



Beauty salon customers' knowledge about active substances used in aging skin care

Wiedza klientów gabinetów kosmetycznych na temat substancji aktywnych wykorzystywanych w pielęgnacji skóry starzejącej się

ABSTRACT

Skin aging is a natural, inevitable, biological and genetic process, which is defined as a set of irreversible changes that progress over time. It is believed that the first signs of skin aging are already visible at the age of 25. During this process, the biological involvement of the body's cells in its renewal is reduced, and regeneration processes slow down.. In order to maintain a good appearance, the help of an experienced cosmetologist is necessary, starting from proper skin diagnostics, followed care recommendations, to professional anti-aging therapies. No less important is the knowledge of active substances with anti-ageing potential. The aim of the study was to investigate the knowledge of beauty salon customers about active substances used in aging skin care.

Keywords: anti-aging, skin aging, active substances, skin care

STRESZCZENIE

Starzenie się skóry to naturalny, nieunikniony, biologiczny oraz genetyczny proces, który jest określany jako zespół nieodwracalnych i postępujących w czasie zmian. Stwierdza się, że pierwsze oznaki starzenia się skóry są już widoczne w 25. roku życia. Podczas tego procesu zmniejsza się biologiczne zaangażowanie komórek organizmu w jego odnowę, spowolnieniu ulegają procesy regeneracji. Aby móc zachować dobry wygląd, konieczna jest pomoc doświadczonego kosmetyka, począwszy od właściwej diagnostyki skóry, poprzez zalecenia pielęgnacyjne, po profesjonalne terapie *anti-aging*. Niemniej ważna jest wiedza na temat substancji czynnych o potencjale przeciwstarzeniowym.

Celem pracy była ocena wiedzy klientów salonów kosmetycznych na temat substancji aktywnych wykorzystywanych w pielęgnacji skóry starzejącej się.

Słowa kluczowe: *anti-aging*, starzenie się skóry, substancje czynne, pielęgnacja skóry

INTRODUCTION

The body's ageing process is characterised by the personal nature of the changes and their individual development and speed of progression [1]. Visible signs of skin ageing include dryness, flabbiness and wrinkles which progress with age. The clinical picture of endogenous ageing is mainly manifested

by epidermal thinning, while ageing associated with extrinsic factors, including primarily sun exposure, is manifested by skin thickening, deep wrinkles, furrows, pigmentary changes and telangiectasias [1-3]. Skin that is directly exposed to negative external factors undergoes the ageing process faster



and more easily than other organs of the human body, and the result of this process is more rapidly noticeable [1-5].

TYPES OF SKIN AGEING

There are two types of skin ageing that can be distinguished. The first is due to external factors that are related to the environment, while the second is related to the influence of the body's internal factors. Intrinsic skin ageing is based on genetic aspects and is linked to disruptions in the normal functioning of the hormonal balance. It can be divided into chronological, intrinsic and physiological ageing. Intrinsic causes of ageing can include immune system dysfunction, vitamin deficiencies in the body, toxin accumulation, free radical damage and metabolic disorders [1, 3]. Factors contributing to a breach in the skin barrier include age, poor nutrition, dehydration, systemic disease, cancer, cardiovascular disease, nervous system disorders, mobility restrictions or complete immobilisation. Extrinsic ageing, which is directly related to environmental factors, is determined by the adverse effects of *ultraviolet radiation* (UV), infrared radiation, ionising radiation and X-rays, an unhealthy lifestyle and an unsuitable diet. Smoking also causes skin damage, degrades *deoxyribonucleic acid* (DNA) and causes premature cell cycle arrest [1, 3, 5].

THEORIES OF SKIN AGEING

There are many hypotheses and theories about the skin ageing process, which are not mutually exclusive. Genetic and telomeric theories attempt to explain the ageing process by taking genetic factors into account. The basis of the genetic theory is the claim that all degradation processes occurring in the body, are registered in the genotype of the organism [1, 3]. The telomere theory, on the other hand, is directly related to the function of telomerase, an enzyme whose function is to replicate chromosomes. The activity of this enzyme decreases with age. A reduction in the contribution of telomerase, which contributes to the reconstruction of dying telomeres, results in the loss of information required for life and leads to cell death. With each cell division, the length of telomeres is shortened, and this happens because their last sequences are not transcribed onto new DNA strands. This reduction in telomere length results in cellular dysfunction, preventing cells from dividing properly [1, 3, 6, 7]. One theory of skin ageing predicts that, with the passage of time, the body's ability to synthesise proteins decreases by approximately 20 to 80%. This is known as the protein disorder theory. During the ageing process, functional and structural changes occur, and protein synthesis is altered and impaired. The exact cause of this phenomenon has not been determined, but it is believed that the cause may be a decrease in the expression of genes encoding amino acids and the expression of genes responsible for self-destructive mechanisms [1, 6, 7]. The ageing process may also be associated with changes in the structure of cell

membranes (membrane theory). Modifications such as stiffening of cell membranes, loss of elasticity and change in viscosity occur with age and contribute to the progression of skin ageing. There is a significant decrease in water content, which is replaced by more lipids, which interfere with the transport of substances, impulses and heat across the membranes, resulting in the accumulation of toxic substances within the cells [1, 7]. Changes in the function and increased permeability of mitochondrial membranes are the basis of mitochondrial theory. Cell death is caused by deformations within the mitochondria. The number of defects continuously increases and the activity and number of cells decrease over time [1, 6, 7]. Another theory explaining the ageing process is the cross-linking theory (glycosylation theory), which is based on the assumption that an oxygen-mediated glucose molecule forms new, abnormal bonds with a protein. Functional changes occur in such a protein [1, 7]. The proper functioning of the endocrine system influences, to some extent, the delay in the ageing process of the organism. The level of hormone secretion and their effective action, unfortunately, decreases gradually with age. Reduced production of selected hormones influences the organism's ageing process, as discussed by the neuroendocrine theory. There is a disruption of the biological clock, as the perception of individual stimuli is disrupted [1, 8]. The last major theory attempting to explain the body's ageing processes is the free radical theory. It is based on the presence of free radicals, which are responsible for ageing and can cause cellular dysfunction. Transcription factors that stimulate cell differentiation processes are mobilised by low concentrations of reactive oxygen species. Exposure to excessively high concentrations of oxygen free radicals induces apoptosis in cells and eliminates cells that may pose a threat to the organism [1, 6, 8].

SELECTED ANTI-AGING SUBSTANCES

The skin ageing process is an inevitable phenomenon. The cosmetics market offers consumers a wide range of preparations designed for mature skin with visible signs of the ageing process. These contain a number of active substances, which include alpha hydroxy acids. A typical example of an alpha hydroxy acid is glycolic acid, which has a small molecule and a simple chemical structure. Its primary effect on the skin is to increase exfoliation processes and unblock the sebaceous gland outlets, increase skin elasticity and stimulate collagen and elastin production [9-11]. Another representative of alpha-hydroxy acids is lactic acid, which has a larger molecule than glycolic acid and thus shows weaker penetration into the skin. L-lactic acid stimulates ceramide production, resulting in improved skin hydration. The metabolic effect of lactic acid can already be observed at low concentrations [11, 12]. Another active substance used in the care of mature skin is mandelic acid. In low concentrations, it has a moisturising effect and also revitalises, improves elasticity and refreshes the skin [10, 13].

In addition to alpha-hydroxy acids, beta-hydroxy acids are also used in *anti-ageing* cosmetology. An example is salicylic acid, which shows anti-inflammatory properties, has a high affinity for lipids in the skin, penetrates the stratum corneum and enters the sebaceous glands, where it cleans clogged follicle orifices and reduces the formation of blackheads [1]. Among other things, it is used to reduce the effects of photo-ageing of the skin, perifollicular keratosis, hyperpigmentation and solar keratosis [9,10]. Polyhydroxy acids such as lactobionic acid and gluconic acid have also found their way into preparations for ageing skin. They belong to a new generation of acids, acting in a very gentle manner. They affect the overall appearance of the skin, and have an exfoliating and brightening effect on the skin's texture and quality. After their application, the skin barrier function is strengthened and water loss from the skin is reduced [1]. Gluconic acid has a strong moisturising effect by reducing transepidermal water loss. It penetrates the skin slowly and does not reach the lower layers of the skin, has a free radical neutralising effect, has a protective effect and strengthens the epidermal barrier. It protects the skin from the negative effects of UV radiation [10, 11, 14].

In diet as in skin care, the presence of vitamins is very important. Antioxidant vitamins are particularly used in anti-ageing cosmetology. One example is retinoids, active substances with biological action based on their ability to bind and activate retinoid receptors. They can be divided into three generations, due to differences in their structure and properties [9]. Natural retinoids belong to the first generation and are characterised by their non-selective action. This group can include retinol and its metabolites, such as retinal, tretinoin, isotretinoin, alitretinoin. Representatives of the second generation of retinoids include monoaromatic retinoids and synthetic analogues of vitamin A, e.g. aztrethine. Generation three retinoids are distinguished by their receptor-selective action; their representatives include bexarotene, adapalene and tazarotene [9, 15]. Vitamin C is an antioxidant and its action can be enhanced by the addition of vitamin E. It nullifies free radicals produced by UV radiation [16, 17]. Ascorbic acid influences the production of type I and III collagen and inhibits collagen breakdown induced by metalloproteinases. It attenuates the oxidation of cell membrane lipids, regenerates the oxidised form of α -tocopherol and β -carotene and contributes to the initiation of DNA repair processes. Vitamin C has a significant effect on reducing oxidative stress and inhibits the process of tumour formation. Thanks to vitamin C, ceramide synthesis is stimulated, resulting in an improvement in the tightness of the epidermal lipid barrier, thereby improving hydration and maintaining the skin's protective barrier at an appropriate level. Vitamin E is known as the "vitamin of youth" due to its antioxidant effects. Vitamin E includes tocopherols and tocotrienols, which are fat-soluble. It has the ability to neutralise the harmful effects resulting

from metabolic processes in the human body, thus slowing down the ageing process and the ill effects of environmental factors on the body. As a result of a decrease in vitamin E, an increase in permeability and a decrease in the fluidity of cell membranes can occur in the body [18].

Another active substance with proven anti-ageing effects is hyaluronic acid, which is naturally part of the dermis, where its function is to absorb and store water. As the ageing process progresses, the amount of hyaluronic acid in the skin decreases, leading to a deterioration of hydration, the formation of wrinkles and a decrease in elasticity. The synthesis of collagen and elastic fibres that occurs in the presence of hyaluronic acid eliminates the signs of ageing contributing to an improvement in skin condition. After application of hyaluronic acid to the skin, increased hydration levels, increased elasticity and firmness can be observed [9, 19-21]. A polypeptide with a similar action and function in the body is the aforementioned collagen. This protein is present in the dermis in the form of fibres, but their number decreases with age, resulting in a loss of firmness. Collagen is used in anti-ageing skin care products because it improves the firmness and elasticity of the skin. It is used in cosmetics, but does not replenish collagen loss in the skin; it acts as a substance, moisturiser, retains moisture in the intercellular spaces of the skin and has a supportive function [9, 22, 23].

Another group of compounds that have found application in *anti-ageing* cosmetology are biomimetic peptides. These are compounds produced by chemical synthesis and are designed to mimic natural compounds that direct metabolic processes. In skin cells, peptides mimic amino acid sequences and produce in the cells the potential to produce support proteins. Present in cosmetics, they signal and stimulate cells to produce new collagen, which promotes the maintenance of skin elasticity [24]. Peptides used in treatments for ageing skin have been shown to reduce wrinkles, promote the formation of new skin cells and moisturise, in addition to influencing cell proliferation, reducing melanin synthesis, which reduces the formation of hyperpigmentation, and lighten and brighten the skin [14, 25].

Co-enzyme Q10 is one of the elements involved in the respiratory chain. Due to its involvement in oxidative processes occurring in cells at the mitochondrial stage, it has also found application in anti-ageing cosmetology. For the cosmetologist, coenzyme Q10 is an antioxidant present in cell membranes and lipoproteins, protecting the skin from ageing too quickly. It smooths the skin and improves its elasticity. It exhibits thermostable properties. Its deficiency can result from genetic insufficiency or be a consequence of ageing. Coenzyme Q10 supplementation has a positive effect on the mitochondria, as it helps to store and generate energy in cells. It acts as an antioxidant without affecting ATP synthesis and mitochondria [19, 26].

PURPOSE OF THE WORK

The urge to keep a young appearance becomes increasingly crucial for most women and men as they age. Therefore, the main objective of this study was to assess the knowledge of customers of beauty salons on active substances with *anti-ageing properties* used in both home and salon care. Another goal was to gather information from respondents on their in-office treatment preferences, sunscreen use, ingredients sought in cosmetic formulations, and how this related to their expertise.

MATERIALS AND METHODS

The study was conducted between September 10 and September 24, 2022, among 120 randomly selected persons, 92% of whom were female and 8% were male. The survey sample included 29% of respondents aged 18 to 25, 17% of respondents aged 26 to 35, 20% of respondents aged 35 to 45 and 46 to 55, and 14% of respondents aged above 55. The research tool was a self-administered anonymous survey questionnaire, which included 24 closed single- or multiple-choice questions and three open-ended questions. The survey was conducted online, among clients of beauty salons.

RESULTS

Respondents chose 319 answers to a closed multiple-choice question about the early indications of skin ageing. Wrinkles were chosen by the majority of respondents (92%), while loss of elasticity was chosen by 74%. Skin thinning was chosen by 38% of respondents, followed by excessive dryness (33%), roughness (19%), enlarged pores (6%), and excessive oiliness

(3%). The first signs of skin ageing were not indicated by 2% of people (Figure 1).

Respondents were asked to indicate, in a closed multiple-choice question, factors that have a significant impact on the progression of the ageing process. A total of 603 responses were given, of which the most frequently chosen answer was "smoking" (83%), 78% of respondents indicated excessive exposure to sunlight, 72% of participants gave the answer "inadequate care", 68% of respondents marked the answer "inadequate diet", 64% of individuals gave the answer "genetics", the answer "stress" was given by 57% of respondents, and the answer "insufficient sleep" was marked by 54% of people. The answer "climate" was given by 10% of the respondents as factors that have a significant impact on the ageing process, "allergies" was the answer given by 7% of the participants, the answer "skin phototype" was given by 6% of the respondents, and the answer "occurrence of acne in youth" was marked by only 3% of the individuals (Fig. 2).

In a further multiple-choice closed question on how respondents deal with signs of skin ageing, the largest number of respondents (36%) said that they tried to treat the signs of ageing by using appropriate cosmetics, 27% said that they tried to treat the signs of ageing by using cosmetic procedures, 25% said that they lead a healthy lifestyle to delay the ageing process, and 12% said that they did not pay attention to the signs of ageing (Fig. 3).

The next closed-ended single-choice question asked about respondents' regular use of anti-ageing treatments in beauty salons. Of the 120 respondents, only 11% confirmed that they regularly use this type of treatment, while 44% sometimes

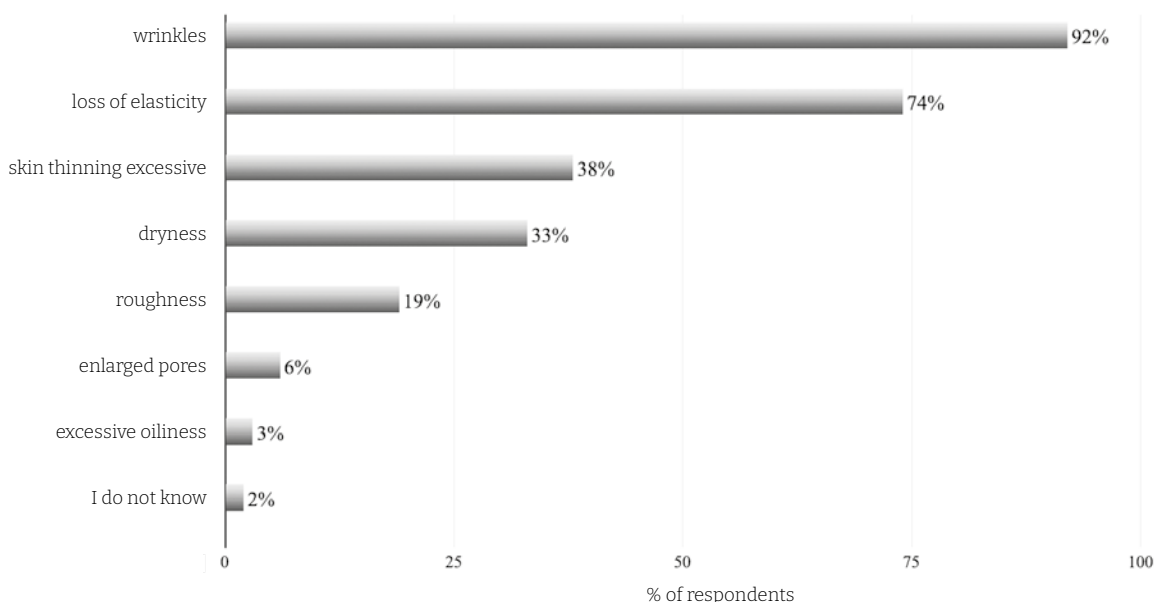


Fig. 1 First signs of ageing according to respondents

Source: Own elaboration

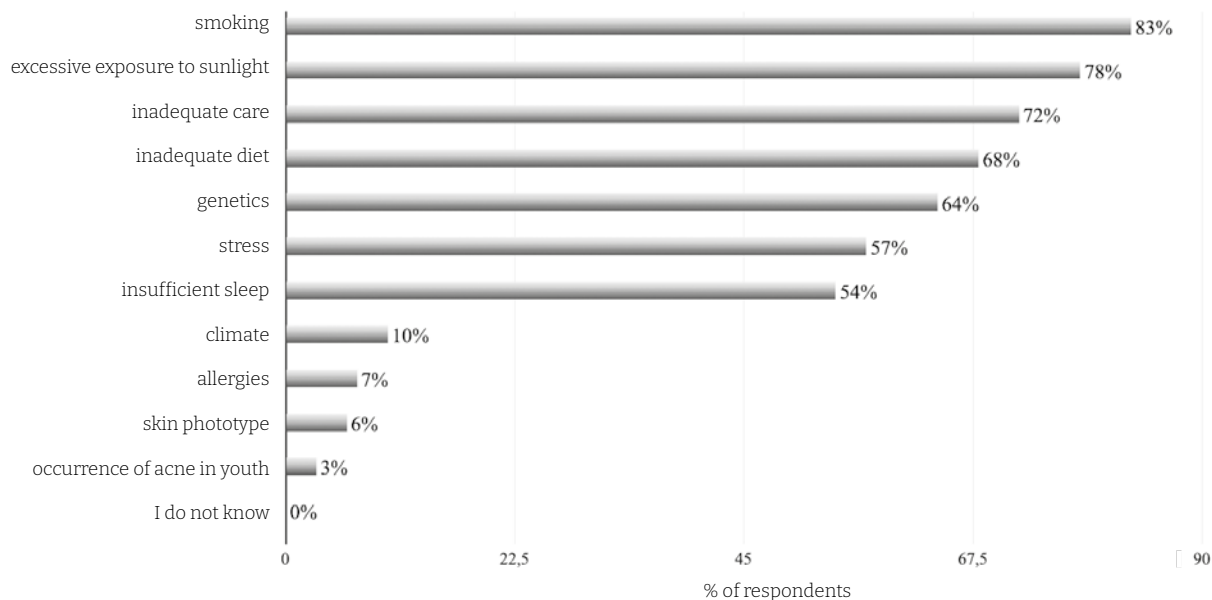


Fig. 2 Factors accelerating the ageing process identified by respondents
Source: Own elaboration

use such treatments. 45% of respondents do not choose *anti-ageing* treatments at all when visiting cosmetology practices (Fig. 4).

In an open question, respondents were asked to indicate the in-office treatments they use most often. Among the cosmetological treatments mentioned, the most frequently indicated answers were “acid peels” marked by 29% of respondents and “micro-needle mesotherapy” used by 18% of respondents. 12% of respondents ticked the answer oxygen infusion, 4% of respondents used algae, 3% of respondents were those who used a cleansing treatment. Other treatments such as carboxytherapy, cavitation peeling, Kobido massage, microdermabrasion, HIFU, direct current, IPL, hydrating masks, sonophoresis, hydrogen cleansing and facial massage were used by a total of 10% of respondents. A significant proportion of respondents, 24%, could not answer the question (Fig. 5).

In a further open-ended question, respondents were asked to list the active substances that work best for ageing skin care. Respondents gave several substances each- a total of 24 different answers were listed, and the most frequently mentioned among them were: collagen (33%), acids (31%) + mandelic acid (3%) + azelaic acid (1%) + glycolic acid (1%), hyaluronic acid (14%), coenzyme Q10 (13%), elastin (13%), retinol (13%) + vitamin A (3%), vitamins (8%) + vitamin C (5%) + vitamin E (2%) + vitamin D (1%) and aloe vera (7%). The responses given by respondents are shown in Table 1.

The next question was a closed multiple-choice question and asked respondents to indicate which active substances they look for in the composition of the cosmetics they buy. Of the available answers, 23% of respondents indicated that they choose cosmetics containing hyaluronic acid, 18% of

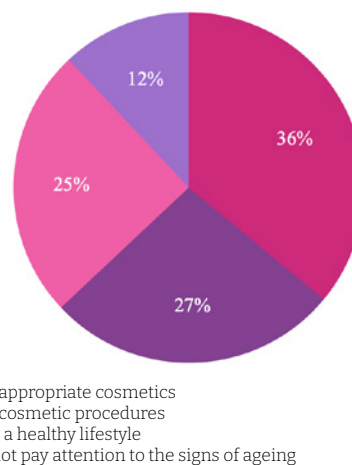


Fig. 3 Responders' management of the signs of skin ageing
Source: Own elaboration

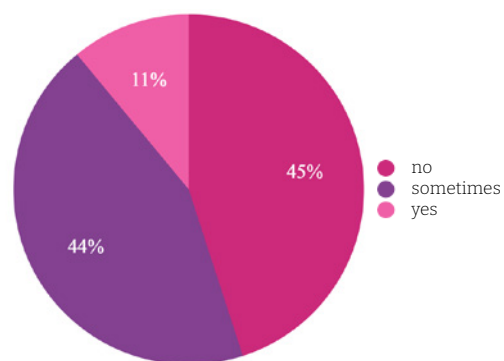


Fig. 4 Use of anti-ageing treatments in beauty salons by respondents
Source: Own elaboration

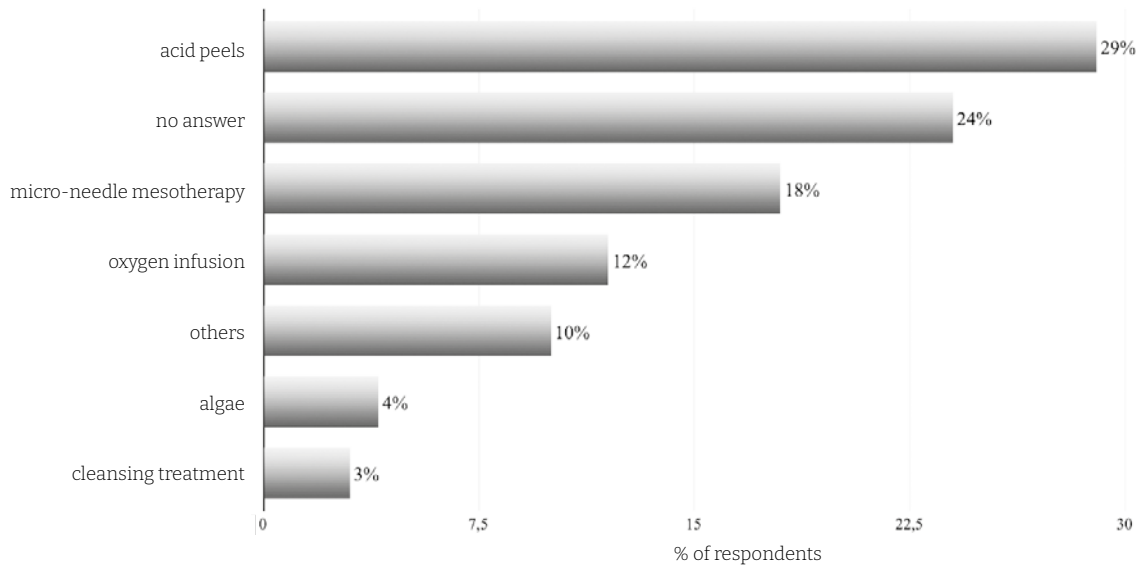


Fig. 5 Professional treatments used most frequently by respondents
Source: Own elaboration

respondents look for coenzyme Q10, AHA acids and vitamin C are chosen by 15% of respondents each. Peptides are chosen by 10% of respondents, vitamin A was indicated by 8% of respondents, vitamin D is sought by 3% of respondents, BHA acids were indicated by 3% of respondents, PHA acids are chosen by 2% of respondents and argan oil was indicated by 1% of respondents. At the same time, 5% of respondents declared that they do not pay attention to the content of active ingredients in the cosmetics they buy (Fig. 6).

When asked about the use of sunscreen, 26% of survey participants said that they use sunscreen on a daily basis, 63% of respondents use sunscreen only during the summer season, in case of high sun exposure, and 11% of respondents said that they do not use sunscreen on a daily basis (Fig. 7).

More than half of the respondents (56%) refer to vitamin E as the vitamin of youth, 10% of the respondents believe it is vitamin D, 8% of the respondents stated that vitamin C is called

that. The smallest group of respondents (2%) believes that the vitamin of youth is vitamin B, while 24% of respondents declared that they did not know anything about it (Fig. 8).

Another closed question concerned the definition of biomimetic peptides. Almost half of the respondents (49%) declared that they did not know what biomimetic peptides are, 41% of respondents answered that biomimetic peptides are compounds that work by mimicking those naturally occurring in the body, 9% of respondents answered that they are skin structural proteins and 1% of respondents answered that they are exfoliating substances used in chemical peels (Fig. 9).

When asked how hyaluronic acid is obtained, 20% of respondents answered that hyaluronic acid is obtained by biotechnological methods using bacterial cultures. 5% of respondents reported that hyaluronic acid is obtained by hydrolysis of bitter almond extract, 4% of respondents believe that it can be obtained from chicken combs and that it can

Table 1 Active substances used by respondents in care of ageing skin

Active substance	result [%]	Active substance	result [%]	Active substance	result [%]
collagen	33%	vitamin C	5%	argan oil	2%
acids	31%	vitamin A	3%	dietary supplements	1%
hyaluronic acid	14%	plant extracts	3%	selenium	1%
coenzyme Q10	13%	ceramides	3%	algae	1%
elastin	13%	mandelic acid	3%	azelaic acid	1%
retinol	13%	peptides	3%	Squalene	1%
vitamins	8%	oils	2%	glycolic acid	1%
aloe vera	7%	vitamin E	2%	vitamin D	1%

Source: Own elaboration

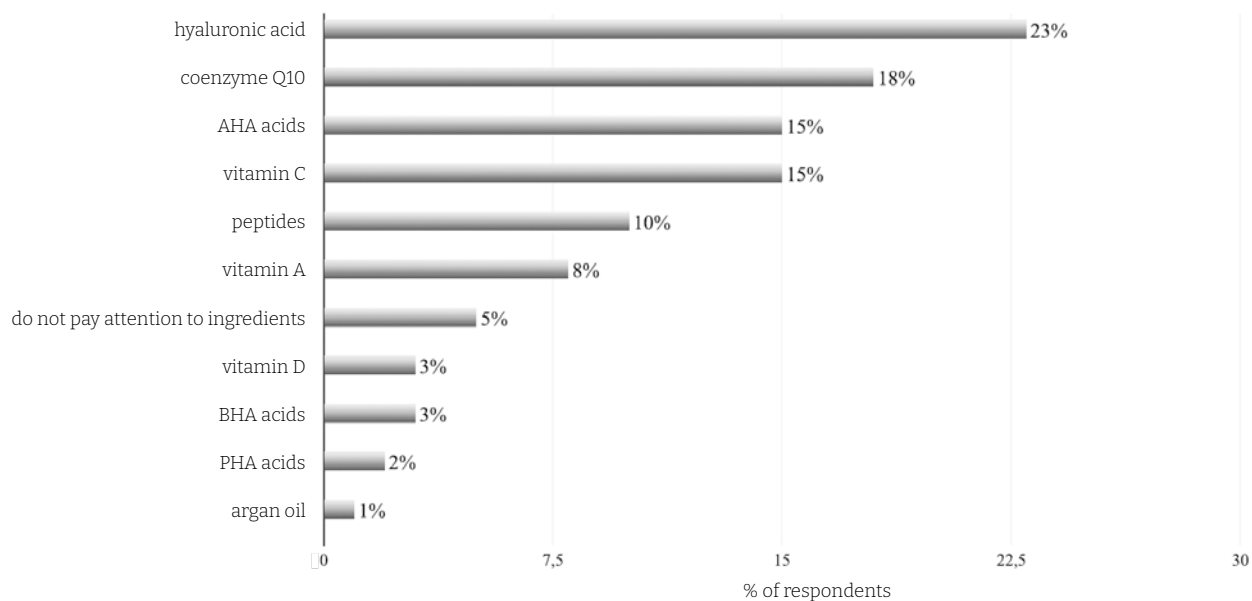


Fig. 6 Active substances sought by respondents in cosmetic formulations
Source: Own elaboration

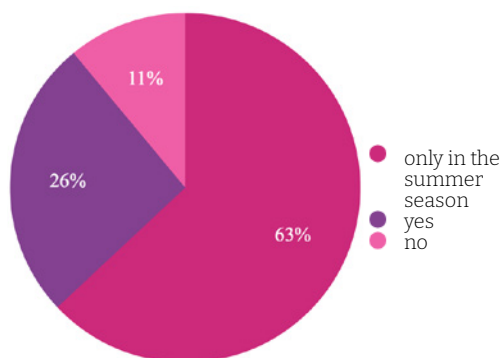


Fig. 7 Use of sunscreens by respondents
Source: Own elaboration

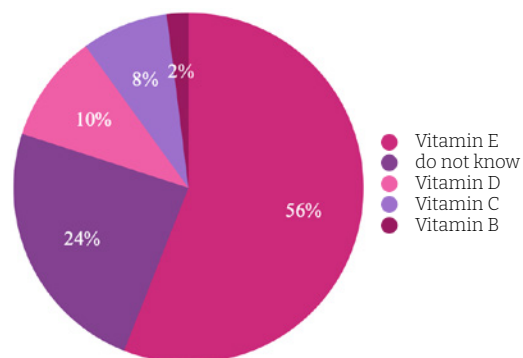


Fig. 8 Vitamins of youth according to respondents
Source: Own elaboration

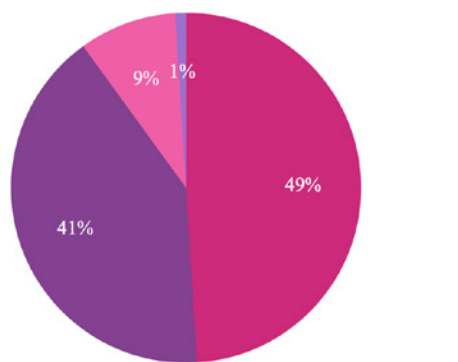


Fig. 9 Biomimetic peptides according to respondents
Source: Own elaboration

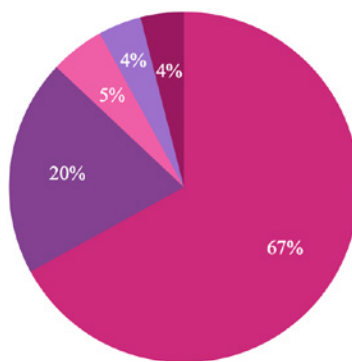


Fig. 10 Methods of obtaining hyaluronic acid according to respondents
Source: Own elaboration

be isolated from legume stems. At the same time, by far the largest proportion of respondents, 67%, answered that they did not know how hyaluronic acid could be obtained (Fig. 10).

DISCUSSION

The drive to maintain a youthful appearance is resulting in an increased interest in anti-ageing prevention. The results presented in this study provide some insight into the respondents' knowledge of active substances used in the care of ageing skin, the causes of degenerative processes and proper care of mature skin. This is due to the randomly selected group of respondents and the number of substantive issues that cannot be covered in a single survey.

The vast majority of survey participants are familiar with the symptoms and causes of skin ageing, and are well aware of factors that have a significant impact on the progression of degenerative changes in the skin. Cigarette smoking was the factor most frequently cited by respondents as having a significant impact on the progression of the skin ageing process, followed by factors negatively affecting the skin such as overexposure to sunlight, inadequate skin care, genetic conditions, poor diet and stress. Similar results were obtained in a study by Wronowska and Rodak (2020), where almost half of the respondents believe that the skin ageing process is influenced by stimulants, 38% of the respondents indicated genetic conditions, 31% of the respondents indicated hormonal factors, 30% of the respondents attributed it to inadequate home care, and 27% of the respondents indicated a lack of professional anti-ageing care at a cosmetology salon [2]. An important part of caring for the skin is both avoiding unfavourable external factors and using appropriately selected home care, as well as taking advantage of professional cosmetological treatments, which are designed to accelerate metabolism and influence skin structure remodelling, regeneration and wrinkle reduction. In the self-reported survey, almost half of the respondents did not use or rarely used treatments to delay the skin ageing process. Popular cosmetological treatments include chemical peelings based on organic acids, mechanical peelings, e.g. microdermabrasion, oxybrasion and physical peelings, e.g. laser action, which accelerates cell renewal by exfoliation, stimulating collagen, elastin and glycosaminoglycan synthesis and additionally tightening the skin. Such treatments are often a prelude to intensive anti-ageing treatment and are combined with preparations in the form of serums and masks, rich in nutrients and regenerating ingredients. Cosmetic procedures also make use of devices that activate repair processes in the skin and tissue remodelling by inducing controlled micro-damage, e.g. micro-needle mesotherapy, which through intradermal injection enables deep nourishment, regeneration of skin structures, revitalisation, improvement of tension and correction of shallow wrinkles [2]. In our own study, when

asked which cosmetological procedures respondents used, almost half of the respondents cited acid peels and micro-needle mesotherapy. Less frequently, respondents indicated professional carboxytherapy treatments, microdermabrasion, high-intensity focused ultrasound (HIFU), direct current, intense pulsed light (IPL) or sonophoresis.

Maintaining a well-balanced diet is not only important in the prevention of disease, but can also contribute to improving skin condition. An inadequate diet has long been recognised as one of the most important risk factors for systemic premature ageing, and an adequate diet rich in vitamins and minerals is recommended. In the survey conducted, respondents were asked to provide methods for caring for their skin. Only one-fifth of the respondents indicated that they eat properly and provide their body with adequate water. People with nutritional deficiencies show changes and abnormalities such as dehydration of the skin, loss of density and firmness and abnormal colouration. People who drink too little fluid have significantly wider wrinkles, more discolouration and larger pores. There is no uniform pattern of recommended diet; guidelines are individualised, depending on lifestyle and health status [27].

Nowadays, young and healthy-looking skin is associated with beauty, success and happiness and is therefore the goal of many women and men around the world. Anti-ageing cosmetology combines preventive and restorative measures. The process of regeneration and remodelling of the skin takes time, and one has to wait for the results, which is why most of the procedures performed in a cosmetology salon are intended for people aware that the condition of appropriate effects is not only proper skin care, but also patience and full compliance with the cosmetologist's recommendations. Proper care should be characterised by regularity and be based on moisturising the skin. Attention should be paid to the type and amount of active ingredients in the cosmetics used. A survey of respondents' knowledge and awareness of the active ingredients used in ageing skin care cosmetics showed that respondents were quite familiar with and able to name these ingredients. The largest proportion of respondents stated that they choose cosmetics containing hyaluronic acid, rich in coenzyme Q10, hydroxy acids: alpha hydroxy acids (AHA), beta hydroxy acids (BHA) and poly hydroxy acids (PHA), vitamins A and C or peptides. Only a minority of respondents declared that they do not pay attention to the content of active ingredients in the cosmetics they use. The results of our own study are comparable to those of a study conducted by Wronowska and Rodak (2020), where the most frequently mentioned active substances were hyaluronic acid 17.52%, retinol 14.28% collagen 12.98%, vitamin C 11.69%, coenzyme Q10 8.44%, vitamin E 7.14%, as well as peptides, elastin, ceramides and AHA acids. According to the results of this study, few respondents (5.19%) are not familiar with *anti-aging* ingredients [2].

The use of sunscreens is an effective and convenient way to protect against early skin ageing. UV filters are among the substances that should act primarily on the skin's surface. In addition to the radioprotective substances that protect the skin against UVA and UVB radiation, cosmetics also use substances that interrupt UV-induced photochemical chain reactions. In a study by Sikora, Szlachta, Pikor et al. (2018), respondents were asked whether they use cosmetics with sunscreen on a daily basis. Only 16% of respondents answered in the affirmative, while the majority of respondents use sunscreen cosmetics when sunbathing (78.4%) [28]. Similarly, in our own study, when asked whether respondents use sunscreen on a daily basis, only 26% of respondents answered in the affirmative, and the majority of respondents (63%) indicated that they only use sunscreen during holidays in case of high sun exposure.

A valuable ingredient in anti-ageing preparations is vitamin E, which has the ability to neutralise the harmful effects of metabolic processes in the human body, slows down the ageing process and minimises the bad effects of environmental factors on the body. Vitamin E has anti-inflammatory effects, prevents irritation, soothes, protects the skin from erythema and swelling, has a beneficial effect on skin nutrition, and improves the elasticity of the epidermis and dermis. It has properties that accelerate the removal of skin discoloration, promotes the removal of free radicals, inhibits the radical oxidation of fatty substances, builds into the lipid structures of the skin, which improves the protective properties of the epidermis and cell membranes, and promotes the prevention of the skin ageing process [29]. In our own study, when asked "Which vitamin is called the vitamin of youth?", the majority of respondents indicated the correct answer that the vitamin of youth is called vitamin E.

Processes in living organisms require the presence of specific modulating substances. These include naturally occurring peptides and cell growth factors. The amount of peptides in the human body decreases with age and, as a result, cellular repair and metabolic processes are weakened and disrupted [30]. Harmful external factors and skin ageing are responsible for the degradation of proteins, resulting in protein dysfunction leading to sagging, loss of skin elasticity and the appearance of wrinkles. Peptides have applications in treatments for ageing skin, helping to reduce wrinkles, showing a moisturising effect and promoting the formation of new skin cells. In the self-reported survey, less than half of the respondents demonstrated knowledge of biomimetic peptides, correctly stating the answer that biomimetic peptides are compounds that work by mimicking those naturally occurring in the body.

In modern cosmetology and aesthetic medicine, hyaluronic acid is often used in both less invasive treatments such as iontophoresis or needle-free mesotherapy and more invasive treatments such as fillers. Hyaluronic acid is

a moisturising substance that acts as a humectant, binding water in the epidermis, which is why it is often used in anti-ageing cosmetics. It has hygroscopic properties, resulting in an improvement in the function of skin structural proteins. In our own study, when asked "How can hyaluronic acid be obtained?" only 24% of respondents indicated the correct answers that hyaluronic acid is obtained by biotechnological methods using bacterial cultures or can be obtained from cockles. Significantly better results were presented in a study conducted by Aleks and Rost-Roszkowska, where an attempt was made to assess the knowledge of a selected group of women regarding methods of obtaining and purifying hyaluronic acid. As many as 53% of the respondents marked the correct answer regarding bacterial strains [31].

CONCLUSIONS

1. Respondents are aware of factors that have a significant impact on the progression of degenerative changes in the skin.
2. Respondents are familiar with and select active substances recommended for the care of ageing skin.
3. Few respondents use sun protection and receive regular treatments at a cosmetology salon.
4. The majority of respondents are able to identify substances with anti-ageing effects, but detailed knowledge of individual substances is insufficient.

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