Evaluation of sensory acuity of students of the Faculty of Veterinary Medicine of Warsaw University of Life Sciences – SGGW in the years 1975-2015

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Summary

Veterinary students taking part in practical classes on “Hygiene of food of animal origin” course were tested on taste and odor identification as well as color differentiation. The results were subjected to statistical analysis to: (a) evaluate the influence of sex, smoking, time of day and status of health declared by the students on the results of tests; (b) determine the number of individuals who may fail the tests on taste and odor identification as well as color differentiation; (c) evaluate whether the sensory acuity of veterinary students changed in the 40 years of observation. The study involved 3310 students. A test for taste and odor identification was performed according to Polish Standard (PN-65/A-04021). The test for color differentiation was carried out using Rabkin color plates. The results of the study were elaborated using IBM SPSS Statistics 23. The chi-square test was used to determine whether there are significant differences between numbers of individuals assessed positively in particular experimental groups. The significance of the effect of experimental factors on the number of correctly identified samples was determined using analysis of variance. It was found that sex and smoking exerted a statistically significant effect ($p < 0.01$) on the number of subjects assessed positively and the number of correctly identified samples in three conducted tests. Female students more often than male students were assessed positively and correctly identified larger number of samples in all conducted tests. Nonsmokers obtained better results than smokers in all performed comparisons (significant difference at $p < 0.01$). It is worth noting that only 65.9% of students passed all three tests, and 1.3% of them did not pass any. In this last group were only men. The analysis of variance indicated that as time passed (since 1975 to 2015) sensory acuity of veterinary medicine students has increased.

Keywords: sensory acuity, taste, odor, color

Despite the great progress in the instrumental analytical methods of food analysis, such attributes of product as its appearance, texture, aroma and flavor are mostly assessed on the basis of sensory evaluation.

The fundamental knowledge of sensory analysis is essential not only for students in Food Science and Technology (11) but also for veterinary students. Because veterinary food inspection specialists have to conduct organoleptic analyses, we decided to familiarize veterinary students with the basic tests for determining their sensory acuity in the frame of the “Food hygiene of animal origin” course. During practical classes students were screened for their sensory

acuity in taste and odor identification as well as color differentiation.

The results of the tests conducted in 1975-1983 and 1975-1991 were published in 1985 (13) and in 1992 (14). Since our last publication, the number of tested students increased substantially, we decided to conduct a more thorough statistical evaluation, done on a larger amount of data that would allow verification of previously obtained results.

The aims of the study were:

- to evaluate the influence of sex, smoking, time of day and self-declared health status of the students on the results of tests;

- to determine the number of individuals who may have difficulties with passing the tests on taste and odor identification as well as color differentiation;
- to evaluate whether sensory acuity of veterinary students changed in the 40 years of observation.

Material and methods

The study involved 3310 students aged between 21 and 51 years with the largest group those at the age of 24 (mean age – 24.4 years). About half of the students were tested in the morning and the other half in the afternoon.

A test for taste identification was carried out in two identical laboratory rooms (for taste and odor identification) and one separate room designated only for the color differentiation test. Efforts have been made to provide favorable conditions for the individual work of each tested person. However, the tables used in the test room did not have dividers, which is a deviation from the requirements for a sensory laboratory (1, 2, 4, 8).

A test for taste identification was performed according to Polish Standard PN-65/A-04021 (7). Basic tastes were represented by solutions of sucrose, sodium chloride, citric acid and quinine hydrochloride. Distilled water was used for the preparation of solutions (7). Every student was asked to take one tablespoon of any out of nine coded samples, hold it in his or her mouth for 10 seconds and identify the taste. Two solutions out of nine were sweet, two sour, two salty and three bitter. The results of the test were considered to be positive if the student correctly identified at least seven samples.

The odor identification test based on the recognition of 10 samples was prepared according to the rules specified in PN-65/A-04021 (7). The odorants represented the following odors: buttery, yeasty, sour, fishy, fermented, rancid, smell of nutmeg, smoky, smell of onion and indifferent. A positive test result assumed the correct identification of at least 8 out of 10 odor samples.

The test of color differentiation was carried out in daylight in a separate room where there was only the teacher and the tested student. The Rabkin color plates were used in the studies (10). The test was considered passed if all of 25 plates were correctly recognized by the subjects. The results of all tests were recorded on specially-prepared questionnaires on which tested persons gave additional information about age, sex, smoking, current status of health and the date and time of the test. Students complaining of headaches, colds and other ailments that may affect the sensory acuity (1, 4) were classified to the group having “bad health condition”. The remaining persons were included in the “good health conditions” group.

The results of the study were elaborated statistically using IBM SPSS Statistics 23. The chi-square test was used to determine whether there were significant differences between the numbers of individuals assessed positively in particular experimental groups. The significance of the effect of experimental factors on the number of samples correctly identified was determined using analysis of variance.

Results and discussion

In the taste identification test 83% of the students obtained positive results (Tab. 1). Among female students, the percentage of persons positively evaluated was 10.7% higher than among male students (Tab. 1), which is a statistically significant difference ($p < 0.01$). Women recognized the samples of all four tastes better than men (Tab. 2). Differences in the number of samples being properly recognized by men and women were statistically significant ($p < 0.01$) in all cases.

Only 79.0% of smokers were positively assessed in the taste identification test, whereas 85.4 non-smokers obtained positive results (Tab. 1). The smokers recognized correctly less number of samples of all tastes than non-smokers did. Statistically significant differences ($p < 0.01$) between these groups were found in all comparisons (Tab. 2).

Time of day as well as health status declared by the students did not exert statistically significant effects on the number of positively evaluated individuals (Tab. 1); however, persons who declared bad health status identified statistically less number of samples for sour ($p < 0.01$) and bitter ($p < 0.05$) tastes (Tab. 2).

The results related to the odor determination and color differentiation tests show similar regularities to those obtained in the taste identification test. Female students more often obtained positive results in both tests (Tab. 1) and correctly recognized more samples than male students (Tab. 2). Similar statistically significant differences ($p < 0.01$) were observed between non-smokers and smokers. Time of day and health conditions declared by the students did not exert statistically significant effects on the results of the odor and color tests (Tab. 1, 2).

Tab. 1. The percentage of persons who obtained positive results in tests for taste identification, odor identification and color differentiation

Source of variation	Number of tested persons	Taste identification test (%)	Odor identification test (%)	Color differentiation test (%)
Sex				
Female	1753	88.0	84.9	98.6
Male	1557	77.3**	77.6**	89.6**
Tobacco smoking				
Non-smokers	2077	85.4	83.9	96.4
Smokers	1233	79.0**	77.5**	90.8**
Time of day				
Before noon	1627	83.5	82.0	94.2
Afternoon	1683	82.5	81.0	94.6
Health status				
Good	2717	83.2	82.0	94.1
Bad	593	82.1	79.4	95.6
Total	3310	83.0	81.5	94.4

Explanation: ** statistically significant difference at $p < 0.01$

Tab. 2. The average number of correctly identified samples

Source of variation	Taste identification					Odor identification	Color differentiation
	Sweet	Salty	Sour	Bitter	Total		
Sex							
Female	1.76	1.86	2.75	1.67	8.06	9.01	24.89
Male	1.68**	1.79**	2.53**	1.55**	7.54**	8.63**	23.94**
Tobacco smoking							
Non-smokers	1.75	1.84	2.69	1.65	7.93	8.94	24.66
Smokers	1.69**	1.80**	2.59**	1.55**	7.62**	8.65**	24.08**
Time of day							
Before noon	1.72	1.83	2.66	1.62	7.82	8.84	24.43
Afternoon	1.73	1.83	2.64	1.61	7.81	8.82	24.46
Health condition							
Good	1.73	1.83	2.66	1.62	7.85	8.86	24.44
Bad	1.69	1.81	2.58**	1.56*	7.64**	8.73	24.49
Total	1.72	1.83	2.65	1.61	7.82	8.83	24.44
	86.0%	91.5%	88.3%	80.5%	86.9%	88.3%	97.8%

Explanations: * statistically significant difference at $p < 0.05$, ** at $p < 0.01$

Tab. 3. Number of persons who passed one, two or three tests out of the three conducted or did not pass any test (taste, odor and color tests)

Number of passed tests	Total		Female		Male	
	No. of persons	%	No. of persons	%	No. of persons	%
0	20	0.6	0	0.0	20	1.3
1	192	5.8	48	2.7	144	9.2
2	918	27.7	408	23.3	516	33.1
3	2180	65.9	1303	74.3	877	56.3
Total	3310	100.0	1759	100.3	1557	100.0

As it is shown in Table 3, only 65.9% persons (2180 out of 3310) were able to pass all the tests. This means that many people (34.1%) may have problems with recognition of tastes, odors and colors. This observation seems to be consistent with data given by Stone and Sidel who reported that generally there are approxi-

mately 30% of consumers who fail to detect some sensory attribute at some level. So panel screening is an important practice in sensory testing (12).

Because there are so little data in the available literature, it was difficult to make direct comparisons of our research with other studies. Generally, the results

Fig. 1. The average number of correctly identified tastes samples in subsequent years (trend lines – linear model)

The results presented on Figs. 1-3 indicate that sensory acuity of students tested since 1975 do 2015 increased over time. Both analysis of variance and linear regression revealed that the increase in the numbers of correctly identified samples was statistically significant ($p < 0.01$) in all tests carried out. This applies not only to data for all subjects, but also for separate analysis for female and male students with only one excep-

tion. The increase in number of correctly identified color plates in the group of female students was not high enough to be statistically important (Fig. 3).

Although the depressing effect of nicotine on the human senses has been well known for a long time (1), opinions on the effect of smoking are also inconsistent. In some similar studies the effect

of smoking on the results of taste identification test was statistically significant (6) but in others not (5).

Conflicting with data from the literature seems to be the lack of the effect of self-declared bad health conditions on the number of positively evaluated individuals (2). This can be explained by the fact that some students declared bad health conditions due to psychological reasons i.e. feeling of shame or fear of failure of being embarrassed among colleagues. Similar results obtained by persons tested before the afternoon do not agree with Pope's observations (9) that time of day affects productivity of students.

Summing up the results it can be concluded that many veterinary students, approximately 34%, may have some difficulties with recognition of tastes, odors and colors. Therefore, it seems that evaluation of sensory acuity of candidates intending to work as veterinary food inspectors is necessary and should be thoroughly conducted.

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Fig. 2. The average number of correctly identified odor samples in subsequent years (trend lines – linear model)

Fig. 3. The average number of correctly identified color plates in subsequent years (trend lines – linear model)