Assessing the Sense of Smell

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Sense of smell

1. The sense of smell
2. The OLFACAT study
3. Measurement of olfaction
4. Smell in upper airway diseases
the sense of smell
The sense of smell

olfactory mucosa
Olfactory pathways
The sense of smell

- animals may smell up to 200,000 odours
- humans may smell up to 10,000 odours
- olfaction has lost evolutive significance
- fetus starts smelling in the uterus

The sense of smell

- Women smell better than men
- Olfaction remains stable between 20 and 40 yr old
- Olfaction worsens after 50 yr old
- Close relationship between olfaction - emotions - memory

Mullol J, et al. Rev Rinol 2011
Sense of smell

evolution loss or lack of training?


Hummel J et al. *Laryngoscope* 2009
Sense of smell
the importance of smell training

Sense of smell

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1. To evaluate the status of the sense of smell in the general population.

2. To study the prevalence of olfactory dysfunctions: anosmia - hyposmia.

3. To investigate the factors associated with the sense of smell: protection - risk.

Mullol J et al. *Lancet* [Submitted]
how do you consider your own sense of smell?

Mullol J et al. *Lancet* [Submitted]
OLFACAT Survey
smell detection

Normosmia

Anosmia

Mullol J et al. Lancet [Submitted]
OLFACAT Survey
smell identification

Mullol J et al. Lancet [Submitted]
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Subjective olfactometry outcomes

- Detection
  - supraliminar
  - threshold (butanol)

- Memory
  - recognize odours

- Identification
  - identify odours with no help

- Forced choice
  - identify odours with help

- Characteristics:
  - agreeability, intensity
  - freshness, irritability

- Sensory (1st CN) vs sensitive (5th CN) perception

- Unilateral vs bilateral studies

- Discrimination

Guilemany JM, J Mullol, et al. *Allergy* 2010
Subjective olfactometry
University of Pennsylvania Smell Identification Test (UPSIT)

Doty RL, P Sahamn. Phys Behav 1984
Subjective olfactometry
University of Pennsylvania Smell Identification Test (UPSIT)

- ID test: 4 booklets, 10 odours & questions each
- scratch the odour patch and smell
- forced choice (4 options)
- cost: US$ 27.5

Doty RL et al. Laryngoscope 1989
Subjective olfactometry
Connecticut Chemosensory Clinical Research Center (CCCRC)

- butanol test: smell threshold
- supraliminal test: smell discrimination
- cost: US$ 1,295 / box

Cain et al. *Laryngoscope* 1988
Subjective olfactometry
Sniffin’ Sticks

- butanol test: smell threshold
- discrimination: 15 odours
- identification: 16 odours (forced choice, 4 options)

Hummel et al. Chem Senses 1997
Subjective olfactometry

Zurich Olfaction Screening Test (ZOST)

- 8 odours in individual cartridges (7+1)
- identification and discrimination
- healthy (7-8), pathology (0-6)

Briner HR, D Simmen. Rhinology 1999
Subjective olfactometry
BArcelona Smell Test (BAST) -24

- odours: olfactory (20) and sensitive (4)
- detection, characteristics, memory, identification
- associated to a gustometry: sweet, salted, acid, bitter, umami

Cordesin et al. Rhinology 2006
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Smell disorders
common causes

• sinonasal infections
  - common cold, flu, bacterial
• inflammation of sinonasal mucosa
  - chronic rhinosinusitis, nasal polyps, allergic rhinitis
• head trauma
  - impairment of olfactory bulbs & olfactory fibers
• neurodegenerative diseases
  - multiple sclerosis, Parkinson & Alzheimer diseases
• smoking habit

Bromley et al. *Am Fam Physician* 2000
Olfaction in Allergic Rhinitis

**PER: 49 patients**
- Age: 32 yr
- M / F: 1 / 1,3

**Control: 60 subjects**
- Age: 35 yr
- M / F: 1 / 1

**ARIA**

**mod./severe PER**
- 65.3% (n=32)

**mild PER**
- 34.7% (n=17)

**PER + SH**
- 67% (n=33)

**PER - SH**
- 33% (n=16)

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Guilemany et al, J Mullol. Laryngoscope 2009
Loss of smell in AR

WITH loss of smell

<table>
<thead>
<tr>
<th></th>
<th>Mild</th>
<th>Moderate / Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>15.2%</td>
<td>84.8%</td>
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</tbody>
</table>

WITHOUT loss of smell

<table>
<thead>
<tr>
<th></th>
<th>Mild</th>
<th>Moderate / Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>25%</td>
<td>75%</td>
</tr>
</tbody>
</table>

Guilemany et al, J Mullol. Laryngoscope 2009
Olfaction in bronchiectasies rhinosinusitis / nasal polyps

BC (n=85)

with RSC 81%

with NP 26%

without NP 55%

without RSC 19%

Guilemany JM et al, J Mullol. Allergy 2009
Persistent allergic rhinitis severity and olfaction

## Nasal polyposis

### ESS vs oral steroids in olfaction

<table>
<thead>
<tr>
<th></th>
<th>baseline</th>
<th>6 months</th>
<th>12 months</th>
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</thead>
<tbody>
<tr>
<td><strong>loss of smell (%)</strong></td>
<td><strong>80</strong></td>
<td><strong>60</strong></td>
<td><strong>60</strong></td>
</tr>
<tr>
<td>oral CS + nasal CS</td>
<td>yellow</td>
<td>green</td>
<td>green</td>
</tr>
<tr>
<td>ESS + nasal CS</td>
<td>green</td>
<td>green</td>
<td>green</td>
</tr>
</tbody>
</table>

Severe nasal polyposis
oral & nasal steroids in olfaction

Severe nasal polyposis
inflammation vs obstruction in olfaction

Nasal endoscopy

Smell (BAST-24)

**Bronchiectasis**
CRS / nasal polyps in olfaction

**Hyposmia**

![Graph showing loss of smell (0-3) for All, CRS-, CRS+, NP-, and NP+ categories. The NP+ category shows a significantly higher loss of smell compared to the other categories.]

Guilemany JM, et al, J Mullol. *Allergy* 2009
Loss of smell and asthma

CRS / nasal polyps

BAST-24 (%)

Identification

Alobid I et al, J Mullol. *Allergy* 2011 [In press]
1. Partial, (hyposmia, 0.5-1%) and total (anosmia, 15-20%) loss of smell is a very prevalent symptom in the general population.

2. Main causes of loss of smell are: common cold, CRS ± nasal polyps, and traumatic brain injury.

3. Allergic rhinitis (moderate) and CRS ± nasal polyps (moderate to severe) have an important impact on the loss of smell.

4. Due to its association to CRS ± nasal polyps, the loss of smell may predict the severity of asthma.

5. Intranasal and oral corticosteroids improve the sense of smell when due to inflammatory diseases.

6. The sense of smell should always be assessed, by symptom or/and by olfactometry, in both upper and lower airway chronic inflammatory diseases.

Mullol J, et al. Rev Rinol 2011