Rhinology, 43, 189-194, 2004

Consequences of olfactory loss and adopted coping strategies*

Ebba Hedén Blomqvist[1], Annika Brämerson[2], Pär Stjärne[3], Steven Nordin[4]

[1] Department of Otorhinolaryngology, Karolinska Hospital, Stockholm, Sweden
[2] Department of Otorhinolaryngology, Central Hospital, Skövde, Sweden
[3] Department of Otorhinolaryngology, Huddinge Hospital, Stockholm, Sweden
[4] Department of Psychology, Umeå University, Umeå, Sweden, and Department of Psychology, San Diego State University, San Diego, USA

SUMMARY

*The **aims of this study** were to investigate the effects of loss of smell as regards the quality of life and the coping strategies used.*

***Methods**: Seventy-two patients with anosmia (46%) or hyposmia (54%) filled in the validated Multi-Clinic Smell and Taste Questionnaire, the validated General Well-being Schedule (GWBS), and answered other questions shown to be of good validity.*

***Results**: Several kinds of negative effects, risks associated with the loss, interference with daily routines and deteriorations in well-being were common. Physical health, financial security, profession, partnership, friendship, emotional stability and leisure were also deemed to be negatively affected and GWBS scores show compromised psychological well-being. The importance of olfaction seemed to be more noticeable after the loss of smell, and several kinds of problem- and emotion-focused coping strategies were adopted by these patients.*

***Conclusions**: We found that the loss of smell had substantial adverse effects on the quality of life and that high priority should be given to its diagnosis and treatment and to further research in this field. Furthermore, a combination of problem- and emotion-focused coping strategies may be suggested to patients who have recently lost the sense of smell.*

Key words: anosmia, hyposmia, well-being, clinical, evaluation

INTRODUCTION

In the USA several hundred thousand patients who complain of smell and taste disorders, especially of the former, are seen by physicians each year (Goodspeed et al., 1987). The results of a population-based study suggest that as many as 24% of persons aged 53-97 years have an impairment of olfactory function (Murphy et al., 2002), while another study suggests a prevalence of 19% among persons aged 20 years or more (Bramerson et al., 2004). However, other data indicate that the prevalence of olfactory problems in the general population may be less (Hoffman et al., 1998), but that it increases exponentially with age.

In humans, the sense of smell has several functions. Perhaps most importantly, olfaction directs our attention, enhanced by positive or negative emotions, towards environmental hazards (e.g., smoke and poisonous fumes) or to sensations that, in a general sense, have positive connotations, such as nutritious food. It is also well-documented that this sense regulates food intake (Friedman and Mattes, 1991; Mattes and Cowart, 1994). The role of olfaction in interpersonal relations has been shown by the communication between women who live together because they synchronize their menstrual cycles (McClintock, 1971) and between the mother and her newborn child (Porter et al., 1983). There is also speculation as to whether women select a spouse partly on the basis of his body odour (Wedekind et al., 1995; Ober et al., 1997).

These findings indicate that patients suffering from loss of smell can be expected to have a poorer quality of life in several respects, which implies that the diagnosis and treatment of this symptom should be given high priority. Indeed, negative effects on mood, enjoyment of food, matters of safety, personal hygiene, social interaction and sexual life have been found in such patients (Varga et al., 2000; Hufnagl et al., 2003). Signs of depression have been detected in 29% (Deems et al., 1991) and 17% (Temmel et al., 2002) of patients with olfactory dysfunction. Temmel and co-workers did also report that 73% of patients with olfactory dysfunction complained of difficulties with cooking, 68% of mood changes, 56% of less appetite, 50% of eating spoiled food, 41% of poor perception of their own body odour, 30% of spoiling/burning foods and 8% of problems at work. Miwa et al. (2001) found that overall satisfaction with life was reduced to only 50%. The most commonly cited

*Received for publication: January 27, 2004; accepted: May 19, 2004

concerns were the inability to detect spoiled food (75%), gas leaks (61%) and smoke (50%) and the negative effects on eating (53%) and cooking (49%). However, these findings should be interpreted with caution due to a low response rate (38%) and as much as eight years between threshold testing and the completed survey.

Previous studies of the consequences of olfactory loss have almost exclusively used closed questions (predetermined, reply alternatives) which do not permit insight into other possible consequences of the loss of smell. The purpose of the present study was therefore to: (a) determine whether the loss of smell (anosmia and hyposmia) entail consequences other than those previously reported, by also using open-ended questions, (b) study the importance of olfaction and (c) evaluate the problem- and emotion-focused coping strategies (Billings and Moos, 1981) that are used by these patients.

Apart from individual questions pertaining to the consequences of olfactory loss, the importance of olfaction and coping, the consequences were also studied by using the General Well-Being Schedule (GWBS) that provides a broad-ranging indication of psychological well-being and distress based on the dimensions of anxiety, depression, general health, positive well-being, self-control and vitality (Dupuy, 1978; McDowell and Newell, 1996). The GWBS has also been used in various clinical studies (e.g. regarding bone mass (Bravo et al., 1997) and blood pressure (Monk, 1981)).

MATERIAL AND METHODS

Patients

Of 135 consecutive patients in the Out-patient Clinics of the Departments of Otorhinolaryngology at Karolinska Hospital, Stockholm and Central Hospital, Skövde, 72 (29 males, 43 females aged 15-78 years, M = 56.1) with the chief complaint of loss of olfactory sensitivity (self-reported anosmia 44%; hyposmia 56%) agreed to participate. Forty-six per cent of the patients were anosmic and 54% hyposmic, according to the CCCRC threshold test (Cain, 1989). Twenty-six per cent suffered from parosmia (perception of an atypical odour in response to a particular stimulus) 5% phantosmia (perception of an unpleasant odour when there is no odour present) and 3% had both. Many patients complained of chronic or frequent nasal/respiratory symptoms and conditions (Table 1). Fifteen per cent of the patients had had olfactory loss for less than 1 year, 42% for 1-3 years, 25% for 3-5 years, 15% for 5-10 years and 3% for more than 10 years.

On the basis of the medical history and a general ENT examination, including rhinoscopy and nasal endoscopy after application of a local anaesthetic and decongestant, we found various causes of the loss of smell in these patients (Table 2). The most common etiology was preceding upper respiratory infection (53%) and unknown etiology (22%).

The study was done in accordance with the Declaration of Helsinki and approved by the Ethics Committee at Umeå University (#01-066, on the 28 March 2001 and with supplement on 11 March 2002).

Table 1. Prevalence of chronic or frequent nasal/respiratory symptoms and conditions reported by the 72 patients.

Prevalence of chronic or frequent nasal/ respiratory symptoms	**Percent (%)**
Sneezing or itchy nose	29
Nasal congestion	26
Nasal discharge	26
Seasonal allergic rhinitis (SAR)	21
Perennial allergic rhinitis (PAR)	17
Sinus pain or headache	18
Allergic nasal symptoms	18
Nasal polyposis	15
Sinus infection	14
Coughing	12
Lower respiratory infection	11
Deviated septum	11

Table 2. Etiologies of the patients' hyposmia and anosmia.

Etiology of anosmia /hyposmia	**Number of patients / (Percent)**
Preceding upper respiratory infection	38 (53%)
Unknown	16 (22%)
Nasal polyposis	8 (11%)
Allergic rhinitis	2 (2,8%)
PNAR (perennial non-allergic rhinitis)	3 (4,2%)
Chronic sinusitis	1 (1,4%)
Head trauma	1 (1,4%)
Iatrogenic (Medication induced)	1 (1,4%)
Congenital	1 (1,4%)
Systemic disease	1 (1,4%)

Procedure

We used questions from the Multi-Clinic Smell and Taste Questionnaire (Nordin et al., 2003) to assess self-reported parosmia, phantosmia, respiratory symptoms and duration of olfactory loss, as well as questions pertaining to the consequences of loss of smell, the importance of the sense of smell, and coping with smell loss (Tables 3-5). Some of the questions regarding consequences (Table 3) have been evaluated metrically and shown to be comprehensible and to generate responses of good reliability (Nordin et al., 2003), and a majority of them were of open-ended character.

The questionnaire also included the questions "How important are the following aspects for your quality of life: physical health, financial security, work life, partnership, friendship, emotional stability and leisure?" (Each aspect was to be rated on a 6-point scale ranging from 0, not important at all, to 5, very important), and "To what extent has your loss of smell affected the following aspects of your quality of life: physical health, financial security, work life, partnership, friendship,

Table 3. Questions and answers (%) about the effects of an abnormal sense of smell.

Has the quality of your life declined in general since you lost your sense of smell?	
Yes	67
No	33
Has your loss of smell had any negative effects? If so, what is the most negative effect?[1]	
Less aware of personal hygiene	36
Less interested in food and drink	21
Less appreciation of nature	6
Poorer quality of life in general	4
Unable to perceive fire / smoke	4
Less emotional satisfaction	3
General feeling of uncertainty	3
Less satisfied with profession	1
Has your loss of smell had any positive effects? If so, what is the most positive effect?[1]	
Not longer bothered by unpleasant odours	38
Have no need to buy perfume	1
Do you perceive any risks associated with your loss of smell? If so, what is the main risk?[1]	
Failure to perceive:	
fire / smoke	42
rancid / ill-smelling food	19
dangerous chemicals/gases	12
Does your loss of smell interfere with your daily activities? If so, what is the main type of interference?[1,2]	
Difficulties in cooking	21
Problems with eating	8
Feel obliged to wash myself / my home more often	7
Difficulties in using perfume/after shave	3
Need to change leisure / spare-time activities	3
Reduced ability to do professional work	3
Seek clean air more often	3
Difficulties in mixing with friends	1
Has your loss of smell affected your well-being? If so, what is the main effect?[1,2]	
Depression	17
Poorer general well-being	7
Irritability	1
Asthmatic reactions more often	1
How has your loss of smell affected your ability to taste / enjoy food?[2]	
Improved	10
Diminished	53
No change	37
How has your loss of smell affected your appetite?[2]	
Improved	4
Worsened	32
No change	64

[1] Open-ended question

[2] Evaluated regarding comprehension and reliability (Nordin et al., 2003).

emotional stability and leisure?" (Each aspect was to be rated on an 11-point scale ranging from -5, very severe deterioration, to 5, very marked improvement).

Finally, the questionnaire included the General Well-Being Schedule (GWBS) (Dupuy, 1978; McDowell and Newell, 1996). The GWBS, ranging between 0 and 110 (a high score indicates positive well-being) has been shown to have good test-retest reliability, internal consistency, validity (Fazio, 1977) and it has normative data (Bowling, 1997). The entire questionnaire was mailed to the patients who answered it at home and returned it by mail.

Statistical analysis

The data were analyzed using the one-sample Sign test, Wilcoxon signed rank test or Chi-square analysis. Values of $p<0.05$ were considered significant. In the figures, results are presented as means.

RESULTS

Consequences of loss of smell

Table 3 shows the distribution of answers concerning the consequences of loss of smell. About 2/3 of the patients reported a decline in the quality of life. The negative consequences mainly concerned personal hygiene, eating and drinking, while not being bothered by unpleasant odours was commonly reported as a positive effect. The commonest answers to the questions about risks, interference with daily routines and well-being were the inability to detect fire-smoke, difficulties with cooking and depression. Many felt that their appreciation of food had declined, and about 1/3 reported that their appetite was poorer.

Figures 1 and 2 show respectively, the importance of various aspects of quality of life and to what extent the smell loss has affected these aspects. One-sample sign tests show that on all aspects, except for financial security, the rated affect differs highly significantly from 0 ($p<0.001$), whereas financial security showed a strong tendency to differ from 0 ($p<0.07$). Therefore, all aspects can be considered as important for quality of life, and as being negatively affected by the loss of smell.

Based on GWBS scores, 51.4% of the patients can be referred to "positive well-being" (scores 73-110), 20.8% to "moderate distress" (scores 61-72) and 27.8% to "severe distress" (scores 0-60). These percentages can be compared with population-based normative data (Bowling, 1997) of 71.0%, 15.5%, and 13.5%, respectively. A chi-square analysis yields a significant difference in distribution across the three categories between the patient and normative data ($x^2(2)=8.92$, $p<0,05$).

Importance of the sense of smell (Table 4)

About 90% of the patients reported that they became more aware of the importance of olfaction after the loss, and they rated its importance (in relation to other senses) as higher in the period after than before the loss, which is supported by a Wilcoxon's matched-pairs signed-ranks test [$T(39) = 38.5$, $p < 0.001$].

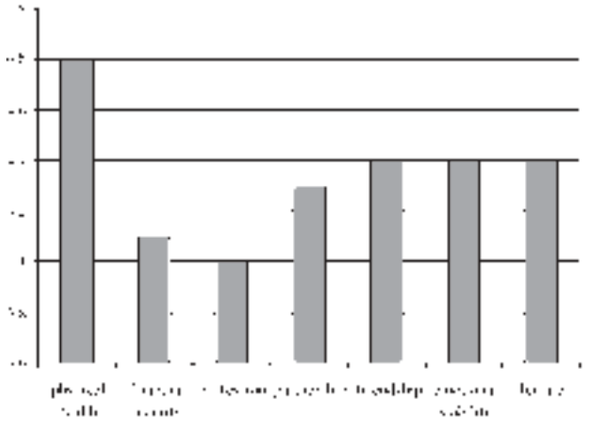

Figure 1. Ratings (mean) concerning the importance of various aspects of quality of life (scale: 0 to 5).

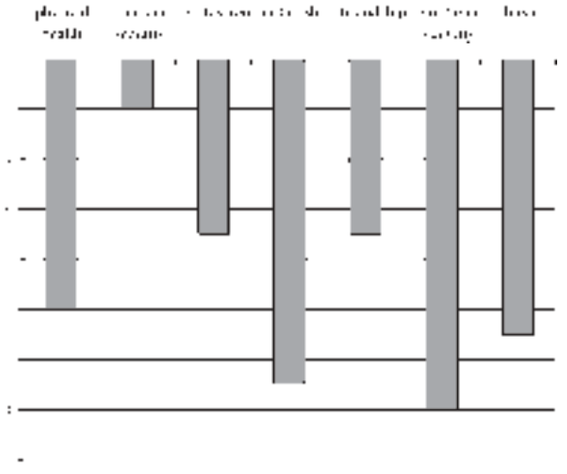

Figure 2. Ratings (mean) of to what extent the loss of smell has affected various aspects of quality of life.

Coping with the loss of smell

Table 5 shows the percentages of patients who adopted the various coping strategies. They usually adopted more than one strategy. The commonest emotion-focused strategy was trying to accept the situation and the commonest problem-focused strategy was letting a family member taste food that might be spoiled. Other common strategies consisted of looking for information, asking a relative to check whether one had used the right amount of perfume/after-shave and comparing their problems with those who had worse symptoms.

DISCUSSION

In this study, we evaluated the known effects of loss of smell and tried to determine if there are any others, by using open-ended questions. The aim was also to assess the effects of this symptom related to food, as the quality of life from a broader point of view, and the psychological well-being. The findings clearly show that the quality of life in general deteriorates after the onset of this symptom, since it was reported by 67% of the patients. The negative consequences of olfactory loss found with the open-ended questions suggest that previous research has been comparatively successful in detecting some of the main effects on the quality of life – e.g., personal hygiene (36%) and eating and drinking (21%), which were also noted by others (Varga et al., 2000; Temmel et al., 2002; Hufnagl et al., 2003) and the risks of failure to perceive fire or smoke (42%), rancid or ill-smelling food (19%) and dangerous chemicals/gases (12%) as reported by others (Temmel et al., 2002; Hufnagl et al., 2003). Similarly, interference with daily routines such as difficulties in cooking (21%) and eating (8%) have been noted by others (Temmel et al., 2002), but washing oneself and cleaning the home more often" (10%) have not been observed before. Finally, depression as an aspect of well-being (17%) has also been reported (Deems et al., 1991). The percentages we found are in general lower than those found in previous studies, probably because we have noted only the main effects.

Not surprisingly, "failure to be bothered by unpleasant odours" was regarded as a positive effect by 38% of the patients. However, the fact that most of them did not report this may be due to being aware that unpleasant odours may be toxic and that it is therefore important to perceive a sensory warning by means of olfaction.

Answers to the two specific questions regarding appreciation of food (taste) and appetite (53% and 32% respectively, reported a decrease) also accord with negative effects on food behaviour, although 4% of the patients had a better appetite. In this

Table 4. a) Questions and answers (%) about the importance of the sense of smell. b) The importance of the sense of smell was rated on a 6-point scale ranging from 0, No importance, to 5, very large importance.

a) Has your view concerning the importance of your sense of smell changed since you developed an abnormal sense of smell?[1] If so, how?[2]	
It has become less important	2
It has become more important	88
My opinion has not changed	10
b) How important did you think your sense of smell was in relation to your other senses (hearing, vision, touch and taste) before you developed an abnormal sense of smell? (median)	3.0
How important did you find your sense of smell to be in relation to your other senses (hearing, vision, touch and taste) after you developed an abnormal sense of smell? (median)	4.5

[1] Open-ended question

[2] Evaluated regarding comprehension and reliability (Nordin et al., 2003).

regard, however, some anosmic patients have gained weight, which they have usually ascribed to a "gustatory" reward in the form of a sweet desert after a dull and unexciting meal (Mattes et al., 1990).

Further evidence of the negative consequences of a loss of smell is provided by the ratings suggesting that emotional stability, partnership, leisure, physical health, friendship and profession are important not only for quality of life, but are also negatively affected by the loss of smell. The fairly high percentage of patients reporting depression in this study and others (Deems et al., 1991), suggests that psychological well-being is affected. Indeed, the data from the broad-ranging indicator of psychological well-being (based on the dimensions of anxiety, depression, general health, positive well-being, self-control and vitality) on the whole indicate an effect.

A second aim of the study was to assess the importance of olfaction. The results clearly suggest that olfaction becomes more important after the loss of smell, as reported by 88% of the patients. This view is also supported by the rating of olfaction in relation to the other senses (hearing, vision, touch and taste). Thus, the sense of smell was rated as much more important after than before the loss had occurred, but this finding should be interpreted with caution because of the retroactive nature of both questions. It is noteworthy, that Van Toller (1999) asked students which of their senses they would choose to lose if forced to. Seventy-nine per cent of them rated their sense of smell as the least important of their five senses. These previous data and those in the present study (also comparisons with other senses) suggest that this phylogenetically old sense is used at a low level of consciousness and that it is not until the sense is lost that the person will detect its value.

A third aim of the present study was to assess which coping strategies that are adopted by patients who have lost the sense of smell. We found that they used several typical strategies to cope with their problems. For example, frequently reported emotional strategies included "attempts to accept the situation and make the best of it" (74%) and "comparing one's problems with those who are worse off" (35%). Since the causes of various types of loss of smell cannot be treated successfully (Murphy, 2003), such strategies may be appropriate for many patients. Other emotional coping strategies were "trying not to think about it" (19%), "seeking social support" (e.g. discussing one's feelings with others) (17%), "changing one's priorities" (15%), and "trying to focus on advantages rather than disadvantages" (11%). These emotional coping strategies are also used by persons with other stressful conditions in general (Stone and Neale, 1984).

Three of the possible alternative answers concerning problem-focused coping were commonly chosen by the patients: "letting a member of the family taste food" (67%) and "check that one does not use too much perfume/after shave" (39%) and "seeking information about the loss of smell" (58%). Only 4% of the patients asserted that they avoided meeting other people, which accords with the findings concerning the effect on friendship. This avoidance is in line with the result of the smell loss having affected friendship. The strategy of trying to obtain more information about the condition is also a very commonly used coping strategy in stressful conditions in general (Billings and Moos, 1981), while the other strategies seem to be more characteristic of patients with olfactory loss. Eighty-five per cent of the patients had had an olfactory loss for more than a year and 43% for three or more years. Therefore, these patients have had considerable time to develop efficient coping strategies, which should be of value for those who have recently developed this condition.

The GWBS has been shown to generate valid and reliable answers (Fazio, 1977) and some of the questions used to assess the effects of loss of smell in this study have likewise been shown to be comprehensible and generate answers of good reliability (Nordin et al., 2003).

It has been suggested that qualitative distortions in olfaction are more upsetting to a person's quality of life than a simple loss (Leopold, 2002). In the present study, 26% of the patients reported parosmia, 5% phantosmia and 3% both conditions. These qualitative distortions may therefore have added to our patients' decline in the quality of life. It is well documented that olfactory loss is common in nasal and sinus disease (Mott et al., 1997). Since several of these diseases can be treated successfully (Jafek and Hill, 1989) and the patients report substantial adverse effects on the quality of life after olfactory dysfunction, treatment of such conditions should be given high priority.

In conclusion, these findings clearly suggest that the quality of life deteriorates after onset of loss of smell. Several types of negative effects on the quality of life, risks associated with the loss, interference with daily routines and deterioration in well-being were found as well as adverse effects on appreciation of food and on appetite. In addition to the data on prevalence,

Table 5. Questions and positive answers (%) about coping with loss of smell.

Do you try to accept your situation and make the best of it?	74
Do you let a member of your family taste food that you suspect is spoiled?	67
Have you sought information about your abnormal sense of smell?	58
Do you ask a member of your family whether you have just enough perfume/after shave?	39
Do you compare your problems with those of others who are worse off?	35
Do you try to forget your abnormal sense of smell?	19
Do you seek social support from family members?	17
Have you tried to change your priorities about what is important to you?	15
Do you try to concentrate on the advantages of your abnormal sense of smell?	11
Do you avoid meeting people?	4
Have you found solutions to problems caused by your abnormal sense of smell?	0

the ratings made by the patients support the view that physical health, financial security, profession, partnership, friendship, emotional stability and leisure are negatively affected by this symptom. The scores on the GWBS also show that psychological well-being (anxiety, depression, general health, positive well-being, self-control and vitality) is negatively affected. The findings also suggest that the importance of olfaction becomes more apparent after the loss of smell, and that these patients adopt several characteristic types of problem- and emotion-focused coping strategies. Therefore, high priority should be given to the diagnosis and treatment of olfactory loss and to further research in this field. A combination of problem- and emotion-focused coping strategies may be suggested to patients who have recently developed this condition.

ACKNOWLEDGEMENTS

This study was supported by grants from the Vardal Foundation, Glaxo Wellcome and Karolinska Institutet. We gratefully acknowledge Ann Langius, RN, PhD, for valuable comments on a previous version of the manuscript.

REFERENCES

1. Billings AG, Moos RH (1981) The role of coping responses and social resources in attenuating the stress of life events. J Behav Med 4: 139-157.
2. Bowlin (1997) Measuring health: A review of quality of life measurement scales. Philadelphia, Open University press.
3. Bramerson AL, Johansson (2004) Prevalence of olfactory dysfunction: the Skövde population-based study. Laryngoscope 114: 733-737.
4. Bravo GP, Gauthier (1997) A weight-bearing, water-based exercise program for osteopenic women: its impact on bone, functional fitness, and well-being. Arch Phys Med Rehabil 78: 1375-1380.
5. Cain WS (1989) Testing olfaction in a clinical setting. Ear Nose Throat J 68: 316, 322-328.
6. Deems DA, Doty RL (1991). Smell and taste disorders, a study of 750 patients from the University of Pennsylvania Smell and Taste Center. Arch Otolaryngol Head Neck Surg 117: 519-528.
7. Dupuy H. (1978) Self-representations of general psychological well-being of American adults. American Public Health Association Meeting, Los Angeles.
8. Fazio AF (1977) A concurrent validational study of the NCHS General Well-Being Schedule. Vital Health Stat 2: 1-53.
9. Friedman M, Mattes R (1991) Chemical senses and nutrition. Getchell TV et al., eds., Smell and taste in health and disease. R. Press. New York: 391-404.
10. Goodspeed RB, Gent JF (1987) Chemosensory dysfunction. Clinical evaluation results from a taste and smell clinic. Postgrad Med 81: 251-257, 260.
11. Hoffman HJ, Ishii EK (1998) Age-related changes in the prevalence of smell/taste problems among the United States adult population. Results of the 1994 disability supplement to the National Health Interview Survey (NHIS). Ann N Y Acad Sci 855: 716-722.
12. Hufnagl B, Lehrner J (2003) Development of a questionnaire for the assessment of self reported olfactory functioning. Chem Senses 28: E27.
13. Jafek BW, Hill DP (1989) Surgical management of chemosensory disorders. Ear Nose Throat J 68: 398, 400, 402-404.
14. Leopold D (2002) Distortion of olfactory perception: diagnosis and treatment. Chem Senses 27: 611-615.
15. Mattes RD, Cowart BJ (1994) Dietary assessment of patients with chemosensory disorders. J Am Diet Assoc 94: 50-56.
16. McClintock MK (1971) Menstrual synchorony and suppression. Nature 229: 244-245.
17. McDowell I, Newell C (1996) Measuring health: A guide to rating scales and questionnaires. New York.
18. Miwa TM, Furukawa (2001) Impact of olfactory impairment on quality of life and disability. Arch Otolaryngol Head Neck Surg 127: 497-503.
19. Monk M (1981) Blood pressure awareness and psychological well-being in the health and nutrition examination survey. Clin Invest Med 4: 183-189.
20. Mott AE, Cain WS (1997) Topical corticosteroid treatment of anosmia associated with nasal and sinus disease. Arch Otolaryngol Head Neck Surg 123: 367-372.
21. Murphy C, Doty RL, Duncan HJ (2003) Clinical disorders of olfaction. Handbook of olfaction and gustation. R. L. Doty. New York, Marcel Dekker: 461-478.
22. Murphy C, Schubert CR (2002) Prevalence of olfactory impairment in older adults. Jama 288: 2307-2312.
23. Nordin S, Bramerson A (2003) A Scandinavian adaptation of the Multi-Clinic Smell and Taste Questionnaire: evaluation of questions about olfaction. Acta Otolaryngol 123: 536-542.
24. Ober C, Weitkamp LR (1997) HLA and mate choice in humans. Am J Hum Genet 61: 497-504.
25. Porter RH, Cernoch JM (1983) Maternal recognition of neonates through olfactory cues. Physiol Behav 30: 151-154.
26. Stone AA, Neale JM (1984) New measure of daily coping: Development of preliminary results. Journal of Personality and Social Psychology 46: 892-906.
27. Temmel AF, Quint C (2002) Characteristics of olfactory disorders in relation to major causes of olfactory loss. Arch Otolaryngol Head Neck Surg 128: 635-641.
28. Van Toller S (1999) Assessing the impact of anosmia: review of a questionnaire's findings. Chem Senses 24: 705-712.
29. Varga E, Breslin P (2000) The impact of chemosensory dysfunction on quality of life, Chem Senses 25:654.
30. Wedekind C, Seebeck T (1995) MHC-dependent mate preferences in humans. Proc R Soc Lond B Biol Sci 260: 245-249.

Ebba Hedén Blomqvist, MD
Department of Otorhinolaryngology
Karolinska Hospital
SE-171 76 Stockholm
Sweden

Tel: + 46-8-5177-0404
Fax: + 46-8-5177-6250