ORIGINAL PAPER

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Factors determining the level of knowledge about parabens in cosmetics

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ABSTRACT

Introduction. Parabens are preservatives that can be found in all types of cosmetics.

Aim. Analysis and evaluation of sociodemographic and psychosocial factors related to the level of knowledge of young people about parabens in cosmetics.

Material and methods. Three hundred students from randomly selected colleges in the Subcarpathian Province took part in the study. The author's questionnaire was used, which consisted of a statement, a scale of attitudes, and a test of knowledge as well as the Multidimensional scale of Health Locus of Control.

Results. A high level of knowledge about preservatives in cosmetics was possessed by 14 % of respondents. The respondents who read cosmetic ingredients showed a higher level of knowledge about parabens more often than others. Young people were most often characterized by type MHLC strong-internal, accounting for 34% of the sample, and this group had a higher level of knowledge about parabens more often than the other respondents.

Conclusion. The respondents who thought that their health depends only on them had a high level of knowledge about parabens. Respondents with a low level of knowledge about cosmetic ingredients are the type that increases the influence of coincidence and the type that magnifies the influence of others.

Keywords. cosmetics, MHLC, parabens, preservatives, young people

Introduction

Parabens are preservatives that can be found in all types of cosmetics, many products for infants and children and in food and pharmaceutical products.[1,2] Parabens are homologous esters of p-hydroxybenzoic acid and represent an aromatic carboxylic acid containing a carboxyl group bonded directly to a benzene ring. Parabens are white, odorless, and crystalline and exhibit adequate water solubility to achieve preservative activity. Parabens are absorbed via the gastrointestinal tract and, to a degree, percutaneously.[3] They are biodegradable by a number of nonspecific enzymes in nature, a fact that would suggest a potential environmental benefit in their use.[4] Methylparaben, ethylparaben, propylparaben, and

butylparaben are the most commonly used members, independently and in combination with each other or other biocides (Fig.1).[5] The paraben family has excellent coverage against fungi and gram-positive bacteria. They are more effective against fungi than bacteria, and antibacterial activity is most effective against gram-positive organisms. Evidence of antimicrobial activity for commonly used parabens shows broad inhibition of *E. coli*, *Pseudomonas aeruginosa, Aspergillus niger*, and *Candida albicans*, with higher inhibition of staphylococcal species, particularly *S. aureus*.[6] Their use has steadily increased. They are now among the most common biocides present in cosmetics. Cosmetic chemists use parabens in their formulations because they have no perceptible odor or taste, are effectively pH neutral, and do not discolor or harden.[7]

Many studies have shown that parabens are the safest preservatives in cosmetics. This status has been achieved because of documented minimal toxicity, low cost, chemical inertness, and near worldwide acceptance.[8] Parabens have been classified as generally regarded safe by the US Food and Drug Administration (FDA).[9] According to the report parabens exhibit a harmful effect on the body only after exceeding the acceptable daily dose. According to the report of the U.S. Food and Drug Administration, the average daily dose of parabens that can be absorbed by a man weighing 60 kg is about 75 mg, of which 1 mg comes from food, 25 mg from medicines and the remaining 50 mg from cosmetics.[10] There is no solid evidence of accumulation within body tissues or organs, although detectable tissue and organ levels of indeterminate duration have been reported. Few studies suggest that parabens penetrate into the body, accumulate in the tissue of the mammary gland. Using deodorants and antiperspirants is particularly dangerous because the parabens from the axillary region are absorbed the most rapidly into the mammary gland. After penetration into the human body, parabens mimic a female hormone – estrogen, thus being able to interfere with the hormonal balance of the body.[11,12]
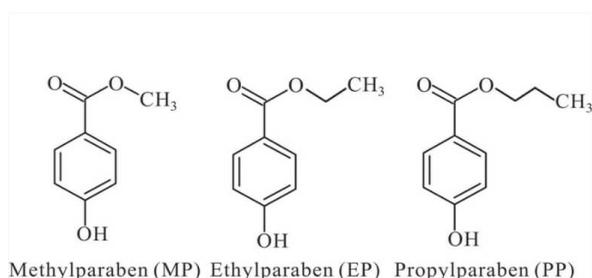
Fig. 1. Structural formulas of parabens

Other studies say that long-term and frequent use of parabens results in their accumulation in the stra-

tum corneum of epidermis, causing disturbances in the morphology of skin cells. Such skin is exposed to UV rays, which react with the Methylparaben accumulated in the skin. This leads to discoloration, skin damage and neoplastic changes.[13] The Scientific Committee on Consumer Safety has reiterated its previous conclusion that the continued use of 4-methylparaben and ethylparaben as preservatives in cosmetics at the maximum authorized concentrations is considered safe for human health at 0.4% for 1 ester or 0.8% when used in combination.[14]

Aim
Analysis and evaluation of sociodemographic and psychosocial factors related to the level of knowledge of young people about parabens in cosmetics.

Material and methods
Organization and the study group
Three hundred students from randomly selected colleges in Subcarpathian Province took part in the study, i.e. University of Rzeszów, University of Information Technology and Management and the State Higher School of Technology and Economics. From among all the students, 100 members of medical, non-medical and cosmetology majors were drawn at random. The division of the students was important for showing the level of the knowledge about parabens. The students from nursing, public health and nutrition majors were randomly drawn to the medical group. The group of non-medical majors included students from the following majors: material engineering, mathematics and computer science. The third group formed students with a cosmetology major. The average age of the respondents was 23.3. The youngest student was 19 years old and the oldest one was 35 years old. The largest group of respondents were the people at the age of 21-25 (57%, N = 171), living in the countryside (59%, N = 177). In this group there were more women – (60.3%, N = 181) than men (39.6%, N = 119).

Research procedure
The research method used in this research was the diagnostic poll method. The author's questionnaire was used, which consisted of a statement, a scale of attitudes and a test of knowledge as well as a standardized the Multidimensional scale of Health Locus of Control tool (MHLC).The first part was respondent particulars, for collecting information about respondents such as: age, education, field of study, place of residence, and interests. The second part was a knowledge test, which was aimed at checking the general level of knowledge about parabens. The test consisted of 20 questions, which concerned: knowledge of the concepts related to parabens, products that most often have parabens in their compo-

sitions, their impact on the human body and the purpose of adding these substances to cosmetics. The third part was the scale of attitudes towards parabens, developed using the 5-point Likert scale. The Multidimensional Health Locus of Control (MHLC) - version B by Wallston and De Vellis in Juczyński's adaptation consists of 18 statements evaluated on a six-point Likert scale. MHLC has three dimensions. The internal dimension determines the extent to which the body is responsible for its own health. The other two dimensions represent man as a person whose aspirations are dictated by the influence of other people or accidental events. In each of the three dimensions, eight combinations of possible connection types can be distinguished: strong-internal, strong-external, diminishing and magnifying the influence of others, diminishing and magnifying the impact of coincidence, undifferentiated strong and weak.[15-16] The study was approved by the Ethics Committee of the University of Rzeszów.

Statistical analysis

For the purpose of this work, for the verification of the hypotheses, the following tests were used for questions on nominal scales: Kramer's V, Phi and in the situation when the dependent variable was on the quantitative/order scale and the independent variable on the qualitative scale, the nonparametric Kruskal-Wallis test (for more than 2 trials) was used. The statistical analysis was carried out using the SPSS program and all relationships are statistically significant when $p<0.05$.

Results

Statistical analysis showed that 2.3% (N=7) of respondents are characterized by a very high level of knowledge about preservatives in cosmetics. A high level of knowledge was presented by 14% of respondents (N=42). A low level of knowledge was shown by 36% (N=108), and very low by 17.3% (N=52) of people. It can be noticed that the age of respondents diversified their level of knowledge about preservatives added to cosmetics (p=0.05, Kendall's Tau-c = 0.08). In the percentage approach, the respondents at the age of 31-35 were characterized by a slightly higher level of knowledge about parabens in cosmetics than younger respondents (5.9%). Comparing percentage figures, it can be seen that students of cosmetology had a higher level of knowledge than students of other majors. The respondents from medical faculties were characterized by a lower level of knowledge about parabens than students of non-medical majors (45% vs. 32%). The respondents who were interested in cosmetology were more likely to have a high and very high level of knowledge about parabens (18%, 10%) than those with other interests (table 1).

The motifs that young people were governed by when choosing cosmetics also diversified their level of knowledge about preservatives added to care products.

Table 1. The general level of knowledge of the subjects on parabens and selected sociodemographic data

		The level of knowledge about parabens											
		Very low		Low		Moderate		High		Very high		Altogether	
		N	%	N	%	N	%	N	%	N	%	N	%
Age	18-20 years	15	20.0	32	42.7	21	28.0	5	6.7	2	2.7	75	100
	21-25 years	29	17.0	56	32.7	58	33.9	24	14.0	4	2.3	171	100
	26-30 years	5	13.5	13	35.1	10	27.0	9	24.3	0	0	37	100
	31-35 years	3	17.6	7	41.2	2	11.8	4	23.5	1	5.9	17	100
	Altogether	52	17.3	108	36.0	91	30.3	42	14.0	7	2.3	300	100
	p=0.05, Tau-c Kednalla=0.08												
Field of study	Medical	19	19.0	45	45.0	28	28.0	7	7.0	1	1.0	100	100
	Cosmetology	17	17.0	31	31.0	28	28.0	18	18.0	6	6.0	100	100
	Non-medical	16	16.0	32	32.0	35	35.0	17	17.0	0	0	100	100
	Altogether	52	17.3	108	36.0	91	30.3	42	14.0	7	2.3	300	100
	p=0.02, V Kramer=0.18, Chi-kwadrat=18.88												
Interests	Cosmetology	8	16.0	18	36.0	10	20.0	9	18.0	5	10.0	50	100
	Medicine	20	15.7	45	35.4	46	36.2	15	11.8	1	0.8	127	100
	Culinary	6	14.3	20	47.6	8	19.0	8	19.0	0	0	42	100
	Hairdressing	4	33.3	2	16.7	3	25.0	3	25.0	0	0	12	100
	Fashion	9	22.0	13	31.7	16	39.0	3	7.3	0	0	41	100
	Other	5	17.9	10	35.7	8	28.6	4	14.3	1	3.6	28	100
	Altogether	52	17.3	108	36.0	91	30.3	42	14.0	7	2.3	300	100
	p=0.04, V Kramer =0.16												

Table 2. The general level of knowledge about parabens and the motives of cosmetics selection

		The level of knowledge about parabens											
		Very low		Low		Moderate		High		Very high		Altogether	
		N	%	N	%	N	%	N	%	N	%	N	%
Reading the composition of cosmetics	Yes, always	3	6.3	8	16.7	17	35.4	15	31.3	5	10.4	48	100
	Yes, sometimes	34	17.0	74	37.0	65	32.5	25	12.5	2	1	20	100
	No, never	12	29.3	22	53.7	6	14.6	1	2.4	0	0	41	100
	I have no opinion	3	27.3	4	36.4	3	27.3	1	9.1	0	0	11	100
	Altogether	52	17.3	108	36.0	91	30.3	42	14.0	7	2.3	300	100
p<0.001, V Kramer =0.24													
The price of products proving the presence of parabens in cosmetics	Yes, the high price guarantees no parabens	11	57.9	5	26.3	0	0	3	15.8	0	0.0	19	100
	The price does not guarantee this	17	9.8	55	31.6	60	34.5	35	20.1	7	4.0	174	100
	I did not think about it	6	9.7	28	45.2	25	40.3	3	4.8	0	0	62	100
	I do not know	18	40.0	20	44.4	6	13.3	1	2.2	0	0	45	100
	Altogether	52	17.3	108	36.0	91	30.3	42	14.0	7	2.3	300	100
p<0.001, V Kramer =0.29													
Emotions related to labeling cosmetics "product contains parabens"	Yes	3	4.3	16	23.2	27	39.1	16	23.2	7	10.1	69	100
	No	26	20.3	45	35.2	38	29.7	19	14.8	0	0	128	100
	I do not read packages	7	17.5	18	45.0	12	30.0	3	7.5	0	0	40	100
	I do not stress because I do not know what parabens are	16	25.4	29	46.0	14	22.2	4	6.3	0	0	63	100
	Altogether	52	17.3	108	36.0	91	30.3	42	14.0	7	2.3	300	100
p<0.001, V Kramer =0.24, Chi-kwadrat=50.21 (df=12)													

Table 3. General knowledge about parabens and MHLC

			The level of knowledge about parabens				
			Very low	Low	Moderate	High	Very high	Altogether
MHLC type	strong-internal	N	8	30	37	22	5	102
		%	15.4	27.8	40.7	52.4	71.4	34.0
	strong-external	N	1	2	1	0	0	4
		%	1.9	1.9	1.1	0	0	1.3
	diminishing the influence of others	N	5	13	14	5	1	38
		%	9.6	12.0	15.4	11.9	14.3	12.7
	magnifying the influence of others	N	3	7	2	0	0	12
		%	5.8	6.5	2.2	0	0	4.0
	diminishing the impact of coincidence	N	5	15	12	9	1	42
		%	9.6	13.9	13.2	21.4	14.3	14.0
	magnifying the impact of coincidence	N	6	7	3	0	0	16
		%	11.5	6.5	3.3	0	0	5.3
	undifferentiated strong	N	8	12	13	4	0	37
		%	15.4	11.1	14.3	9.5	0	12.3
	undifferentiated weak	N	16	22	9	2	0	49
		%	30.8	20.4	9.9	4.8	0	16.3
	Altogether	N	52	108	91	42	7	300
		%	100	100	100	100	100	100
p=0.01, V Kramer =0.20								

The respondents who read the composition of cosmetics more often than others have high and very high knowledge about parabens contained in cosmetics (31.3%, 10.4%).The respondents who thought that the high price would ensure the lack of preservatives in cosmetics were characterized by a very low level of knowledge (57.9%). However, in people who are of the opinion that the price of the product does not guarantee the absence of parabens in cosmetics, there was a higher level of knowledge about them (4.0%). The respondents with a very high level of knowledge about preservatives are stressed to a greater extent than people with a very low level of knowledge when they reach for cosmetics with paraben content (10.1% vs 4.3%) (table 2).

Analyzing the results of the Health Locus of Control, it can be seen that young people were most often characterized by an intrinsically strong type (34%, N=102). Slightly fewer people exhibited the undifferentiated weak type (16.3%, N=49). The type magnifying the influence of others was found in 4% of respondents (N=12), and the type magnifying coincidence in 5.3% (N=16). The subjects with a very high level of knowledge about parabens contained in the cosmetics were much more likely than the others to have an intrinsic type (71.4%). Respondents with a very low level of knowledge more often exhibited the undifferentiated weak type (30.8%) (table 3).

Discussion

The level of knowledge of young people in Poland about preservatives added to cosmetics is very low. Woźniak-Holecka in her study reports that 38.58% of respondents have heard about parabens, but they do not have detailed information about them and cannot describe the impact of these substances on the body.[17] The author's own research shows that only 2.3% of respondents have a very high level of knowledge about preservatives in cosmetics. 45.3% of the respondents have heard about these preservatives, but not everyone knows how these substances work. A survey conducted among young women in South Asia shows that only 10% of the group under study exhibits a high level of knowledge about substances in cosmetics.[18] The fact that people do not read the chemical compositions of cosmetics is also a big problem. Kleszczewska E. and Jaszczuk A. in their study showed that women read labels of products only occasionally (39%), and 22% of respondents do not read them at all.[4] In the author's own study only 16.0% of the respondents admitted that they always read the composition of cosmetics. Research showing the lack of interest in cosmetics labels can be readily found worldwide. Soyun Cho et al. showed that in Korea, 79.2% of residents admitted to buying cosmetics without reading their composition.[19] Noiesen et al., after carrying out a questionnaire sur-

vey, concluded that for 46% of people reading the ingredients of cosmetics is too difficult and presented the fact that it is closely related to the low level of education of these people. This stems not only from the low level of knowledge about preservatives in cosmetics, but also from poor knowledge in the area of medical sciences.[20] Azam A. et al. showed that according to customers, the brand and high price will ensure high-class products.[21] The author's own study shows that people with a very low level of knowledge about preservatives added to cosmetics believe that a high price will guarantee them a cosmetic without paraben content. People who know what parabens are and how they impact the human body are aware that in most cosmetics, regardless of their price, one can find preservatives. Our own study showed that there is a considerable correlation between the Health Locus of Control and the level of knowledge about preservatives added to cosmetics. Statistical analysis shows that the majority of respondents are characterized as an internally strong type. These people believe that their health depends only on themselves. These individuals are characterized by a high level of knowledge about parabens. They realize that their level of health depends only on them, which is why they do not opt for cosmetics with preservatives. The subjects of the type magnifying the impact of coincidence and the type that magnifies the influence of other people have a very low and low level of knowledge about parabens to a greater extent. People with these types of MHLC believe that their health depends on other people or is coincidental. They are not interested in the composition of cosmetics until someone makes them interested in this topic or instruct them in the drugstore which cosmetics they should choose. Drugstore and pharmacy assistants play a big role in disseminating information about cosmetic ingredients. Educational materials may be helpful. A study published by Holt. et al. shows that people of the type that magnifies the impact of coincidence and the type that magnifies the influence of others are more sensitive to educational materials than those of the type with inner strength.[22] In the author's own study, 34.3% of the respondents admitted that during the next visit to a drugstore they would ask the assistant about parabens. This indicates that the employees of cosmetics stores enjoy high public confidence and should reliably broaden their knowledge and support clients in choosing the right cosmetics.[21]

Conclusions

The level of knowledge about parabens is low among young people. The low level of knowledge is caused by the lack of interest in cosmetic ingredients and selecting them according to their price. The age of the respondents influences their level of knowledge about parabens. The older the person has more knowledge about

parabens. Respondents interested in cosmetology had a greater level of knowledge about parabens than people with other interests. People who read the composition of cosmetics have a high level of knowledge about parabens. Respondents who think that the high price of cosmetics will ensure the lack of preservatives have a low level of knowledge about parabens. The respondents with a low level of knowledge about cosmetic ingredients are of the MHLC type magnifying the impact of coincidence and the type magnifying the influence of others. The respondents who thought that their health depends only on them had a high level of knowledge about parabens. Teach the public about substances added to cosmetics. Educational materials and social campaigns may be helpful.

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