obtain n-butanol thresholds for individuals in two test groups and the group scores based on an operating practice called the "Standard Procedure for Testing Individual Odor Sensitivity", utilizing "Sniffin' Sticks" as the test instrument.

METHODOLOGY

Odor screening was conducted using the Odor Pen Kit (St. Croix Sensory, Inc), which is a commercially available method for measuring the olfactory sensitivity. The Odor Pen Kit contains one set of "Sniffin' Sticks", a blindfold for the test individual, and odorless non-latex gloves for the test administrator (Figure 1). The "Sniffin' Sticks" pens are felt tip markers in which the pen is impregnated with an odor agent. The odor agent used for olfactory threshold screening is n-butanol. Fourteen pens contain the n-butanol solution at different concentrations and two pens are odorless. The "Sniffin' Sticks" manufacturer performed the preparation of the test solutions of n-butanol.

Figure 1. The St. Croix Sensory Odor Pen Kit. Included in the picture are the blindfold, non-latex gloves and the set of 14 n-butanol pens (red) and odorless blank pens.

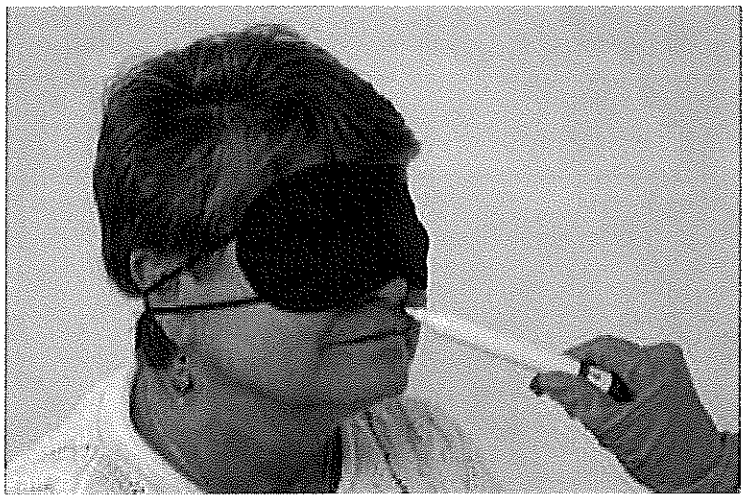


All test individuals were tested following the same procedure. The procedure is called the "Standard Procedure for Testing Individual Odor Sensitivity". The objective is to identify the detection threshold of the test individual by correct detection of the odor pen in a triad. The presentation method of the odor pens is a triangular force choice method, also known as 3-Alternative Forced Choice (ASTM, 1997). A pen triad is made up of three pens, two are blank pens and a third is an odor pen. The test individual is required to distinguish between the three pens by declaring which pen contains an odor. If no odor is perceived, the test individual is to assign a response of guess to one of the three odor pens. After a response is made, the test proceeds to the next pen triad. The next triad contains an odor pen with a greater n-butanol concentration than the previous series. The logic of the test is that the potential for the test individual to identify the odor pen increases as the test moves to the next concentration level. The increasing concentration levels will continue until the test individual correctly identifies the odor pen in a triad for two test levels. The level where a pen is first correctly identified as the odor pen is the score for the test individual and thus the odor threshold score of the individual. The odor sensitivity score for each of the participants was calculated by averaging the odor pen number (concentration level) associated with their first correct detection of the n-butanol

pen in the triad. The odor pens were sorted and presented in ascending concentrations of n-butanol. The concentration values of the odor pens is undetermined, therefore, quantitative n-butanol values are not available.

Olfactory sensitivity was determined in two study groups, the Odor Inspectors and the Trained Odor Assessors. The Standard Procedure and the Odor Pen Kit was the method of assessment used for both groups (Figure 2).

Figure 2. A Test Individual being administered a n-butanol pen from the Odor Pen Kit.



The Odor Inspector study group was made up of six Regional Agency Offices. Each of the Regional Offices received an Odor Pen Testing Kit and a copy of the "Standard Procedure". The testing period began in January and is on-going. However, this paper represents data collected between January and October, 2003. The same Odor Pen Testing Kits were used throughout the entire testing period. Minor revisions were made to the Standard Procedure twice between January and October. Each Regional Office designated one Odor Inspector to serve as test administrator throughout the study. The test administrator learned the test method as described by the Standard Procedure. There was no consideration given to the age or sex of the Odor Inspector tested in the study. The number of Odor Inspectors in each of the offices ranged from 4 to 12 (Table 1). A total of 39 Odor Inspectors were tested. The number of times each Inspector was tested ranged from 1 to 10. The most common number of times an Inspector was tested was 8 (n=12). A threshold average emerged for each of the individuals. The Inspector's odor detection threshold was the mean of their test scores.

The Trained Odor Assessor group was made up of 39 trained odor assessors. Participation in the study group was based on volunteerism. Age and gender were not considered as Assessor attributes for inclusion in the group. The testing occurred during September 2003. The number of times each assessor was tested was twice. The test

administrator for all of the evaluations used the same Odor Pen Testing Kit. The Assessor's odor detection threshold was the average of the thresholds from the two times they were screened.

Table 1. Number of Odor Inspectors in each of the Regional Agency Offices.

Regional Agency Office	Number of Odor Inspectors
RO 1	4
RO 2	7
RO 3	12
RO 4	6
RO 5	6
RO 6	4

RESULTS

The olfactory detection threshold of the Odor Inspectors varied. The mean scores of the individuals ranged from 5.33 to 11.5, with a mean of 7.33 ($n=39$, $s^2=1.47$). Three Odor Inspectors had an olfactory sensitivity greater than 9.5. No mean scores were distributed between 13 thru 15. Three of the thirty-nine inspectors screened showed mean scores between 4.5 and 5.33. There were no detection thresholds below level 4.

The frequency of mean individual scores was dispersed towards the left of the threshold range (Figure 3). The majority of Inspectors reported scores in the lower pen number range and the reported pen scores spread across 8 pens (pen level=5-12). The mode of the Odor Inspector group was odor pen 7. The frequency of each pen was calculated by rounding individual mean scores up to the corresponding odor pen if the mean score was greater than 0.5 and down to the corresponding odor pen if less than 0.5.

The Odor Assessor group reported individual olfactory sensitivity mean scores between 7.0 and 12.25. Two assessors were shown to have mean threshold scores of 7.0, as well as two assessors having scores of 12.25. The mean threshold score of the group was 9.45 ($n=39$, $s^2=1.17$).

The frequency of detection scores followed a normal distribution and was dispersed roughly in the middle of the odor pen range and spread across six pens (pen level=7-12). The mode of the Odor Assessor group was odor pen 9 (Figure 4). Pen scores were generated following the same conversion as stated in the above paragraph.

A z-test of the comparison of means showed a significant difference in the mean odor detection thresholds of the Odor Assessor group and the Odor Inspector group ($\alpha=0.05$).

Figure 3. The frequency of each odor pen was determined from the mean detection threshold score of an individual in the Odor Inspector Group (n=39, x=7.33, s^2=1.47). The mode of the group was odor pen number 7.

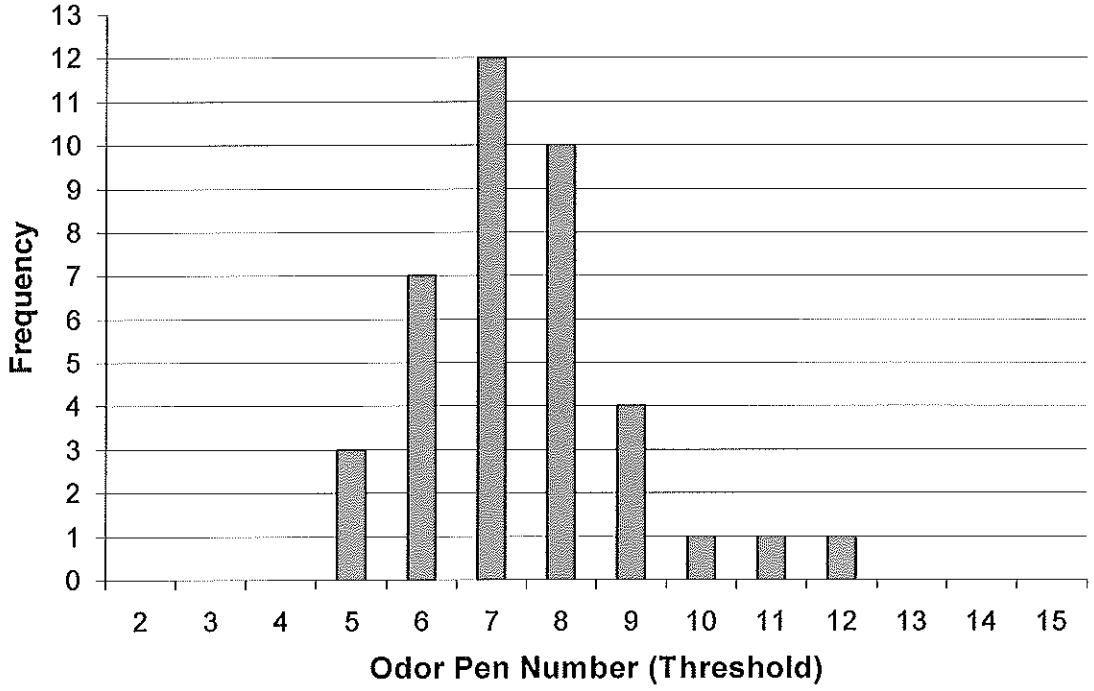


Figure 4. The frequency of each odor pen was determined from the mean detection threshold score of an individual in the trained Odor Assessor Group (n=39, x=9.45, s^2=1.17). The mode of the group was odor pen number 9.

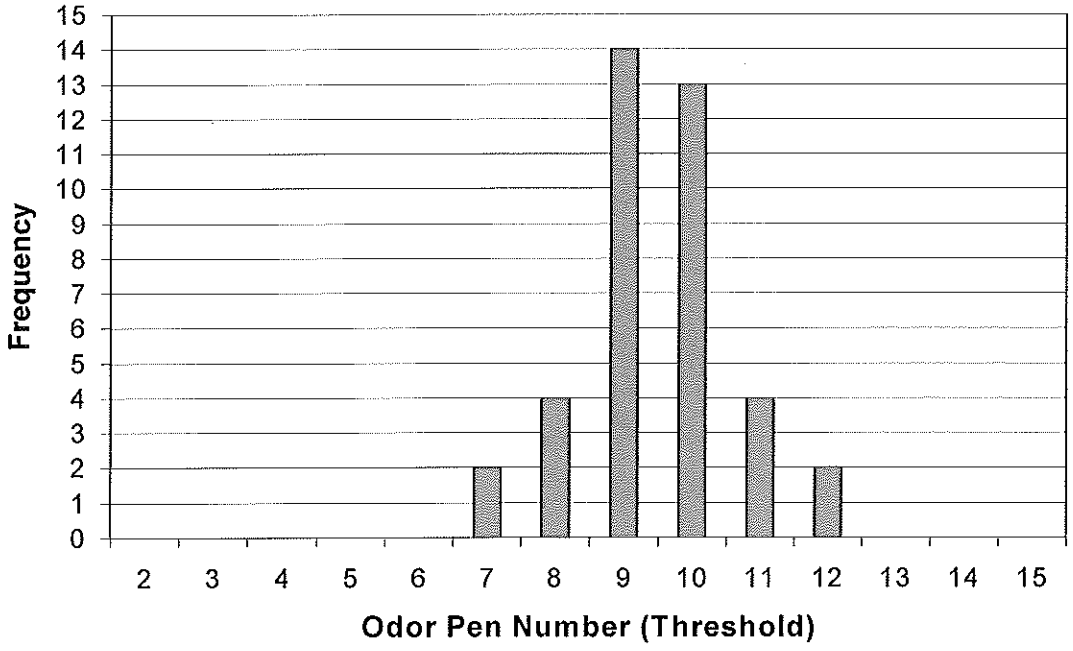
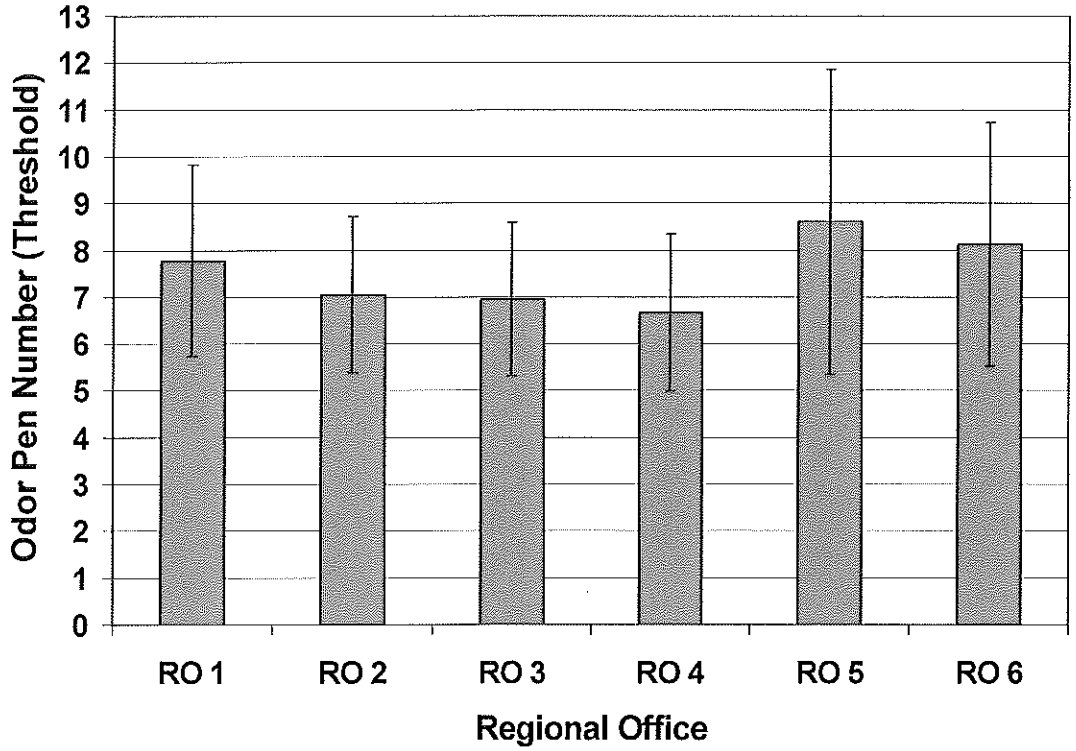


Figure 5 displays the mean scores for each of the Regional Offices. The odor sensitivity varied between each of the offices. The mean threshold scores for the six Regional Offices ranged from 6.66 to 8.45. Odor sensitivity varied within each of the Regional Offices as well. The standard deviation was the lowest at the Regional Office 3, which reported a standard deviation of 1.64. The highest standard deviation occurred at Regional Office 5, reporting a standard deviation of 3.26.

Figure 5. Olfactory sensitivity mean detection thresholds for the six Regional Offices of the Odor Enforcement Group. (RO 1=2.05, RO 2=1.66, RO 3=1.64, RO 4=1.68, RO 5=3.26, RO 6=2.61)



DISCUSSION

This study provides olfactory sensitivity data in the form of odor detection thresholds from a commercially available test kit for two groups, the Odor Inspector group and the Odor Assessor group. The odor pen thresholds for these two groups both occurred within the middle range of possible odor pens. This suggests that there is a general sensitivity range within the population of individuals who will be assessing, enforcing or monitoring odors for industry, commercial and agency groups.

In an attempt to obtain normative odor threshold values in healthy subjects, a previous study with "Sniffin' Sticks" measured and compared the olfactory sensitivity (standard odorant n-butanol) in three age groups (Kobal et al, 2000). The age groups were 16-35

yrs (n=461), 36-55 yrs (n=60) and age greater than 55 yrs (n=30). The results showed that the odor detection thresholds for theses groups were 8.5 (s^2=3.12), 8.5 (s^2=2.08) and 7.6 (s^2=3.43), respectively. Post-hoc testing with ANOVA found differences for thresholds between subjects aged 36-55 yrs and greater than 55 yrs. Thus, these researchers concluded that odor sensitivity varies as a function of age.

The findings from this study are similar to the odor detection thresholds measured in this current study within the Inspector Group and Assessor Group, where mean group thresholds were 7.33 (s^2=1.47) and 9.45 (s^2=1.17), respectively. Furthermore, the published data from the Kobal et al study may provide an explanation for the difference group means between the Inspector Group and the Assessor Group. That study showed that an individual's olfactory function varies in relation to age, and it may be that the age categories of the individuals were aggregated within the two test groups in this current study. However, age was neither an examined attribute nor criterion for inclusion in either of the study groups. Therefore, further study of olfactory sensitivity as a function of age may be conducted in the forthcoming test cycle of this ongoing study.

The mean threshold scores of the two groups tested in this study are significantly different. It is important to consider the reasons for these differences. It is likely these two groups represented to distinctly different samples of the general population, and subset groups would not necessarily be expected to have an average equivalent to the population mean. For example, the Regional Office Odor Inspectors potentially represent a narrow age range and come from similar socio-economic backgrounds.

Likewise, the trained odor assessors also come from similar backgrounds and live in relatively close proximity in a few neighboring communities. Additionally, age of the assessors was not categorized and may contribute to the sensitivity profile of the assessor. Furthermore, the trained odor assessor group is familiar with the odor testing process, specifically the triangular forced choice approach, and they are familiar with the n-butanol odorant as used for assessor training and qualification and in intensity measurement procedures. This could explain why this specific sample of the population scored higher than the average reported by other studies.

This study is an ongoing investigation into the odor detection threshold of odor assessors and investigators. A greater understanding of necessary performance criteria is forthcoming from continuation of this study. Nonetheless, general recommendations that can be offered to groups or agencies who will be screening odor monitors are:

- Screen individuals an initial 5-6 times. This generates a profile of the individual's sensitivity.
- Screen individual's once a month after a profile of the individual's sensitivity has been established (mean threshold score). This will confirm their olfactory function by using pervious scores as the reference of function.

Continuation of the monitoring of these study groups and additional groups will provide additional information about the population average and variability of data sets within specific samples of individuals.

CONCLUSIONS

Measuring the odor sensitivity of individuals who will be inspecting odors in the ambient air generates credibility for the agency or facility coordinating the monitoring. Odor detection thresholds provide credentials for the individual inspector, enforcer or assessor directing observing the odorous air. Furthermore, obtaining the threshold score of individuals who will be routinely observing odorous air is an important characterization of the individual's sensitivity to odor and therefore allows a reference for accurate assessment of the strength of the odor in waste water, landfill, composting and other industry environments.

The results of this study provide a basis for conducting assessments of olfactory sensitivity of odor inspectors, monitors and assessors with the St. Croix Sensory Odor Pen Kit ("Sniffin' Sticks") and the "Standard Procedure for Testing Individual Odor Sensitivity".

ACKNOWLEDMENTS

We would like to thank Donna McGinley, Nick Kreyer, Melissa McGinely and Deb Methias for their help with the evaluation procedures. We are also grateful to Michael McGinley, P.E. for his advice during all stages of the project and for his critical review and useful comments on the manuscript.

REFERENCES

ASTM International (1997), *Standard Practice for Determination of Odor and Taste Thresholds by a Forced-Choice Ascending Concentration Series Method of Limits*, E679-91 (97), Philadelphia, PA, USA.

Heinrich Burghart GmbH, *Manual for Odor Sticks "Sniffin' Sticks"*, Tinsdaler Weg 175, D-22880 Wedel, Germany, Tel.: +49 (0) 4103-800 76-0, Fax: +49 (0) 4103-80076-29, Web: www.burghart.net

Humel, T., Sekinger, B., Wolf, SR., Pauli, E. and Kobal, G. (1997), *'Sniffin' sticks: olfactory performance by the combined testing of odor identification, odor discrimination* and olfactory threshold. Chemical Senses. (22): 39-52.

Kobal, G., Klimek, L. Wolfensberger, M., Gudziol, H., Temmel, A.,Owen, C., Seeber, H., Pauli, E., Hummel, T. (2000). *Multicenter investigation of 1,036 subjects using a standardized method for the assessment of olfactory function combining test of odor identification, odor discrimination, and olfactory thresholds.* Eur Arch Otorhinolaryngol. (257): 205-211.

Appendix

Standard Procedure for
Testing Individual Odor Sensitivity

Purpose

The purpose of this standard procedure is to determine the olfactory threshold (odor sensitivity) of an individual to a standard odorant.

Materials and Resources

The testing method requires a Test Kit, approximate cost US$200, containing the following items

- "Sniffin' Sticks" odor pens--14 odor pens and 2 blank pen in a storage box with pen tips facing down. 12-month shelf life expected with refrigerated storage, 6-month shelf life with unrefrigerated storage.
- Blind fold (sleeping mask)
- Odor Sensitivity Test Data Sheets

Not included in the Test Kit but required are odorless cotton gloves or Nitrile exam gloves (single use, ambidextrous) that are to be worn by the test administrator during testing to minimize hand odor influence.

Pens are to be removed from refrigeration and placed in room temperature conditions two-hours before testing.

Thirty minutes of time is necessary for the administrator to complete the entire test procedure for one individual.

Summary of Test Method

The testing procedure assesses an individual's olfactory sensitivity by using odor pens, devices like felt tip pens that contain 1-butanol (n-butanol), a standard odorant. 1-butanol is a common odorant used in felt tip marker pens thus tested individuals are familiar with its odor.

The practice combines two statistical procedures. First, the ascending concentration procedure utilizes 14 odor pens that contain an increasing concentration of 1-butanol in discrete steps (15=lowest and 2=highest). Second, the three-alternative forced choice (AFC) procedure requires the individual to indicate which pen contains the odorant out of

a triplet of pens, one of which is an odor pen and the other is an odorless pen, used twice as the blank pen. The individual will make three sniffing observations, one of each pen, and will be forced to make a choice, even if no difference is observed. When making a choice between pen one, two or three, the testing individual will indicate the selection as detect if a detectable odor difference is perceptible or will state guess if no difference is observed between the pens in the series. A response of detect is given even in the case that the odor is only observed in one of the two nostrils.

A detection threshold is the concentration of the odorant that has a 0.5 probability of being detected under test conditions. The probability of detection at any of the 14 concentrations is not a fixed attribute of the individual but a value, which assumes that olfactory sensitivity varies as a result of random fluctuation in factors such as alertness, attention, fatigue, health status, and possibility of variability presentation of the odor pen.

An individual's olfactory threshold is based on a series of judgments made by the individual. It is important to recognize that the determination of an individual's threshold is a definable task in which precision of the result is mainly a question of the number of times the individual takes the test. This test procedure requires a concentration series presentation Pretest, Test #1, to approximate the olfactory threshold of the individual and is followed by Test #2 and Test #3, two more concentration series presentations. These second and third presentations are averaged together to become the individual's olfactory threshold estimate.

The Test Data Sheet is used as a guide for presenting the odor pen and blanks. One of three Test Data Sheets will be randomly selected for recording the test individual's presentation observations. The three Test Data Sheets presentation columns are sequenced in unique predetermined random orders. The test administrator presents the pen triplet for a concentration level in the order that is coded on the Test Data Sheet. The presentation code sequence follows that the odor pen corresponds to the shaded box in the triplet row. The two unshaded boxes correspond to the blank pens. The red pens in the kit correspond to the 1-butanol pens and the blank pen is the green, blue or other than red colored pen.

The individual should wait one hour after any meal, snack or drink before testing and the meal or snack must not consist of spicy food items. During the one-hour period before testing, the individual may consume water. They should be free of cold, flu or allergy symptoms. A pregnant person should be excluded from testing. The test administrator should check that none of the pens in the kit smell like an odor other than 1-butanol or a blank. If a pen is malodorous, it should be discarded and replaced.

Procedure for Testing Individual Odor Sensitivity

1. Test administrator presents odor pen 4 to the test individual to familiarize the test individual with the odor of n-butanol. The sniffing technique used in the evaluation is to sniff as if naturally sniffing the end of a felt tip marker.

2. Test individual places blindfold over eyes to prevent visual detection of odor pens.

3. Test administrator is to complete the top portion of the Odor Sensitivity Test Data Sheet. Fill in the name of the testing individual and the date of the test.

4. Test administrator starts Pretest, Test #1, with odor pen 15 and will furthermore present every other odor pen dilution level (i.e. 15, 13, 11). Lay the pen triplets (odor containing pen, one blank used twice) on the table that will be presented for the beginning dilution series in the order corresponding to the sequence on the Test Data Sheet.

5. Test administrator states the first pen of the triplet verbally to the test individual as "Number One Pen." The test individual will smell each odor pen twice, once under each nostril. The administrator will remove the pen cap and the statement "Sniff" will be made when the pen is presented to the right and left nostril. The pen is to be held for three seconds, 1/4" below each nostril. **Note:** Test Administrator does not allow the odor pen to contact skin or facial hair on the individual.

6. Test individual will sniff the odor pen when directed and is required to remember the pen number that was presented (Number One Pen).

7. Test administrator replaces the cap on the odor pen. The second pen in the triplet sequence is verbally announced as "Number Two Pen". The administrator will remove the pen cap and the statement "Sniff" will be made when the pen is presented to the right and left nostril. The pen is to be held for three seconds, 1/4" below each nostril.

8. Test individual will sniff the odor pen when directed and is required to remember the pen number that is presented (Number Two Pen).

9. Test administrator replaces the cap on the odor pen. The third pen is verbally announced as "Number Three Pen". The administrator will remove the pen cap and the statement "Sniff" will be made when the pen is presented to the right and left nostril. The pen is to be held for three seconds, 1/4" below each nostril.

10. Test individual will sniff the odor pen when directed and is required to remember the pen number that is presented (Number Three Pen).

11. Test individual indicates which one pen of the three presented (One, Two, Three) is different from the other two pens. The test individual must indicate their response as a guess or detect.

12. Test administrator records the individual's observation in the first, second or third box in the dilution level row on the Test Data Sheet. The response is recorded as "G" for guess and "D" for detect.

13. Test administrator replaces the 15 odor pen in the "Sniffin Sticks" box and selects odor pen 13, the next odor pen dilution level to be observed. Lay the pen triplets (odor containing pen, two blanks) on the table in the order corresponding to the sequence on the Test Data Sheet.

14. Test administrator waits thirty seconds before proceeding to the presentation of the odor pen 13 and blank pen triplet, following the same procedure as used for the odor pen 15 (see above steps 3-11)

15. Test administrator concludes the Pretest, Test #1 when the test individual has indicated two correct consecutive detects. Correct guesses are not considered correct detects.

16. Test administrator waits three minutes before starting Test #2. Start Test #2 with the odor pen three dilution levels above the first correct detect of the Pretest, Test #1 [refer to attached example that indicates odor pen 5 as the first correct detect, odor pen 4 as the second correct detect (refer to step 15), therefore, select odor pen 8 to begin Test #2]. Proceed by laying the pen triplets (odor containing pen, two blanks, where one odor pen is used as both blanks) on the table in the presentation order corresponding to the sequence on the Test Data Sheet. **NOTE:** Test #2 requires the odor pen level to proceed in sequence, thus the test administrator will furthermore select the odor pen at the next dilution level lower than the preceding level. **Example:** In Test #2, the presentation following odor pen 8 will be odor pen 7.

17. Test administrator follows the Pretest, Test #1 procedure for Test #2 with the exception of not skipping every-other odor pen, as noted above.

18. Test individual continues to observe the pens when presented and indicates guess or detect for the different pen in the triplet.

19. Test administrator concludes Test #2 when the test individual has indicated two correct consecutive detects. Correct guesses are not considered correct detects.

20. Test administrator scores Test #2. The dilution level of the first of two consecutive correct detects is the score (refer to attached example that indicates a scored Test #2).

21. Test administrator waits five minutes before starting Test #3. Start Test #3 with the odor pen two dilution levels above the first correct detect of Test #2 (refer to attached example that indicates odor pen 6 as the first correct detect; therefore, select odor pen 8 to begin Test #3). Proceed by laying the pen triplets (odor containing pen, two blanks, where one blank pen is used twice) on the table in the presentation order corresponding to the sequence on the Test Data Sheet. **NOTE:** Test #3 requires the odor pen level to proceed in sequence, thus the test administrator will furthermore select the odor pen at the next dilution level lower than the preceding level. Example: the presentation following odor pen 8 will be odor pen 7.

22. Test administrator concludes Test #3 when the test individual indicated two correct consecutive detects. Correct guesses are not considered correct detects.

23. Test administrator scores Test #3. The dilution level of the first of two consecutive correct detects is the score (refer to attached example that indicates a scored
Test #3).

24. Test administrator averages the scores of Test #2 and Test #3 to generate the tested individual's olfactory (odor) threshold estimate (refer to attached example that indicates the tested individual's odor threshold).

References

ASTM E544-99, Standard Practice for Referencing Suprathreshold Odor Intensity, Approved April 10, 1999 and Published July 1999.

ASTM E679-91 (Reapproved 1997), Standard Practice for Determination of Odor and Taste Thresholds by Forced-Choice Ascending Concentration Series Method of Limit Approved August 15, 1991 and Published October 1991.

ASTM E1432-91 (Reapproved 1997), Standard Practice for Defining and Calculating Individual and Group Sensory Thresholds from Forced-Choice Data Sets of Intermediate Size, Approved August 15, 1991 and Published October 1991.

EN 13725:2003, Air Quality – Determination of Odour Concentration by Dymanic Olfactometry, BSI, Head Office, 389 Chiswick High Road, London W4 4AL, UK.

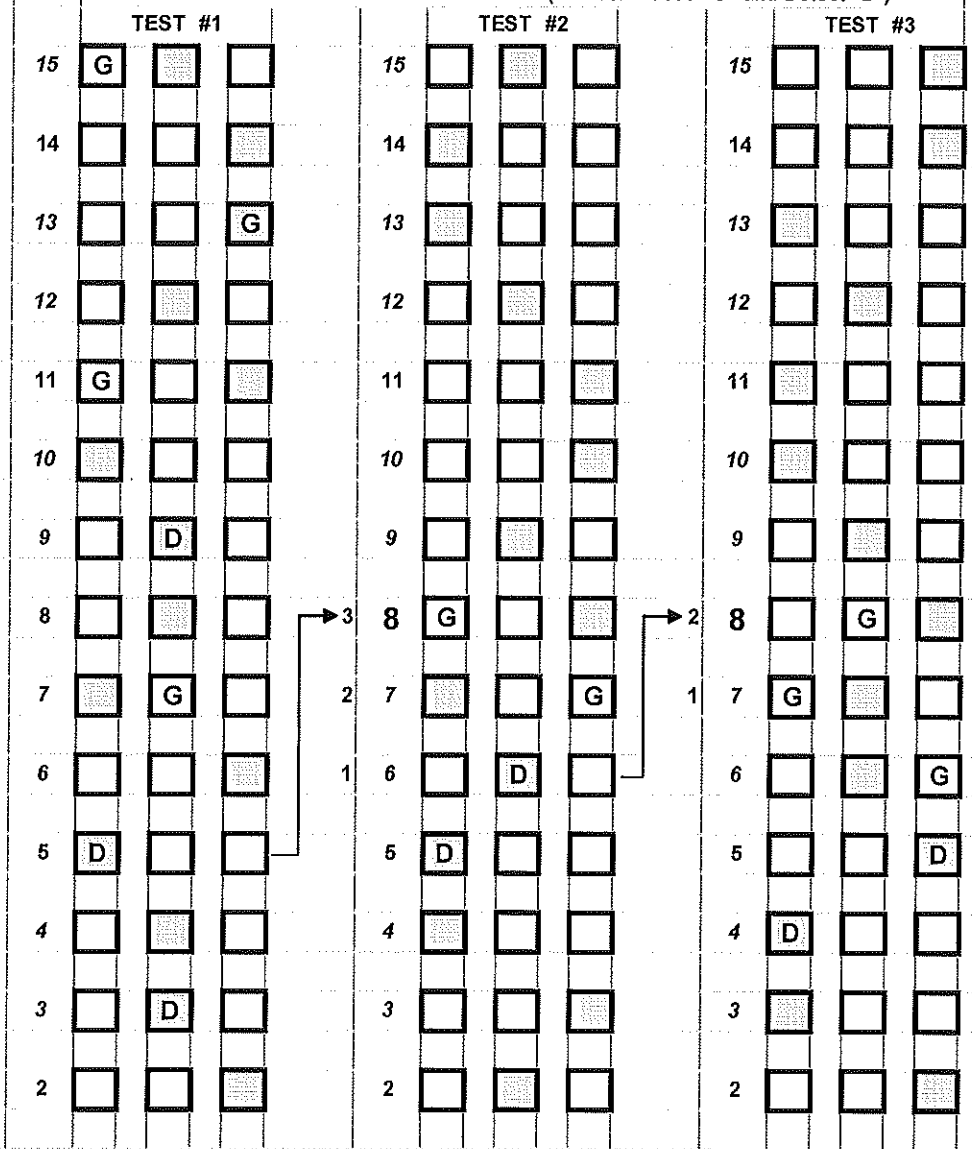
Heinrich Burghart GmbH, Manual for Odor Sticks "Sniffin' Sticks", Tinsdaler Weg 175, D-22880 Wedel, Germany, Tel.: +49 (0) 4103-800 76-0, Fax: +49 (0) 4103-80076-29, Web: www.burghart.net

St. Croix Sensory, Inc.

Odor Sensitivity Test Data Sheet (I)

Name : *Example* Date : Time :

Use shaded box for Numbered Red Pen (Indicate Guess "G" and Detect "D")



The dilution level of the first of two consecutive correct detects is the Score

SCORE: 6 SCORE: 5

Individual's Odor Threshold (average of the Scores): 5.5

Test Administrator : *Signed*

St. Croix Sensory, Inc. 3549 Lake Elmo Ave. N. P.O. Box 313 Lake Elmo, MN 55042 U.S.A. Tel:800-879-9231 Fax:651-439-1065
Email:stcroix@fivesenses.com Web:www.fivesenses.com and www.nasalranger.com

Reference #9

Odor Sensitivity Test
Procedure, TP 2000

PURPOSE

The purpose of this standard procedure is to determine the olfactory threshold (odor sensitivity) of an individual to a standard odorant.

INTRODUCTION

The Odor Sensitivity Test exists as a measurement of olfactory sensitivity for individuals who will be conducting odor strength assessments. The Odor Pen Test kit is comprised of n-butanol dispensing instruments which are organized on a dilution scale. A Test Individual's performance against this standard odorant exists as a reference of their sensitivity to odorants. A Test Individual is expected to produce a series of judgments with respect to the definable task of selecting one odorous presentation against two others that are odorless, thereby demonstrating an ability to distinguish like from unlike at set levels of dilutions.

SCOPE

This document provides technical instructions and specifications on the material items used to successfully accomplish the test. A step-by-step test plan is presented so that the Test Administrator may conduct the test with confidence and proficiency. Examples of Data Sheets constructed from both incorrectly and correctly recorded Test Individual responses are included to illustrate the score transcription format. Also included are blank Test Data Sheets that will be used to officially record and document test scores.

RENEWAL

This Test Procedure is effective as of 1 April 2006, and is scheduled for review annually.

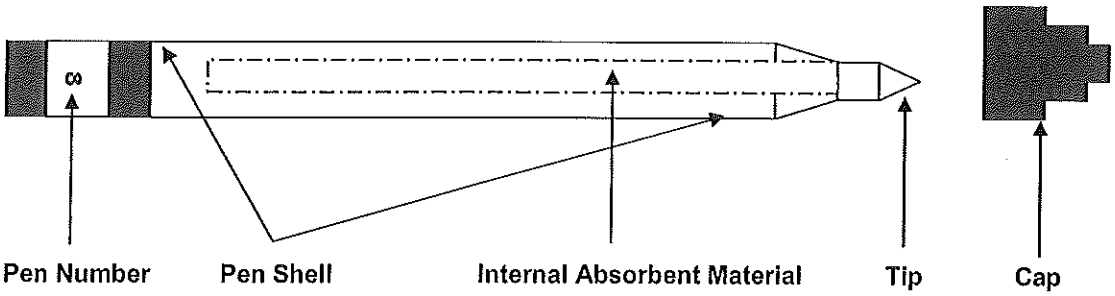
MATERIALS & RESOURCES

The testing method requires a Test Kit; approximate cost US$230, containing the following items

- "Sniffin' Sticks" odor pens--14 n-butanol odor pens and 2 blank pens in a Test Kit box. 6-month shelf life or 50 tests whichever comes first.
- Blind fold (sleeping mask).
- Odor Sensitivity Test Data Sheets A through C.
- Nitrile exam gloves

Not included in the Test Kit but recommended are odorless cotton gloves that can to be worn by the test administrator during testing to minimize hand odor influence.

Illustration I. Schematic of n-butanol Odor Pen



Within the kit, pens containing the n-butanol odorant are labeled with numbers 2-15 and each of the red pens is impregnated with a certain dilution that is different than the others on the series. Also in the kit are two blank pens filled only with odorless solvent. **Pens are labeled with numbers on an arbitrary number scale.** The blanks are numbered 1 and 16 and their caps are colored green or blue. The numbering of the blank pens has no significance. N-butanol is a common odorant used in felt tip marker pens; tested individuals are generally familiar with its odor.

When the cap is removed the odorant will be released from the felt tip of the pen. The cap should only be taken off to present the pen or to conduct a quality assurance inspection of the kit. This limits the potential of the felt tip being contaminated. The life cycle of the pen kit is expected to be 6 months or 50 tests, which ever comes first.

The odor pens' felt tip must not contact skin or facial hair. Thirty minutes (30 min) is necessary for the administrator to complete the presentation section of the test for one individual.

REFERENCES

ASTM E544-99, Standard Practice for Referencing Suprathreshold Odor Intensity, Approved April 10, 1999 and Published July 1999.

ASTM E679-04, Standard Practice for Determination of Odor and Taste Thresholds by Forced-Choice Ascending Concentration Series Method of Limit Approved April1, 2004 and Published April 2004.

ASTM E1432-04, Standard Practice for Defining and Calculating Individual and Group Sensory Thresholds from Forced-Choice Data Sets of Intermediate Size, Approved April 1, 2004 and Published April 1, 2004.

EN 13725:2003, Air Quality – Determination of Odour Concentration by Dymanic Olfactometry, BSI, Head Office, 389 Chiswick High Road, London W4 4AL, UK.

Heinrich Burghart GmbH, Manual for Odor Sticks "Sniffin' Sticks", Tinsdaler Weg 175, D-22880 Wedel, Germany, Tel.: +49 (0) 4103-800 76-0, Fax: +49 (0) 4103-80076-29, Web: www.burghart.net

TERMINOLOGY

Test Individual—The person being tested and responding to the presented pens while blindfolded.

Test Administrator—The presenter of the test and is also who prepares the pens and scores the Data Sheet.

Individual Threshold—The level on the dilution scale where the Test Individual first detects the odor pen and consecutively correctly detects the odor pen again at the following level.

SUMMARY of METHOD

The testing procedure determines an individual's olfactory sensitivity by using odor pens, devices like felt tip pens that contain 1-butanol (n-butanol), a standard odorant. The combination of standard presentation methods and statistical analysis make this test a reliable method of measuring individual olfactory sensitivity.

The practice combines two standard procedures. First, the ascending concentration procedure utilizes 14 odor pens that contain an increasing concentration of n-butanol in discrete steps (15=lowest and 2=highest). Second, the test uses a presentation method called "3-alternative forced choice (3-AFC), also known as triangular force-choice (TFC) method. The method requires the individual to indicate which pen contains the ordorant out of a triplet of pens, one of which is an n-butanol odor pen and the other is an odorless pen, used twice as the blank pen. Presenting the same pen for both blank observations ensures the consistency of the "odorless" sensation. The individual will make three sniffing observations, one of each pen, and will be forced to make a choice, even if no difference is observed. When making a choice between pen one, two or three, the test individual will indicate the selection as detect if a detectable odor difference is perceptible or will state guess if no difference is observed between the pens in the series. A response of detect is given even in the case that the odor is only observed in one of the two nostrils.

Table I. Summary of Responses

Symbol Recorded by Test Administrator	Description of Response	Stated by Test Individual When...
G	A GUESS is a random selection of one of the three presented pens.	Three pen odors are indistinguishable.
D	A DETECT is confidently noticing one of the three pens is emitting an odor.	One pen odor can be distinguished as n-butanol from the other two pens.

A detection threshold is the concentration of the odorant that has a 0.5 probability of being detected under test conditions. The probability of detection at any of the 14 concentrations is not a fixed attribute of the individual but a value, which assumes that olfactory sensitivity varies as a result of random fluctuation in factors such as alertness, attention, fatigue, health status, and the possibility of variable presentation of the odor pen.

This test procedure requires a presentation series called a Warm Up to approximate the olfactory threshold of the individual and for the individual to establish proficiently how to complete the task. The Warm Up is followed by Round 1 and Round 2. The Test Administrator calculates the results following a statistical procedure in which the score is the average of the first correct detect of two correct detects in a row from Round 1 and Round 2.

The Test Data Sheet is used as a guide for presenting the odor pen and blanks. One of three Test Data Sheets will be randomly selected for recording the test individual's presentation observations. The three Test Data Sheets presentation columns are sequenced in unique predetermined random orders. The Test Administrator presents the pen triplet for a concentration level in the order that is coded on the Test Data Sheet. The presentation code sequence follows that the odor pen corresponds to the shaded box in the triplet row. The two un-shaded boxes correspond to the blank pens. The red pens in the kit correspond to the n-butanol pens and the blank pen is the green, blue or other than red colored pen.

The individual should wait 30 minutes after any meal, snack or drink before testing and the meal or snack must not consist of spicy food items. During the 30 minutes period before testing, the individual may consume water. They should be free of cold, flu or allergy symptoms. A pregnant person should be excluded from testing. The test administrator should check that none of the pens in the kit smell like an odor other than 1-butanol or a blank. If a pen is malodorous, it should

be discarded and replaced.

DETAILED PROCEDURE

1. Test Administrator presents odor pen # 2 to the Test Individual to familiarize the Test Individual with the odor of n-butanol. The sniffing technique used in the evaluation is to sniff as if naturally sniffing the end of a felt tip marker.

2. Test Individual places the blindfold over eyes to prevent visual detection of odor pens. (If the blindfold that is provided with the kit is a discomfort to the test individual, other blindfolds may be used.)

3. Open the Test Kit Box. The odor pens are arranged in numerical order. The most dilute odor pen (weakest) corresponds to number 15 and the least dilute (strongest) corresponds to number 2.

4. Test Administrator is to complete the top portion of the ***Odor Sensitivity Test Data Sheet.*** Fill in the name of the Testing Individual and the date and time of the test.

5. Test Administrator starts the test with the Warm Up. The starting point is odor pen 15 or 14, depending upon the chosen presentation schedule, and will furthermore present every-other odor pen dilution level (i.e. 15, 13, 11 or 14, 12, 10, respectively). Lay the pen triplets (odor containing pen, one blank used twice) on the foam pad in the Test Kit Box in the order corresponding to the sequence on the Test Data Sheet.

6. Test Administrator announces the first pen of the dilution level as "Number One Pen." The Administrator will remove the pen cap and verbally instruct the Test Individual to take a "Sniff". The command "Sniff" will be given each time the Test Individual is expected to smell the odor pen, which is twice per pen, once under each the left and right nostril. The pen is to be held for three seconds, 1/2" below each nostril.

7. Test Individual will smell the odor pen and must remember the pen number that was announced when presented (Number One Pen).

8. Test Administrator immediately replaces the cap on the odor pen. The second pen in the triplet sequence is verbally announced as "Number Two Pen". The Administrator will remove the pen cap and the statement "Sniff" will be made when the pen is presented to

the right and left nostril. The pen is to be held for three seconds, 1/2" below each nostril.

9. Test Individual will smell the odor pen and must remember the pen number that is presented (Number Two Pen).

10. Test Administrator replaces the cap on the odor pen. The third pen is verbally announced as "Number Three Pen". The Administrator will remove the pen cap and the statement "Sniff" will be made when the pen is presented to the right and left nostril. The pen is to be held for three seconds, 1/2" below each nostril.

11. Test Individual will smell the odor pen and must remember the pen number that is presented (Number Three Pen).

12. Test Individual indicates which one of the three presented pens (One, Two, and Three) is different from the other two pens. The test individual must indicate their response as a GUESS or DETECT.

13. Test Administrator records the Individual's response in the first, second or third box in the dilution level row on the Test Data Sheet. The test administrator records the response as a capital "G" for GUESS or "D" for DETECT.

14. Test Administrator replaces the 15 odor pen in the pen line-up and selects odor pen 13, the next presentation dilution level. Lay the pen triplets (odor containing pen, one blank used twice) in the box in the order corresponding to the sequence on the Test Data Sheet.

15. Test Administrator waits thirty seconds (30 sec) before proceeding to the presentation of odor pen 13 and the blank pen(s), following the same procedure as used for the odor pen 15 (see above steps 3-12)

16. Test Administrator concludes the Warm Up when the Test Individual has indicated two correct consecutive detects. Correct guesses are *not* correct detects. A correct detect is considered a "false positive" if it is not immediately followed by a second correct detect.

17. Test Administrator waits five minutes before starting Round 1. Start Round 1 three dilution levels above the first of two consecutive correct detects of the Warm Up. Proceed

by laying the pens (odor containing pen and one blank used twice) in the Test Kit Box on the indented foam presentation pad. **NOTE:** Round 1 requires the odor pen level to proceed in sequence, thus the Test Administrator will furthermore select the odor pen at the next dilution level lower than the preceding level and no longer alternate levels.

18. Test Administrator follows Warm Up procedure for Round 1 with the exception of *not* skipping every-other odor pen, as noted above.

19. Test individual continues to observe the pens when presented and indicates guess or detect for the different pens in the triplet.

20. Test administrator concludes Round 1 when the test individual has indicated two correct consecutive detects. Correct guesses are not considered correct detects.

21. Test administrator scores Round 1. The dilution level of the first of two consecutive correct detects is the score.

22. Test administrator waits five minutes before starting Round 2. Start Round 2 with the odor pen two dilution levels above the first of two consecutive correct detects of Round 1. Laying the pens (odor containing pen and one blank used twice) in the Test Kit Box on the indented foam presentation pad. Round 2 requires the odor pen level to proceed in sequence, thus the test administrator will furthermore select the odor pen at the next dilution level lower than the preceding level.

23. Test administrator concludes Round 2 when the test individual indicated two correct consecutive detects. Correct guesses are not considered correct detects.

24. Test administrator scores Round 2. The dilution level of the first of two consecutive correct detects is the score.

25. Test administrator averages the scores of Round 1 and Round 2 to generate the tested individual's olfactory (odor) threshold estimate.

26. Test administrator, initials and records the date and time of test on the Testing Record, which is on the inside cover of the Test Box kit.

JUDGEMENTS/DECISIONS

Assessment Recommendations

An individual's olfactory threshold is based on a series of judgments made by the individual. It is important to recognize that the determination of an individual's threshold is a definable task in which precision of the result is mainly a question of the number of times the individual takes the test.

Agencies that monitor odor can use the Odor Pen Test Kit and procedure to set performance standards for their programs or qualification criteria. The odor sensitivity of an individual can be well-estimated from their performance the first time the test is administrated, contingent upon the test being presented according to the instructions. Therefore, a viable score is derived from one performance. However, to determine the variability of the individual's sensitivity and to increase the chances that the level of sensitivity is accurate, results should be acquired over a series of test presentations. Designing a sensitivity testing program that evaluates individual's scores by achieving a baseline score from the first performance result and thereafter generating an average and standard deviation is technically necessary for conducting statistical analyses. Also, a collection of sensitivity score per individual provides a foundation for understanding the performance range of the individual. In other words, a statistical analysis of sensitivity scores is a more meaningful way to report the results by producing defensible and valid performance records and generating a standard setting process regarding the selection and training of odor assessing individuals.

Test Program Example

Each individual will be tested three times during the first 30 days of the Test Program to establish a "baseline" individual threshold. Each individual will then be tested monthly.

Testing Recommendations

The Test Administrator is expected to demonstrate a proficient level of ability in relation to preparing and presenting this test.

The Administrator will not communicate how well Test Individuals are scoring or what dilution level they are observing, during the test. Only at the conclusion of the evaluation will the Test Individual receive information about the results.

Each pen within each dilution level is presented once. A Test Individual may ask a pen to be repeated but this should be limited. A test can be abandoned and restarted at a later time during the same day if it becomes necessary to do so. The test procedure must start from the beginning and the incomplete test discarded in its entirety.
If Test Individual becomes aware of a glove smell, the glove may be removed and the test presented without.

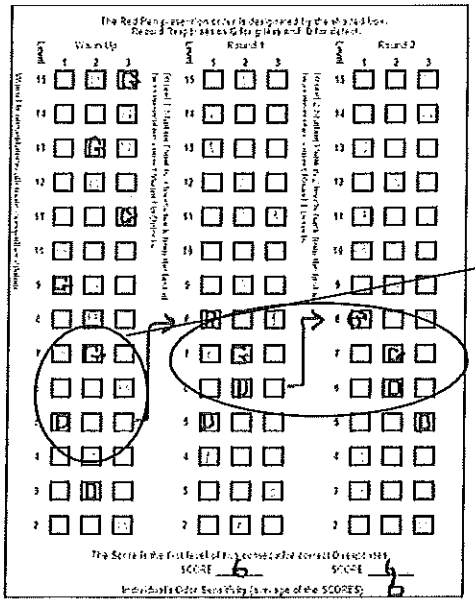
Test Administrator selects which of randomly sorted presentation schedule A-C Data Sheets to select.

Test Administrator decides to rotate between 15 and 14 as the start point for Warm Up.

REPORTS

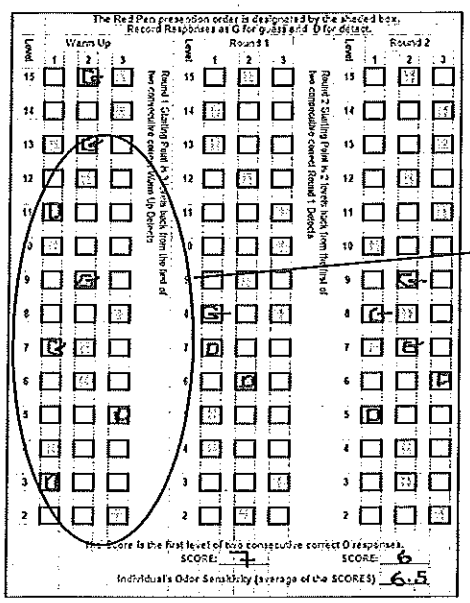
The Test Administrator will be capturing the Test Individual's responses on the Odor Sensitivity Test Data Sheet, leading to the Sensitivity Score. For the measured outcome to be considered reliable the Testing Materials must be prepared according to the aforementioned instructions, the Detailed Procedure steps be followed and duplicated and the responses recorded accurately on the Test Data Sheet so statistics may be calculated. Any deviation from the instructions described by this Standard Practice jeopardizes the accuracy of the outcome and leads to striking the score from the record retesting the Test Individual.

Illustration II. Correctly Filled Out Data Sheet



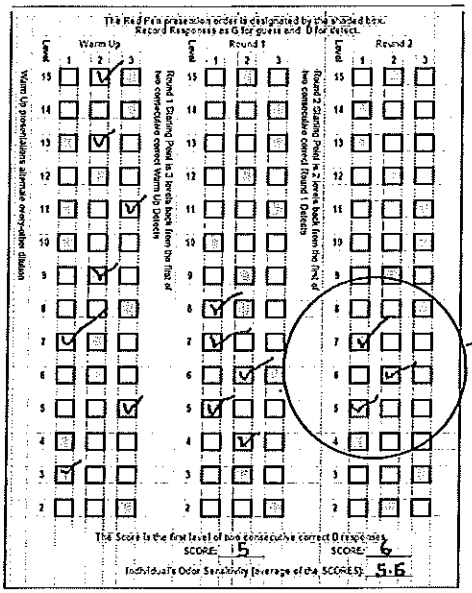
Responses are indicated by D or G and each round concludes after two correct consecutive detects. The score of 6 is valid.

Illustration III. Example of a False Positive



The correct detect at level 11 was not followed by a second correct detect. The response was a False Positive. The round continues until two consecutive correct detect responses are given. This Data Sheet is properly filled out and the 6.5 score is valid.

Illustration IV. Incorrectly Filled Out Data Sheet



The marks fail to distinguish between Guess and Detect. This is unreliable response recording. The 5.5 Score cannot be considered valid.

APPENDICES

Example Odor Sensitivity Test Data Sheet

Odor Sensitivity Test Data Sheet A

Odor Sensitivity Test Data Sheet B

Odor Sensitivity Test Data Sheet C

KEYWORDS

Odor, sensitivity, threshold, odor pen

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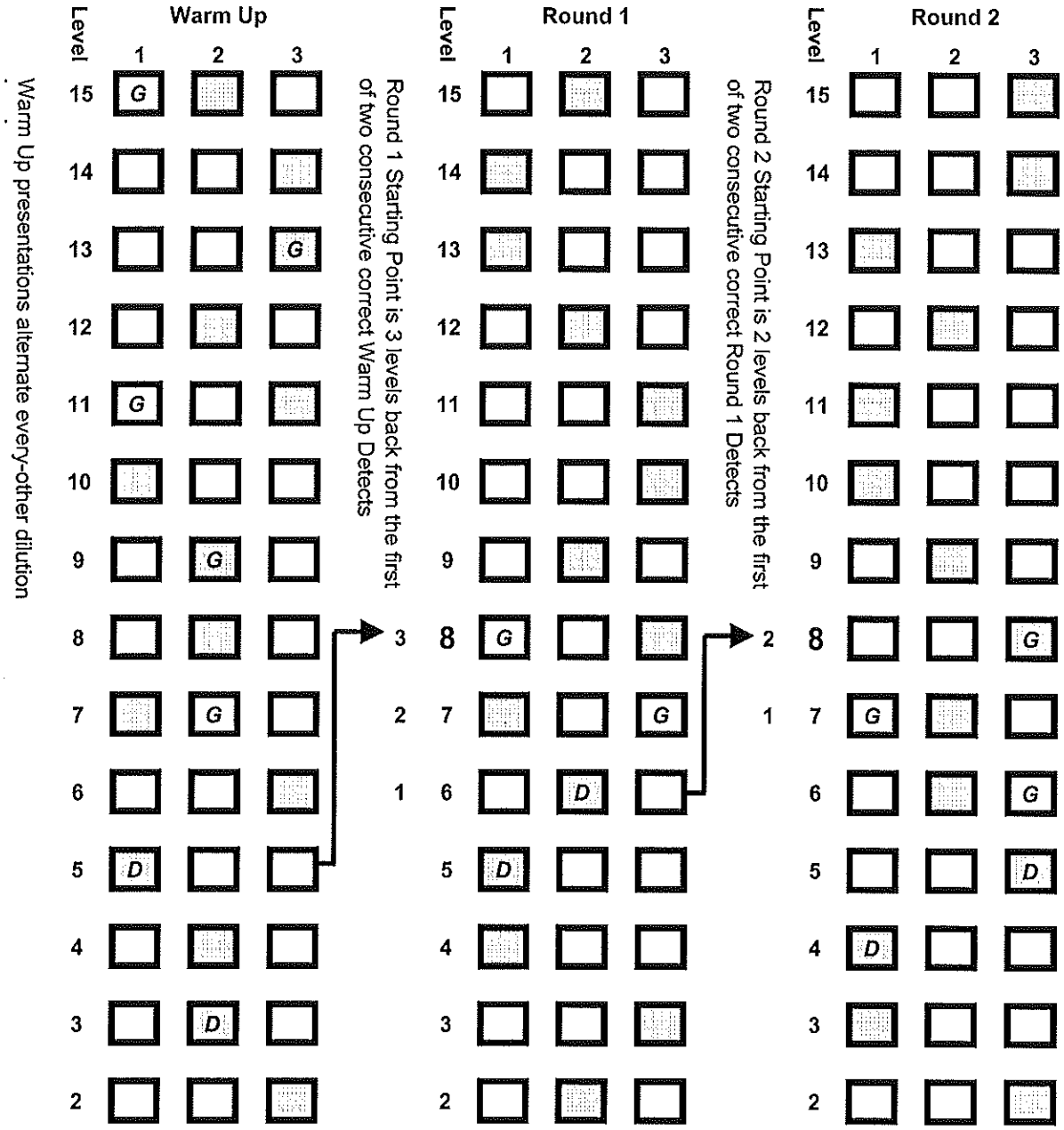
EXAMPLE: Odor Sensitivity Test Data Sheet A

Name : *Jane Doe* Date : *1.1.05* Time : *11:00 AM*

The Red Pen presention order is designated by the shaded box.
Record Responses as G for guess and D for detect.



The Score is the first level of two consecutive correct D responses.

SCORE: *6* SCORE: *5*

Individual's Odor Sensitivity (average of the SCORES): *5.5*

Test Administrator : *John Smith*

Odor Pen Kit Serial Number : *S/N xxxx-xxx*

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Odor Sensitivity Test Data Sheet A

Name : _____ Date : _____ Time : _____

The Red Pen presention order is designated by the shaded box.
Record Responses as G for guess and D for detect.

Warm Up presentations alternate every-other dilution

Level	Warm Up 1	Warm Up 2	Warm Up 3	Round 1 1	Round 1 2	Round 1 3	Round 2 1	Round 2 2	Round 2 3
15	☐	■	☐	☐	■	☐	☐	☐	■
14	☐	☐	■	■	☐	☐	☐	☐	■
13	☐	☐	■	■	☐	☐	■	☐	☐
12	☐	■	☐	☐	■	☐	☐	■	☐
11	☐	☐	■	☐	☐	■	■	☐	☐
10	■	☐	☐	☐	☐	■	■	☐	☐
9	☐	■	☐	☐	■	☐	☐	■	☐
8	☐	■	☐	☐	☐	■	☐	☐	■
7	■	☐	☐	■	☐	☐	☐	■	☐
6	☐	☐	■	☐	■	☐	☐	■	☐
5	■	☐	☐	■	☐	☐	☐	☐	■
4	☐	■	☐	■	☐	☐	■	☐	☐
3	☐	■	☐	☐	☐	■	■	☐	☐
2	☐	☐	■	☐	■	☐	☐	☐	■

Round 1 Starting Point is 3 levels back from the first of two consecutive correct Warm Up Detects

Round 2 Starting Point is 2 levels back from the first of two consecutive correct Round 1 Detects

The Score is the first level of two consecutive correct D responses.

SCORE: _____ **SCORE:** _____

Individual's Odor Sensitivity (average of the SCORES): _____

Test Administrator : _____

Odor Pen Kit Serial Number : _____

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Odor Sensitivity Test Data Sheet B

Name : _____ Date : _____ Time : _____

The Red Pen presention order is designated by the shaded box.
Record Responses as G for guess and D for detect.

Warm Up presentations alternate every-other dilution

Level	Warm Up 1	Warm Up 2	Warm Up 3	Round 1 1	Round 1 2	Round 1 3	Round 2 1	Round 2 2	Round 2 3
15	☐	☐	■	■	☐	☐	☐	■	☐
14	☐	☐	☐	☐	☐	☐	☐	☐	■
13	■	☐	☐	☐	☐	☐	☐	☐	■
12	☐	■	☐	☐	■	☐	☐	■	☐
11	■	☐	☐	☐	☐	■	☐	☐	■
10	■	☐	☐	☐	☐	■	■	☐	☐
9	☐	■	☐	☐	■	☐	☐	■	☐
8	☐	☐	■	☐	☐	■	☐	■	☐
7	☐	■	☐	■	☐	☐	■	☐	☐
6	☐	■	☐	☐	■	☐	☐	☐	■
5	☐	☐	■	■	☐	☐	■	☐	☐
4	■	☐	☐	■	☐	☐	☐	■	☐
3	■	☐	☐	☐	☐	■	☐	■	☐
2	☐	☐	■	☐	■	☐	■	☐	☐

Round 1 Starting Point is 3 levels back from the first of two consecutive correct Warm Up Detects

Round 2 Starting Point is 2 levels back from the first of two consecutive correct Round 1 Detects

The Score is the first level of two consecutive correct D responses.

SCORE: _____ **SCORE:** _____

Individual's Odor Sensitivity (average of the SCORES): _____

Test Administrator : _____

Odor Pen Kit Serial Number : _____

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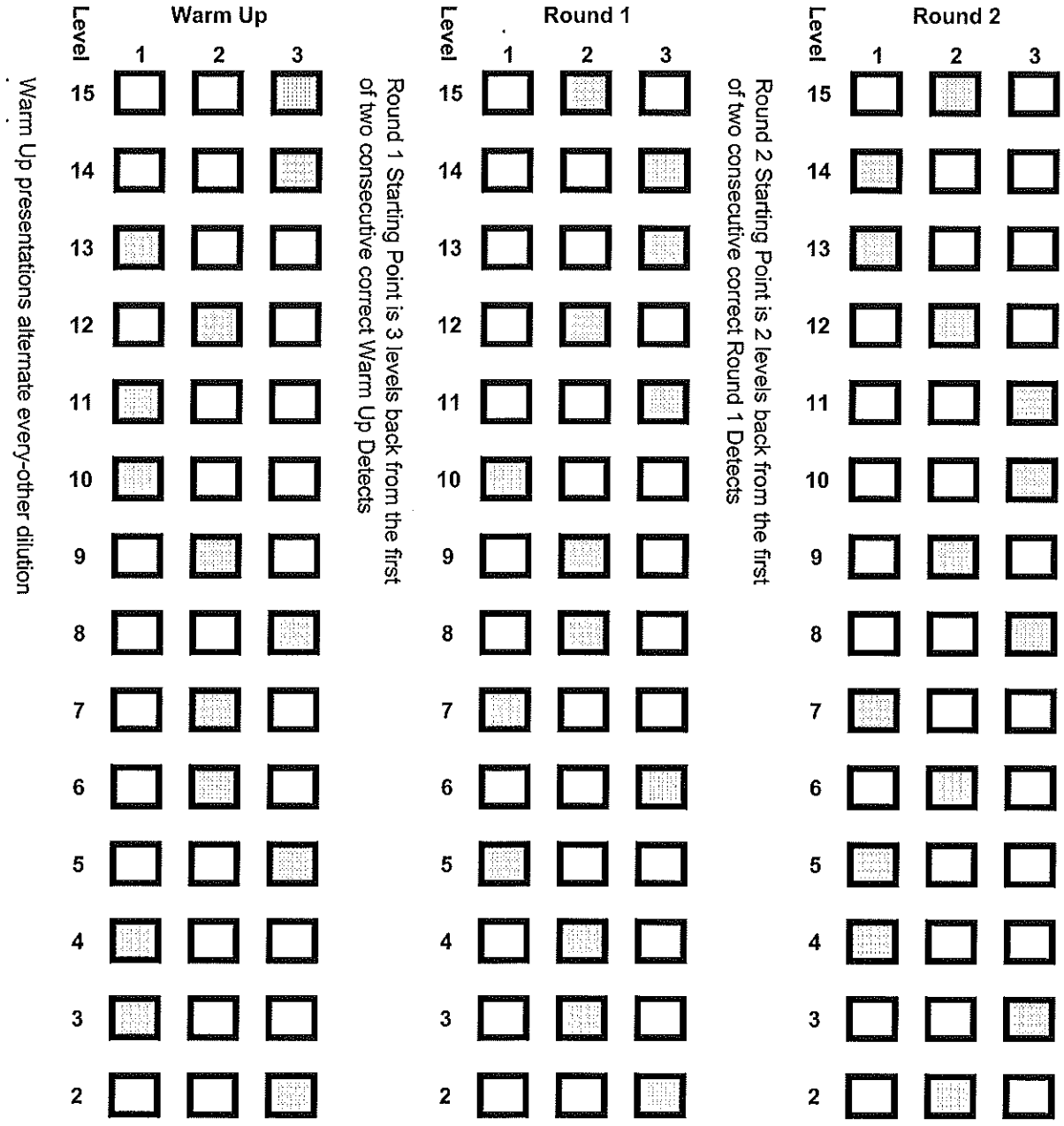
Odor Sensitivity Test Data Sheet C

Name : _____ Date : _____ Time : _____

The Red Pen presention order is designated by the shaded box.
Record Responses as G for guess and D for detect.



The Score is the first level of two consecutive correct D responses.

SCORE: _____ **SCORE:** _____

Individual's Odor Sensitivity (average of the SCORES): _____

Test Administrator : _____

Odor Pen Kit Serial Number : _____

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Reference #10

Odor Sensitivity Test

TP 2000

Highlighted Paragraphs

Odor Sensitivity Test – TP 2000 – Highlighted Paragraphs

1) "The testing procedure determines an ***individual's olfactory sensitivity by using odor pens***..." (Summary of Method, Page 3 of 12)

2) "The method requires the individual to indicate which pen contains the odorant out of a triplet of pens, one which is an n-butanol odor pen and the other is an odorless pen, ***used twice as the blank pen***. Presenting the same pen for both blank observations ensuring the consistency of the "odorless" sensation." (Summary of Method, Page 3 of 12)

3) "The probability of detection at any of the 14 concentrations of the pens ***is not a fixed attribute of the individual but a value***, which assumes that olfactory sensitivity varies as a result of random fluctuation in factors such as alertness, attention, fatigue, health status, and the possibilities of variable presentation of the odor pen." (Summary of Method, Page 4 of 12)

4) "An individual's olfactory threshold is based on a series of judgments made by the individual. It is important to recognize that the determination of an individual's threshold is a definable task in which ***precision of the result is mainly a question of the number of times the individual takes the test.***" (Judgment/Decisions, Page 8 of 12)

5) Test Program Example: "***Each individual will be tested three times during the first 30-days of the Test Program to establish a "baseline" individual threshold.*** Each individual will then be tested monthly." (Page 8 of 12)

6) "Each pen within each dilution level is presented once. A Test Individual may ask a pen to be repeated but this should be limited. ***A test can be abandoned and restarted at a later time during the same day if becomes necessary to do so.*** The test procedure must start from the beginning and the incomplete test discarded in its entirety. (Judgment/Decision, Page 9 of 12)

20 April 2012