

SAMPLE RESULT



Name: John

Date of the test: 9.8.2020

Surname: Smith

Test code: AABCC112233









WHAT YOU WILL FIND IN THE RESULT

The H4H result provides information on the concentrations of nutritional and toxic elements in the test organism. The levels of individual micro and macro elements, the load of toxic elements, and the resulting vitamin deficiencies, hormonal imbalance, and the level of resistance to stress reflect the causes of the problem of hair loss and the deterioration of its overall health and condition.







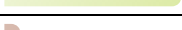



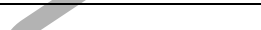
The use of diet and supplementation based on the H4H result enables the inhibition of hair loss and stimulation of their physiological growth. It allows the body to restore the biochemical balance responsible for its healthy look and proper condition.

H4H TEST RESULT

CONCENTRATION OF NUTRITIONAL ELEMENTS – MACRO-ELEMENTS

Element	Patient result (ppm)	Normal value	DEFICIT	NORM	EXCESS
Potassium(K)	101	75 – 125			
Phosphorus(P)	175	110 – 210			
Magnesium(Mg)	63	20 – 50			
Sulfur(S)	50,974	20,000 – 35,000			
Sodium(Na)	101	100 – 310			
Calcium(Ca)	635	220 – 380			

CONCENTRATION OF NUTRITIONAL ELEMENTS – MICRO-ELEMENTS

Element	Patient result (ppm)	Normal value	DEFICIT	NORM	EXCESS
Chromium(Cr)	0.07	0.6 – 1.1			
Iodine(I)	1.79	3.5 – 6			
Cobalt(Co)	0.0381	0.035 – 0.06			
Silicon(Si)	43.5	35 – 65			
Lithium(Li)	0.048	0.038 – 0.05			
Manganese(Mn)	0.17	1 – 1.9			
Copper(Cu)	10.3	9.5 – 17.5			
Selenium(Se)	0.06	0.6 – 1.1			
Vanadium(V)	0.0039	0.04 – 0.08			
Iron(Fe)	7.4	14 – 24			
Zinc(Zn)	182	120 – 220			

CONCENTRATION OF TOXIC ELEMENTS

Element	Patient result (ppm)	Maximum value	EXCESS
Arsenic(As)	0.171	0.6	
Barium(Ba)	1.41	1.5	
Aluminium(Al)	5.36	10	
Cadmium(Cd)	0.156	0.3	
Nickel(Ni)	0.45	2.6	
Lead(Pb)	0.97	4	
Mercury(Hg)	0.064	0.5	
Strontium(Sr)	0.95	4.1	
Thallium(Tl)	0.00001	0.0015	

PROPORTION OF NUTRITIONAL ELEMENTS

Proportion	Patient result (ppm)	Normal value	TOO LOW	WITHIN NORM	TOO HIGH
Sodium(Na) Potassium(K)	1	1.92 - 2.88			
Sodium(Na) Magnesium(Mg)	1.61	3.2 - 4.8			
Calcium(Ca) Magnesium(Mg)	10.08	5.6 - 8.4			
Calcium(Ca) Phosphorus(P)	3.63	2.08 - 3.12			

Tendency of tested hair to have disturbed growth and fall off:

High growth disturbance and heavy prolapse Moderate growth disturbance and prolapse Correct course of hair development cycle



Hair tendency to be dry and brittle:

Very dry hair without moisture Moderate dryness, too little hydration Correct level of hydration

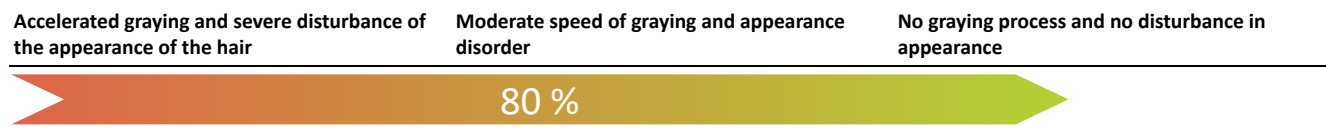


Hair tendency to lack bounce and strength:

No elasticity, low tensile strength Moderate elasticity and tensile strength High resilience and tensile strength



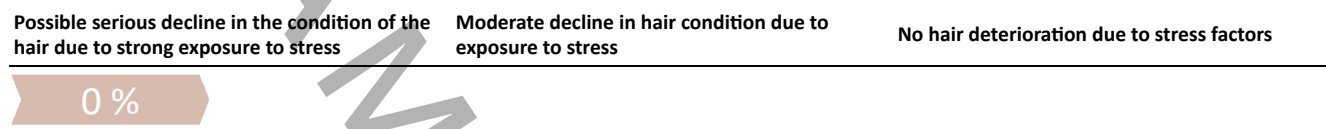
Hair tendency to turn gray and have impaired texture (appearance):



Hair condition versus hormonal balance:



Hair condition on the background of the stress exposure:



Every organism is exposed to toxic elements that enter it from the external environment. The presence of such elements is therefore inevitable and, in excess, dangerous to health.

The H4H study was performed using the ICP-OES technique - optical emission spectrometry with excitation in inductively coupled plasma. Analyzed on the Avio 200 PerkinElmer spectrometer by the analyst technician, Lifeline Diag laboratory:

The description of the result was prepared based on the cooperation and analysis of a team of trichologists and nutritionists cooperating with the Lifeline Diag laboratory.

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starszy technik analityki

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SAMPLE RESULT

I. APPEARANCE, STRENGTH AND CONDITION OF HAIR

Disturbances in growth and loss

Hair grows out of the holes in the epidermis called hair follicles. The hair growth cycle consists of alternate overlapping phases. These cycles (hair follicles go through these cycles 30 times in human life) proceed at a suitable pace and are closely influenced by many factors, including mineral balance. Each hair grows for several years, then it drops, and another one appears in its place.

Hair covers almost the entire surface of the skin. In the case of the scalp, we are talking about the so-called pilosebaceous units, i.e. groups of hair follicles from which 3-4 hairs grow simultaneously. Their growth rate is about 0.37–0.44 mm per day (in men it is slightly higher than in women) and is the most intense between the ages of 15 and 30.

Phases of hair development cycle:

- **Anagen** – the active phase of hair growth in the hair follicle, the length of which is genetically determined and lasts from 2 to 7 years. About 90% of the hair on the head should be in this stage. Hence, it is assumed that proper loss is limited to 50-100 hairs a day. A higher loss rate, lasting several weeks, could indicate illness or an unhygienic lifestyle, such as poor diet and nutrient deficiencies. When the anagen phase is shortened, the hair bulb becomes weaker, the hair is thinner, falls out faster and in greater amounts, and each subsequent cycle (of which the number is limited) will accelerate the condition that can lead to baldness.
- **Catagen** – after the end of the growth phase, the hair goes into the catagen phase, or transitional phase, which lasts from 14 to 21 days. Reconstruction processes take place at the hair's root, its matrix disappears and the hair is pushed towards the surface of the skin. About 3% of the hair on the head is in this phase.
- **Telogen** – the hair loss phase, in which the hair is completely dead, calloused, and no more metabolic processes take place in it. Within 30-90 days the hair bulb becomes thinner and thinner until the hair finally falls out or is pushed out by the new hair. About 13% of the hair on the scalp is in this phase.
- **Exogen** – the step where dead hair falls out, which, however, should not occur until the next hair is in the anagen phase. Usually, in the exogen stage, the hair follicle cells work intensively on the newly formed hair.
- **Kenogen** – sometimes hair falls out and the anagen step is not initiated (yet or not at all). We are now talking about the rest of the hair follicle, i.e. the kenogenic phase. This phase covers only a small percentage of the hair on the scalp. However, when more hair follicles enter this phase, visibly less hair is left on the head, because the process of baldness is initiated, i.e. irreversible dying off and disappearance of the hair follicles.

Human hair growth phases are out of sync. This means that adjacent hair follicles are at different stages of development and each of them has a microscopic image characteristic to any given phase. The exception is hair growth during pregnancy, which is synchronous at that time and is the result of an increase in estrogen levels. Hence, increased hair loss affects as much as 90% of women after childbirth, when estrogen and progesterone levels drop sharply. Hair growth is a complicated process. The mesenchymal cells of the hair papilla, capable of synthesizing growth factors and cytokines, play a special role in it.

There are three types of human hair. The first is the light and delicate nap (lanugo hair), which appears already in the third month of prenatal life. The second type is a thin and dye-free permanent hair (vellus hair) that replaces the fetal hair (which falls out shortly after or just before birth). During puberty, vellus hair thickens, darkens, and remains on the scalp in this form throughout life, in the amount of approximately 9%. The third type is terminal hair. They are thicker than the previous ones and contain dye. They can be of different diameters and lengths. They are found in the scalp (including eyebrows and eyelashes) and cover the skin of the armpits, the pubic area, and the chin. In the final stage, hair is dead. These are calloused structures that, once fully developed, are no longer subject to physiological changes. All processes that affect their properties take place in the period preceding their formation. Terminal hair, however, may gradually transform into vellus hair. This is the case with alopecia, such as androgenic alopecia.

Diet and supplements that provide the right nutrients have a huge impact on hair growth in the anagen phase. Taking into account the fact that the hair on the human head does not grow synchronously, the need for constant and regular attention to proper nutrition and supplementation becomes obvious, as well as systematic diagnostic control. Only such a comprehensive procedure will allow the body's biochemical balance to be assessed and for any deficiencies affecting the strength, health, and condition of the hair to be averted. Taking internal measures is incomparably more effective than the use of even the most expensive hair and scalp cosmetics, which of course (if properly selected) can be an effective complement to the therapy.










Excessive hair loss is a problem that affects both women and men. Physiologically, we lose up to 100 telogen hairs every day. In cases above this number, we are talking about baldness. Many factors can be responsible for proper hair growth and at the same time for disrupting the hair growth cycle and loss of hair. The most common of them include hormonal disorders, hypothyroidism (including Hashimoto's atrophic thyroiditis), as well as active viral and bacterial infections (including *Helicobacter pylori*), yeast overgrowth of the genus *Candida albicans*, bacterial overgrowth of the small intestine (SIBO), latent food hypersensitivity, non-celiac gluten hypersensitivity, intestinal dysbiosis (leaky gut syndrome), anorexia, stress, depression, as well as the degree of blood supply to the head and medications taken. Frequent causes of hair loss are also deficiencies of vitamins and minerals and the burden of the body with toxic elements. An important role is played, among others, by zinc, sulfur, silicon, copper, iron, and many more.










- **Zinc (Zn)** – participating in the metabolism of carbohydrates, fats, and proteins, its lack negatively affects hair and hair follicles. It is essential for the production of keratin and collagen and protects the hair from UV radiation (which can cause telogen effluvium). Neglecting it thus affects the growth of hair, and increases its loss leading to baldness.
- **Iron (Fe)** – its deficiency causes hair loss and blocks growth. It disrupts the supply of energy to the matrix cells responsible for their formation. It also influences the activity of enzymes responsible for the structure and rate of hair growth.
- **Silicon (Si)** – its deficiency interferes with proper hair growth, a correct level helps the body dispose of aluminum.
- **Sulfur (S)** – is a building material for hair. Its lack interferes with its growth and accelerates hair loss.
- **Copper (Cu)** – its deficiency causes weakness and hair loss.
- **Magnesium (Mg)** – its deficiency contributes to hair loss.
- **Manganese (Mn)** – its deficiency slows down the rate of hair growth.
- **Selenium (Se)** – its deficiency may cause alopecia with pseudo-albinism.
- **Calcium (Ca), Copper (Cu), Iron (Fe), Magnesium (Mg)** – their excess may limit the absorption of zinc, necessary for proper hair growth and control of hair loss.
- **Vitamin A** – its deficiency interferes with proper keratinization of hair, an excess may cause hair loss.
- **Vitamin B**
 - **B5 (pantothenic acid)** – its deficiency interferes with normal hair growth due to its influence on cell division in the hair follicle.
 - **B6** – its deficiency inhibits hair growth by blocking the incorporation of cysteine (an amino acid that is 10-17% of the hair's building material) into keratin.
 - **B7 (H, biotin)** – its deficiency disrupts the function of the skin that supports the hair roots, limiting their growth and causing hair loss. It also lowers the level of sulfur, which is a building material for hair, and disrupts the metabolism of fats and proteins, which is also a cause of baldness.
 - **B9 (folic acid)** – its lack inhibits the regeneration of hair follicle cells and causes hair loss.
 - **B12 (cobalamin)** – deficiency may be associated with excessive hair loss, especially in women with anemia or depression.
- **Vitamin C (ascorbic acid)** – influences the formation of the hair shaft. Its deficiency causes hyperactivity of the hair follicle canal cells and prevents the complex process of collagen production from taking place in the cells. The lack of vitamin C is therefore an indirect cause of telogen effluvium. Its deficiency also reduces the absorption of non-haem iron from plant products, necessary for proper hair growth.
- **Vitamin D** – a lack of it disrupts the hair growth cycle and leads to increased hair loss. A low concentration of vitamin D has been demonstrated in women with both telogen effluvium and chronic alopecia.
- **Vitamin E** – improves circulation and thus stimulates hair growth.

The presence of toxic elements in the body is a direct cause of growth deterioration and hair loss. Their excess blocks the absorption of nutritional elements and vitamins and disrupts the work of hormones that ensure a proper structure and hair growth. The toxic elements responsible for this state of affairs include:

- **Aluminum • Arsenic • Barium • Cadmium • Nickel • Lead • Mercury • Strontium • Thallium**

H4H result showed:

Element	Patient result (ppm)	Normal value	DEFICIT	NORM	EXCESS	Related vitamin deficiency	Related vitamin excess
Zinc (Zn)	182	120 - 220				-	-
Iron (Fe)	7.4	14 - 24				B6, B12, E	D, E
Silicon (Si)	43.5	35 - 65				-	-
Sulfur (S)	50,974	20,000 - 35,000				-	B7
Copper (Cu)	10.3	9.5 - 17.5				-	-
Magnesium (Mg)	63	20 - 50				D, E	B6, D
Manganese (Mn)	0.17	1 - 1.9				A, B6	B12, E
Selenium (Se)	0.06	0.6 - 1.1				C, D	A
Calcium (Ca)	635	220 - 380				A, B6, C, E	B12, C, D, E

Element	Patient's result (ppm)	Maximum value	EXCESS	Related vitamin deficiency
Aluminium (Al)	5.36	10		Possible deficiency of: A
Arsenic (As)	0.171	0.6		Possible deficiency of: C, E, D
Barium (Ba)	1.41	1.5		Possible deficiency of: D
Cadmium (Cd)	0.156	0.3		Possible deficiency of: B5
Nickel (Ni)	0.45	2.6		Possible deficiency of: B vitamins
Lead (Pb)	0.97	4		Possible deficiency of: C, D
Mercury (Hg)	0.064	0.5		Possible deficiency of: B vitamins, E
Strontium (Sr)	0.95	4.1		possible lack of other vitamins
Thallium (Tl)	0.00001	0.0015		Possible deficiency of: B vitamins, D, E

For the proper growth and loss of hair, hormones are also responsible (see chapter II. HAIR CONDITION AND HORMONAL BALANCE)

Tendency of tested hair to have disturbed growth and fall off, based on the H4H result:



Dryness, brittleness and breakage

Dry hair has a low level of moisture. Due to its very structure, curly hair is prone to be dry. This does not mean that they are damaged, but if neglected, they may become brittle and fall off. Dry hair, on the other hand, is often the result of improper care. In both cases, it is difficult to arrange them, they become hay-like shortly after washing, they frizz and electrify, they are rough, dull, and the ends tend to split. Dryness of the hair is the result of the opening of their cuticles, which causes the loss of water.

The lack of proper hydration of hair are its brittleness and bre. The cause of all these symptoms may be improper care or poorly selected hair care products, styling using high temperature (curling, straightening, warm air drying), too frequent washing of the head, frequent coloring, as well as excessive weight loss, stress, skin diseases, exposure to the sun, frost and strong wind, air conditioning, and even too frequent visits to the sauna or solarium. However, brittleness and breakage are caused mainly by a poor diet with inadequate vitamin and mineral levels, such as zinc, iron, or copper, and vitamins A, C, and E.



- **Zinc (Zn)** – necessary for the production of collagen and keratin. Hence, its deficiency manifests itself in the form of dry and brittle hair. It activates enzymes in matrix cells and creates disulfide bonds, which make the hair resistant to breakage.
- **Iron (Fe)** – low levels interfere with the transport of nutrients, the lack of which prevents the hair from reaching an appropriate level of hydration, which makes it brittle and fragile.
- **Copper (Cu)** – deficiency makes the hair stiff and brittle, and therefore prone to breaking.
- **Calcium (Ca), Copper (Cu), Iron (Fe), and Magnesium (Mg)** – an excess limits the absorption of zinc, which protects the hair from dryness and brittleness.
- **Vitamin A** – its deficiency deprives the hair of protection against water loss.
- **Vitamin B**
 - **B3 (PP, niacin)** – its deficiency has a negative effect on the skin's water transformation, necessary in maintaining proper nourishment and hydration of hair.
 - **B5 (pantothenic acid)** – low levels mean that the hair lacks the right level of hydration.
 - **B7 (H, biotin)** – deficiency causes dry hair and skin.
- **Vitamin C** – only with its participation it is possible for the cells to produce collagen, which prevents excessive drying of the hair.
- **Vitamin E** – an appropriate level has a moisturizing and smoothing effect on the hair.
- **Vitamin A, E, C** – appropriate levels ensure the proper functioning of the sebaceous glands, which makes the hair better moisturized and less brittle. Moreover, in the case of vitamin C, it is only with its participation that the complex process of collagen production can take place in the cells, the correct level of which prevents brittleness and breakage.

Another direct cause for the loss of moisture, brittleness and breakage is the presence of toxic elements in the body. Their excess blocks the absorption of nutritional elements and vitamins and disrupts the work of hormones that ensure a proper level of hair hydration. The toxic elements responsible for this state of affairs include:

• **Aluminum • Arsenic • Barium • Cadmium • Nickel • Lead • Mercury • Thallium**

H4H result showed:

Element	Patient result (ppm)	Normal value	DEFICIT	NORM	EXCESS	Related vitamin deficiency	Related vitamin excess
Zinc (Zn)	182	120 - 220				-	-
Iron (Fe)	7.4	14 - 24				B3, E	E
Copper (Cu)	10.3	9.5 - 17.5				-	-
Calcium (Ca)	635	220 - 380				A, B3, C, E	C, E
Magnesium (Mg)	63	20 - 50				E	B3

Element	Patient's result (ppm)	Maximum value	EXCESS	Related vitamin deficiency
Aluminium (Al)	5.36	10		Possible deficiency of: A
Arsenic (As)	0.171	0.6		Possible deficiency of: C, E
Barium (Ba)	1.41	1.5		possible lack of other vitamins
Cadmium (Cd)	0.156	0.3		Possible deficiency of: B3, B5
Nickel (Ni)	0.45	2.6		Possible deficiency of: B vitamins
Lead (Pb)	0.97	4		Possible deficiency of: C
Mercury (Hg)	0.064	0.5		Possible deficiency of: B vitamins, E
Thallium (Tl)	0.00001	0.0015		Possible deficiency of: B vitamins, E

Hormones are also responsible for the dryness and brittleness of hair (see Chapter II. HAIR CONDITION AND HORMONAL BALANCE)

Tendency of tested hair to dryness and brittleness based on the H4H result:



Lack of strength and elasticity, i.e. low tensile strength


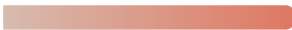




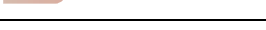
The tensile strength of hair depends on the degree of bounce and elasticity of hair. Strong hair is resistant to damage and it presents a beautiful, healthy look and is easy to style. Its strength and elasticity depend on a proper structure and growth, which is ensured by the correct supply of minerals such as silicon, zinc, or sulfur, as well as vitamins C and B, especially B7 (biotin), which provides the hair with elasticity and bounce.










- **Silicon (Si)** – its deficiency reduces the bounce and elasticity of the hair and also makes it thin and weak, which further reduces its tensile strength.
- **Sulfur (S)** – creates bonds that stabilize the hair shaft, providing them with elasticity.
- **Copper (Cu)** – strengthens the hair, contributing to the proper development of its structure. A deficiency reduces the number of sulfide bonds responsible for strength and elasticity. It makes them stiff, weak, and brittle, and therefore not very resistant to stretching.
- **Zinc (Zn)** – activates enzymes in the matrix cells and creates disulfide bonds that provide the hair with structural strength. It also participates in the formation of collagen and keratin, which provide the hair with elasticity. Its deficiency makes the hair weak and not resistant to damage.
- **Iron (Fe)** – deficiency disrupts the proper structure of the hair, which makes it thin, and weak.
- **Calcium (Ca), Copper (Cu), Iron (Fe), and Magnesium (Mg)** – an excess may limit the absorption of zinc, which is responsible for the strength, endurance, and elasticity of hair.
- **Vitamin C** – only with its participation, it is possible for the cell to produce collagen, which provides the hair with elasticity, as well as strength and endurance.
- **Vitamin B**
 - **B7 (H, biotin)** contains sulfur which gives the hair elasticity and bounce.

The direct cause of weak, low-resilience hair is also the presence of toxic elements in the body. Their excess blocks the absorption of nutritional elements and vitamins and disrupts the work of hormones that give the hair strength, elasticity, and endurance. The toxic elements responsible for this state of affairs include:

- **Aluminum • Arsenic • Barium • Cadmium • Nickel • Lead • Mercury • Strontium • Thallium**

H4H result showed:

Element	Patient result (ppm)	Normal value	DEFICIT	NORM	EXCESS	Related vitamin deficiency	Related vitamin excess
Silicon (Si)	43.5	35 - 65				-	-
Sulfur (S)	50,974	20,000 - 35,000				-	B7
Copper (Cu)	10.3	9.5 - 17.5				-	-
Zinc (Zn)	182	120 - 220				-	-
Calcium (Ca)	635	220 - 380				C	C
Iron (Fe)	7.4	14 - 24				possible lack of other vitamins	-
Magnesium (Mg)	63	20 - 50				possible lack of other vitamins	-

Element	Patient's result (ppm)	Maximum value	DEFICIT	NORM	EXCESS	Related vitamin deficiency
Aluminium (Al)	5.36	10				possible lack of other vitamins
Arsenic (As)	0.171	0.6				Possible deficiency of: C
Barium (Ba)	1.41	1.5				possible lack of other vitamins
Cadmium (Cd)	0.156	0.3				possible lack of other vitamins
Nickel (Ni)	0.45	2.6				B vitamins
Lead (Pb)	0.97	4				C
Mercury (Hg)	0.064	0.5				B vitamins
Strontium (Sr)	0.95	4.1				possible lack of other vitamins
Thallium (Tl)	0.00001	0.0015				B vitamins

Hormones are also responsible for the lack of strength and elasticity as well as low tensile strength (see chapter II. HAIR CONDITION AND HORMONAL BALANCE)

Tendency of tested hair to lack bounce and strength based on the H4H result:



Accelerated graying and disturbed hair texture







Hair is a source of self-confidence for every human being. That is why we want to keep it healthy and in good shape as long as possible. To do this, you need to supply the right nutrients. Their lack, apart from falling out, can accelerate graying, and also makes the texture of the hair look unhealthy. It is porous, dull, rough and without shine. The lack of adequate vitamins and minerals also causes the problem of oily hair and dandruff, which also determines their aesthetics. For the appearance of the hair, the following are especially important: silicon, zinc, copper and many vitamins, especially from group B.

- **Copper (Cu)** – helps to preserve the color of the hair. Its deficiency contributes to the disappearance of pigment and graying, while also making the hair dull and stiff.
- **Zinc (Zn)** – as necessary for the production of collagen and keratin, its deficiency manifests itself in the form of thin, splitting hair that becomes greasy faster. Its deficiency also causes dandruff.
- **Silicon (Si)** – provides hair with thickness and volume. Its deficiency makes hair thin and without shine.
- **Iron (Fe)** – deficiency causes the hair to be thin and low in volume.
- **Calcium (Ca), Copper (Cu), Iron (Fe), and Magnesium (Mg)** – an excess may limit the absorption of zinc responsible for a beautiful, healthy-looking hair.
- **Vitamin A** – helps maintain proper hair pigmentation. Excess, however, can cause problems with hair regeneration.
- **Vitamin B**
 - **B5 (pantothenic acid)** – prevents premature graying, can restore the natural color of the hair (accelerates the production of melanin), regulates the functions of the sebaceous glands
 - **B6** – its deficiency reduces the thickness of the hair diameter by blocking the incorporation of cysteine (an amino acid that is 10-17% of the hair's building material) into keratin.
 - **B7 (H, biotin)** – deficiency causes excessive work of the sebaceous glands, which contributes to oily hair and the formation of dandruff. The excess causes the hair texture to deteriorate.
 - **B9 (folates)** – low levels accelerate hair graying and disrupt the function of the sebaceous glands.
- **Vitamin C** - only with its participation, can cells produce collagen. Adequate levels ensure beautiful-looking hair.

The presence of toxic elements in the body is a direct cause for the loss of hair appearance. Their excess blocks the absorption of nutritional elements and vitamins and disrupts the work of hormones that give the hair a healthy and beautiful look. The toxic elements responsible for this state of affairs include:

- **Aluminum • Arsenic • Barium • Cadmium • Nickel • Lead • Mercury • Strontium • Thallium**

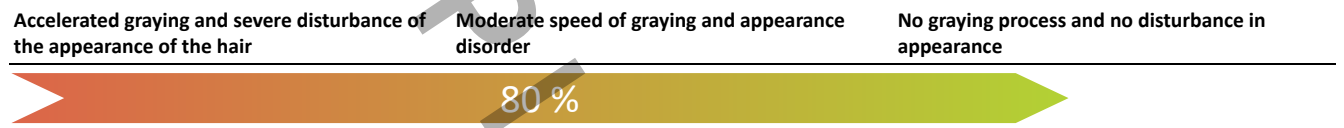
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Element	Patient result (ppm)	Normal value	DEFICIT	NORM	EXCESS	Related vitamin deficiency	Related vitamin excess
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Zinc (Zn)	182	120 - 220				-	-
Silicon (Si)	43.5	35 - 65				-	-
Iron (Fe)	7.4	14 - 24				B6	-
Calcium (Ca)	635	220 - 380				B6, C	C
Magnesium (Mg)	63	20 - 50				-	B6

Element	Patient's result (ppm)	Maximum value	EXCESS	Related vitamin deficiency
Aluminium (Al)	5.36	10		Possible deficiency of: A
Arsenic (As)	0.171	0.6		Possible deficiency of: C
Barium (Ba)	1.41	1.5		possible lack of other vitamins
Cadmium (Cd)	0.156	0.3		Possible deficiency of: B3
Nickel (Ni)	0.45	2.6		Possible deficiency of: B vitamins
Lead (Pb)	0.97	4		Possible deficiency of: C
Mercury (Hg)	0.064	0.5		Possible deficiency of: vit. z gr. B
Strontium (Sr)	0.95	4.1		possible lack of other vitamins
Thallium (Tl)	0.00001	0.0015		B vitamins

Hormones are also responsible for the proper appearance of hair (see chapter II HAIR CONDITION AND HORMONAL BALANCE)

Tendency of examined hair to graying and texture disorders based on the H4H result:



II. HAIR CONDITION AND HORMONAL BALANCE

Hormonal balance has a huge impact on the health and condition of the hair. Responsible, inter alia, for their correct height, thickness and color. Disrupted hormone levels determine not only dry hair or excessive sebum secretion, it can also cause hair thinning and even lead to baldness.

As the work of hormones is influenced by minerals, and hormones, in turn, affect the level of the different elements, the relationship between them is inseparable and allows for the mutual evaluation of their functioning. Mineral surpluses or deficiencies are an obstacle to the proper functioning of the hormones responsible for the proper appearance and health of the hair. Testosterone (as well as its derivative dihydrotestosterone), estrogen, progesterone, and thyroxine are key hormones that support many important functions in the body, including those most important for the hair growth cycle.

- **Thyroid hormones** – A poorly functioning thyroid gland may make too many hormones (hyperthyroidism) or not make enough of them (hypothyroidism). Hypothyroidism lowers the metabolic rate in hair cells. This slows down the growth of new hair, causes them to fall off more frequently, and causes an unfavorable look. In turn, hyperthyroidism causes the hair to become thin and excessively shiny, and their loss usually begins 2-4 months after the onset of the disease. The only way to stop hair loss caused by a thyroid gland not working properly is to regulate hormone levels. The thyroid hormones include, among others triiodothyronine and thyroxine, which is most often associated with hair loss.
 - **thyroxine** – regulates the secretion of sebum. Its deficiency affects the appearance of hair, which becomes dull, rough, and brittle.
 - **triiodothyronine** – the proper secretion of this hormone determines and at the same time proves the proper functioning of the thyroid gland. Disorders in the production of this hormone negatively affect its work, which visibly affects the quality and appearance of the hair.
- **Parathyroid gland** – disturbed functioning leads to disorders of calcium metabolism and the acid-base balance of tissues. The hormones produced by the parathyroid gland are:
 - **parathyroid hormone and calcitonin** – their excess can contribute to high levels of calcium in the bones and blood, leading to an acid-base imbalance. Calcium begins to compete with silicon - hair becomes harder and less bouncy.
- **Sex hormones** – are the main factor in the occurrence of androgenetic alopecia, which affects up to 95% of balding men. However, this type of alopecia also affects women who are deficient in female or excess male hormones. Sex hormones include testosterone and its active form of DHT (androgens), as well as female sex hormones, estrogen, and progesterone. All of these hormones are found in both women and men.
 - **testosterone and DHT (dihydrotestosterone)** – too high levels shorten the hair growth phase. In menopausal women, hair follicles become more susceptible to their influence. They are responsible, among others for regulating hair growth. However, an excess may cause androgenic alopecia in both men and women. Hair loss is a symptom of the hypersensitivity of the hair follicles to DHT. They shrink, which makes hair thinner and shorter, and less and less of it until it is eventually lost. If the receptors are very sensitive to the action of DHT, even a small amount of it can cause baldness.
 - **DHEA** – a natural steroid hormone produced from cholesterol in the adrenal glands, specifically in the reticular layer of the adrenal cortex. Low levels are associated with the adrenal exhaustion syndrome, which leads to a weakening of collagen synthesis, which in turn causes deterioration of the hair structure.
 - **estrogen** – in women it is responsible for keeping the hair on the scalp strong while reducing the amount of hair on the rest of the body. It extends the growth phase and stimulates the appearance of new hair and prevents hair loss. High levels (e.g. during pregnancy) make the hair shiny, thick, and healthy. A low level (e.g. after childbirth) causes thinning, weakening, and dullness of the hair. There is also a decline during menopause when a woman begins to gradually lose her hair.
 - **progesterone and estrogen** – Proper functioning of the hair follicles depends on the balance of these female sex hormones. The disorder may occur as a result of nutrient deficiencies in the diet, taking birth control pills, and medications containing estrogen. The imbalance results in thin and brittle hair. Their effect on hair can be seen from the menstrual cycle in women. A decrease in the first few days causes dry hair. From the tenth day of the cycle onward, their level increases, and the condition of the hair improves significantly. Over the course of the next few days, as progesterone continues to rise, the hair begins to grease more quickly.
 - **SHBG (sex hormone binding globulin)** – a protein produced mainly in the liver, binding sex hormones, the level of which affects the ratio of testosterone to estrogens affecting the body. Chronically elevated SHBG levels may be associated with hair loss and a small amount of hair on the head or the entire body (for men). Higher SHBG levels are observed in people with vitamin D deficiency. The correct SHBG level is indirectly dependent on the correct level of zinc, selenium, and magnesium, but also many other factors, therefore it cannot be assessed solely on the concentration of elements in the body.

- **Adrenal glands** – Symptoms of hair loss may result from too low or too high levels of hormones produced in the adrenal cortex, including adrenaline and cortisol, the so-called stress hormones, which is one of the most common causes of hair problems.
 - **adrenaline** – hair loss can be triggered by chronic stress. Repeatedly processing negative thoughts causes a constant feeling of sadness, anxiety, and worry. The body reacts to this situation by producing stress hormones, which include, among others, adrenaline.
 - **cortisol** – another of the so-called "Stress hormones", is involved in the process of androgenetic alopecia. A high level can damage the hair matrix and cause hair loss. A low level of cortisol also has a negative effect on the condition of the hair.
- **Pancreas** – its impaired functioning causes inappropriate insulin production.
 - **insulin** – too high a level increases the sensitivity of the hair follicles to DHT, which causes their miniaturization.

H4H result showed:

GLAND/ hormone	Intensively excreted into your hair ('Yes' indicates an excess, hence affecting proper functioning)	Retained in your body ('Yes' indicates an excess, hence affecting proper functioning)	
THYROID	Calcium (Ca)	YES	
	Cobalt (Co)	-	
	Lithium (Li)	-	
	Copper (Cu)	-	
thyroxine	Calcium (Ca) Iodine (I)	YES -	
triiodothyronine	Zinc (Zn) Mercury (Hg)	- -	
PARATHYROID GLAND	Magnesium (Mg)	YES	
	Sodium (Na)	-	
	Potassium (K)	-	
	Phosphorus (P)	-	
	Iron (Fe)	-	
	Chromium (Cr)	-	
parathyroid hormone and calcitonin	Calcium (Ca)	YES	
SEX HORMONES			
testosterone and DHT	Calcium (Ca)	YES	
	Lead (Pb)	-	
	Sodium (Na)	-	
	Cadmium (Cd)	-	
DEHA	Calcium (Ca)	Zinc (Zn)	-
		Magnesium (Mg)	-
		Sodium (Na)	-
		Potassium (K)	-
estrogen	Zinc (Zn)	-	
	Magnesium (Mg)	YES	
	Sodium (Na)	-	
	Iron (Fe)	-	
	Potassium (K)	-	
	Phosphorus (P)	-	
	Manganese (Mn)	-	
progesterone	Copper (Cu) Calcium (Ca)	Zinc (Zn)	-
		Iron (Fe)	YES
		Sodium (Na)	-
		Magnesium (Mg)	-
		Phosphorus (P)	-
		Potassium (K)	-

GLAND/ hormone	Intensely excreted into your hair ('Yes' indicates an excess, hence affecting proper functioning)	Retained in your body ('Yes' indicates an excess, hence affecting proper functioning)	
ADRENAL GLANDS	Magnesium (Mg)	YES	
	Copper (Cu)	-	
	Calcium (Ca)	YES	
	Chromium (Cr)	-	
adrenaline	Sodium (Na) Potassium (K)	- -	
cortisol	Sodium (Na)	-	
PANCREAS	Iron (Fe)	-	
	Manganese (Mn)	-	
	Zinc (Zn)	-	
	Phosphorus (P)	Copper (Cu)	-
	Chromium (Cr)	Calcium (Ca)	-
	Potassium (K)	-	
insulin	Lead (Pb)	-	
	Sodium (Na)	-	
	Iron (Fe)	-	
	Manganese (Mn)	-	
	Magnesium (Mg)	YES	
		Calcium (Ca)	-
		Chromium (Cr)	YES
		Vanadium (V)	YES

Hair condition versus hormonal balance as demonstrated by the H4H test:



III. Hair condition and stress

Stress is a factor that we all deal with every day - to a greater or lesser extent. Stress and the high level of cortisol that occurs because of it cause a significant problem for our skin and appendages, including hair. This process is often called psychogenic alopecia. In the course of psychogenic alopecia, various hair disorders can occur. Experiencing stress may result in the premature transition of the hair into the resting phase, but also lead to inflammation of the hair follicles or general weakening of the hair structures. Patients with psychological aspects leading to baldness may present various types of alopecia. Some people may develop total alopecia in various places on the head (resembling the changes occurring in the course of alopecia areata), while others may develop the so-called alopecia or telogen effluvium, in which a significant reduction in hair density is noticeable.

The assessment of stress in the elemental hair analysis is very important and is directly related to the key elements involved in the regulation of stress, i.e. calcium, magnesium, sodium, and potassium, and their relative proportions, which are given below:

- **Sodium to Potassium Na/K** – allows you to assess the function of the adrenal glands, specifically cortisol. It is connected with the distribution of nutrients to hair tissue.
- **Sodium to Magnesium Na/Mg** – allows you to assess the adrenaline function related to microcirculation in the skin, which significantly affects proper hair growth and disturbs this process.
- **Calcium to Magnesium Ca/Mg** – allows the assessment of muscle tone, which nourishes the hair and activates it for growth.
- **Calcium to Potassium Ca/P** – allows you to assess the balance between energy consumption and production. Excessive energy production leads to a depletion of nutritional resources. Insufficient production means poor regeneration. These phenomena significantly affect all skin appendages, especially the hair.

H4H result showed:

Na/K

Norm for Sodium/Potassium	1.92 - 2.88
Patient's result	1
Proportion	TOO LOW
Limit intake of	potassium
Increase intake of	sodium
Check what are the trends for your Na:K ratio	
TOO LOW	Chronic stress effect
TOO HIGH	High stress effect

Na/Mg

Norm for Sodium/Magnesium	3.2 - 4.8
Patient's result	1.61
Proportion	TOO LOW
Limit intake of	magnesium
Increase intake of	sodium
Check what are the trends for your Na:Mg ratio	
TOO LOW	Chronic stress effect
TOO HIGH	High stress effect

Ca/Mg


Norm for Calcium/Magnesium	5.6 - 8.4
Patient's result	10.08
Proportion	TOO HIGH
Limit intake of	calcium
Increase intake of	magnesium
Check what are the trends for your Ca:Mg ratio	
TOO LOW	Chronic stress effect
TOO HIGH	High stress effect

Ca/P

Norm for Calcium/Phosphorus 2.08 - 3.12

Patient's result	3.63
Proportion	TOO HIGH
Limit intake of	calcium
Increase intake of	phosphorus
Check what are the trends for your Ca:P ratio	
TOO LOW	High stress effect
TOO HIGH	Chronic stress effect

Hair condition in relation to the degree of stress exposure demonstrated by the H4H result:

Possible serious decline in the condition of the hair due to strong exposure to stress	Moderate decline in hair condition due to exposure to stress	No hair deterioration due to stress factors
		

IV. HAIR POROSITY TEST - PERFORM THE TEST AND COMPARE RESULTS AFTER 6 MONTHS

Hair porosity describes the degree to which the hair cuticles have deviated from the hair core. The type of hair care to be used depends on the degree of porosity. The most accurate way to assess this is by looking at it under a microscope. However, if you are unable to determine their porosity by microscopic examination, perform a simple test and check what type your hair presents:

Low porosity hair – considered the healthiest. Even without special care, they are smooth and shiny.

High porosity hair – its appearance is far from ideal, it is dull and damaged. Improving their condition requires, first of all, dietary changes, but also appropriately selected care cosmetics.

Medium porosity hair – the vast majority of people have this type of hair. It is an intermediate type between high and low porosity hair. They have a bit of natural shine, but not to the same extent as low porosity hair. They are slightly frizzy and static and show moderate susceptibility to styling. Improving their appearance requires proper mineral and vitamin nutrition as well as care with properly selected cosmetics.

Performing the hair porosity test straight after the first H4H analysis, and then after 6 months of following the guidelines contained in the result, will show the improvement in the nourishment of the hair with nutrients and the related positive changes in its appearance. If there is no improvement, despite following the recommendations contained in the H4H result, we recommend further diagnostics to check the function of the kidneys and a daily urine collection test.

Now do the test below - put a cross next to each correct answer and check what degree of porosity your hair presents

Low porosity hair	High porosity hair	
is naturally shiny	without the use of specialized care cosmetics, it seems matte	
runs through the fingers, is loose	is stiff or rough to the touch	
soaks poorly in water, which flows down it as if on a smooth surface	It is easy to wet, quickly soaks up with water	
if it is thoroughly wet, it takes a long time to dry	dries very quickly	
is resistant to styling, quickly returns to its natural state (after a few hours of tying with an elastic band, it falls smoothly, has no deformations)	is susceptible to styling with a curling iron and straightener, keeps its shape after removing an elastic band	
is easy to overdo with care oils, a small amount of which makes it seem heavily burdened and greasy	absorbs large amounts of care cosmetics, e.g. hair oils, masks and conditioners. It is difficult to burden them with cosmetics	
is not prone to frizz or static	tends to frizz and static	
has never been bleached, dyed with ammonia dyes, subjected to permanent waving and other invasive cosmetic treatments	the hair has been bleached, dyed with ammonia dyes, subjected to permanent waving and other invasive cosmetic treatments	

If 100% of the answers are on the low porosity hair side:

Congratulations, your hair is healthy and in good condition. To maintain this state, try to regulate any excess and nutritional deficiencies with the diet shown in the result of the H4H test. Most likely, you can also say that you use the right cosmetics for your hair care. In this case, light herbal conditioners and ingredients such as coconut, clay, or shea butter work best. Low porosity hair doesn't like proteins, and it's usually easy to overburden it with exaggerated amounts of cosmetics.

If 100% of the answers are on the high porosity hair side:

Your hair requires special care and treatment. To improve its health and appearance, adjust the deficiencies and excesses of nutrients as shown by the H4H test. For this purpose, use a targeted diet and supplementation prepared, among others, based on the H4H test score. If possible, give up hair coloring and aggressive styling. Choose only the best (with good, natural ingredients) hair care products, especially delicate emollients with a high content of moisturizing substances that prevent hair breakage. In the case of high porosity hair, it is also good to use appropriate moisturizing masks and acid rinses to close the cuticle. In this case, it is also advisable to additionally consult a dietitian, as well as perform additional diagnostics for the proper functioning of hormones and kidneys.

If you have given mixed answers:

Your hair is the most popular type of medium porosity hair. It is not bad, but to improve its condition, adjust the vitamin and mineral deficiencies and excesses shown on the H4H test by having an appropriate diet and supplementation. Start using more delicate care cosmetics and limit the use of invasive hairdressing and styling treatments. Medium porosity hair usually does not need such strong masks as high porosity hair, but they like proteins and moisturizing.

V. ADDITIONAL NOTES

Cosmetics

Let the composition and not the packaging decide the purchase. Read the labels. Many popular cosmetics contain heavy metals that are harmful to the health, condition, and appearance of the hair. Choose cosmetics depending on the porosity of your hair.

Water

Remember to stay hydrated. Hair also needs water to grow healthily. Water affects the level of skin hydration and the condition of the hydro-lipid layer on its surface. Physiologically, the amount of water present in the body that is bound in the skin should be 20%. A good source of it (and at the same time of nutrients) are mineral and spring waters. Fluids should be consumed in amounts of 30-35 ml/kg body weight/day, including 1.5 liters of water, preferably between meals.

Protection against weather conditions

Protect your hair from frosty air, harsh sun, and strong wind. Adverse weather conditions negatively affect their health and appearance.

Diet and supplementation

Design your diet based on the H4H result. Providing adequate nutrients through diet and supplementation allows you to restore the biochemical and hormonal balance of the body. Only this way will you ensure your hair its proper growth, structure, as well as a beautiful and healthy look.

SAMPLE RESULT