ADAPTATION OF THE HUMAN BODY TO ENVIRONMENT

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Summary

The article reflects the regularities and rules for adapting the human body to the changing environmental conditions, such as exposure to weather conditions, high altitudes and latitudes different geographical variation.

Rezumat

Adaptarea corpului uman la mediul ambiant

În articol se reflectă legităţile şi regulile de adaptare a corpului uman în condiţii ale mediului ambiant în continuă modificare, cum ar fi expunerea la condiţii climaterice, altitudini mari, latitudini diferite şi variaţiile geografice.

Novelty of Theme

Currently, the extent of the adaptation to environment is obvious: the sudden climatic changes occurring on our planet, the problem of resource depletion of quantity of drinking water and oxygen on Earth, energy resources. In period of mass migration of population the problem of fast adaptation of the organism to new living conditions acquires special importance. Sooner or later people will be forced to move to other planets, medicine must be ready and for this perspective.

Aim

To study the role of environment in human variations and the way the Human Body reacts to environmental changes it's exposed to, to what extent, and what are the proportions.

Materials and methods

An analysis of the literature that focuses on illuminating the adaptation of the human body and observation of adaptational signs of 100 foreign students were performed.

Discussions and results

The human body readily responds to changing environmental stresses in a variety of biological and cultural ways. We can acclimatize to a wide range of temperature and humidity. When traveling to high altitudes, our bodies adjust so that our cells still receive sufficient oxygen. We also are constantly responding in physiological ways to internal and external stresses such as bacterial and viral infections, smog, dietary imbalance, and overcrowding.

This ability to rapidly adapt to varying environmental conditions has made it possible for us to survive in most regions of the world. We live successfully in humid tropical forests, harsh deserts, arctic wastelands, and even densely populated cities with heavy pollution. Most other animal and plant species are restricted to one or relatively few environments by their more limited adaptability.

Factors of human variability

It is hard to ignore the fact that the different proposed races of the human species have originated in separate isolated regions of the earth. And where crossroads have been formed between these regions a blend of the races has developed.

There are three factors of geography that may be attributed to race.

1.Physical barriers such as mountain ranges, oceans, desert regions, etc.
2.The effect of geography on climate which leads to the variations within species.
3.A less impact have the chemical or mineral variations in terrain and soil.

Physical barriers keep interbreeding between different regions to a minimum. They restrict the movement of genes from spreading to other populations. In prehistoric times, the ability of human kind to break these geographical barriers was small. Once established in an area, years of isolation lead to a variation within that population that other populations would not have had access to. These factors in racial variations had a direct impact on the next two.

Climate has a direct effect on the pigmentation of races. In areas where peoples were exposed to more direct sunlight, skin pigmentation becomes increasingly darker. As stated earlier, the skin develops darker pigmentation to effectively protect itself from the sun. In areas where less sunlight is experienced, the skin does not develop this quality genotypically, but embodies the ability to adapt rapidly when exposed to the sun.

The third factor of chemical or mineral variation in the terrain is quite complicated and best understood by a simple example. In New Zealand, the natives centuries ago had a legend of the "good lands" and the " bad lands." In the bad lands, the cattle and people were often struck with a sickness, today identified as pernicious anemia. The anti-pernicious factor in humans is a compound of cobalt and in areas where the sickness occurred, cobalt was minimal in the soil. This further prevented the movement of people.

The response of organisms to environmental change is complex and highly context dependent, and is shaped by their environment. We'll be studying human adaptation to the environment on several aspects.

Ecogeographical rules have been abundantly validated by studies of many species of mammals and others. Concordantly, there are three main patterns of geographical phenotypic differentiation between populations: variation in color, variation in the size of appendages, variation in body size.

Studying the variation of color, Gloger's rule indicates, individuals that live in warm and humid areas are darker in color than those living in cold and dry areas meaning that individuals with more cryptic coloration are under reduced predation pressure. And also individuals with darker pigmentation are found in the tropics, while individuals with lighter pigmentation predominate towards the poles (fig.1). Data from our observations and interviews confirm these statements (tab.1).

The adaptations of human appendages, meaning ears, limbs ect., were studied and recorded by Allen, concluding that appendages' sizes are reduced in cold climates. Basing the conclusion on the simple reasoning that the less surface area an organism has relative to its body mass, the more thermally efficient it will be, since it will lose less heat.

Fig.1. Skin color variations: very dack brown, dack brown, light brown, white.

Tab.1. Observational data and interviews of the students from Israel for adaptation to external environmental conditions

N of observations	*dark eyes*	*light eyes*	*migration data*	*dark skin*	*light skin*	*migration data*
85 /men/	80	5	4	76	9	8
15 /women/	12	3	3	9	6	4

And since the most well-known ecogeographical change is the tendency of individuals within the geographical range to change in body size under certain climatic conditions, it was easy to detect that bodies tend to be larger in colder climatic conditions; relying on the trend of Carl Bergmann.

Concluding that there is a selective advantage to a higher body surface to volume ratio in warm areas, and conversely, to the reduced heat loss that accompanies a lowered surface to volume ratio in higher latitude and colder climates.

Although there is a need to mention that the debate and universal argument about human adaptation in body size to environmental factors has not been settled and agreed yet.

Exposure and relations to cold climates

Studying to what extent people living in northern climate are exposed to cold during their daily activities, and to analyze factors affecting outdoor exposure at the population level (based on a research done in Finland).

Relying on the results proceeded - a Finnish person would be exposed to the cold in winter 7 hours per week, meaning only 4% of the time, it is concluded that while exposed to cold, seasonal differences in skin temperature, metabolic rate, circulation and thermal sensitivity were observed. The observed thermal responses did not resemble cold habituation responses typical and expected for cold acclimatization. But instead, they showed reactions in non-cold acclimated subjects for absolute cold exposure. It is possible that the cold-protective clothing used, short cold exposure periods and high housing temperatures in winter prevent the development of cold habituation.

Cold habituation responses did not affect cognition. It is suggested that moderate cold exposure affects cognition, through either distraction or arousal caused by the cold exposure.

According to another study (made on rats), it shows that Mean-scaled sinus volume is significantly smaller in individuals raised in the cold. As well as cold-reared rats also show significantly smaller nasal cavity volume for the size of the cranium.

Climatic-geographic factors (comparative analysis)

Testing the Russians of Western and Eastern Siberia and on the Buryats of Eastern Siberia, (as viewed in the table), scientists noted that:

(1) The two groups of Siberian Russians of either sex were taller and heavier than the Buryats.
(2) Normal distribution of shoulder breadth to stature.
(3) The amount of muscular tissue M varies only slightly.
(4) The differences in the amount of fat tissue D are huge and noticeable.

And many other comparison fields ending with a conclusion that the influence of extremely strong climatic factors may seriously lead to genetic adaptation and evolutionary changes in a gene pool from generation to generation.

Another brief presentation of environmental factors and their affects

*Obtaining large human populations leads to infectious diseases.
*Other environmental changes like global warming may expand the range of tropical diseases.

And keeping in mind, the time factor, observing human adaptation may take a long time, if the changes are not of a rapid type, since human adaptation to environmental conditions is associated with time. And the later could differ from years to over decades (Adaptation - long term or acclimatization - short tem).

Humans normally respond to environmental stresses in four ways: genetic change; developmental adjustment; acclimatization; cultural practices and technology.

The first three are biological responses. The last three occur during our lifetime without further genetic change.

Genetic Change

When an environmental stress is constant and lasts for many generations, successful adaptation may develop through biological evolution. Those individuals who inherit a trait that offers an advantage in responding to particular stresses in the environment are more likely to survive longer and pass on more of their genes to the next generation. This is evolution through

natural selection. For instance, people whose ancestors have lived in areas that have had endemic malaria for thousands of years often inherit some degree of immunity to this serious disease. The high incidence of sickle-cell trait among the people of Central Africa is largely the result of indirect selection for this trait by malaria. Genetic change in response to environmental stresses usually takes many generations to become widespread in a population. Fortunately, we also have other ways of responding more quickly as individuals during our own lifetime. The word adjustments is used here to refer to these shorter term physiological changes that are not inheritable. The word adaptations is reserved for inheritable genetic changes developed in a population over a long period of time.

Developmental Adjustment

One of the most powerful types of adjustments to environmental stresses is a change in growth patterns and development. This occurs in childhood and typically results in anatomical and/or physiological changes that are mostly irreversible in adulthood. Such permanent changes are referred to as developmental adjustment or developmental acclimatization.

Among humans, developmental adjustments result from both natural environmental pressures and cultural practices. An example of the latter was the now illegal custom in China of tightly wrapping or binding the feet of young girls with cloth in order to hinder normal growth. While this caused permanent, crippling deformities of the foot bones, it also resulted in extremely tiny feet which were considered to be very attractive. Parents crippled their daughters with good intentions. Small feet would make them more attractive marriage partners for rich important men and save them from a life of drudgery.

It is easy to condemn the old Chinese custom of foot binding as being barbaric. However, it is worth considering that North Americans and Europeans have intentionally altered parts of the bodies of their children and themselves with unpleasant procedures as well. In the late 19th century, tight corsets worn by girls when their bodies were still growing had the effect of deforming lower rib bones dangerously in towards their lungs. Some rich women even had lower ribs surgically removed in order to achieve a stylish "wasp-shaped" waist. A 19 inch circumference was the ideal.

Acclimatization

All other forms of adjustment to environmental stresses are usually reversible whether they occur in childhood or adulthood. These reversible changes are referred to as acclimatization or acclimatory adjustment. It is useful to consider the different forms of acclimatization in terms of the length of time over which they can occur: log-term (years), seasonal (months), short-term (days, hours, seconds).

An example of a long-term acclimatization is people who lose excess body fat and are very slender as a result of mild, long-term undernourishment. If they later increase their diet to a consistent level of excessive calories, they will very likely retain more body fat and eventually become obese.

Combined Effects

Genetic adaptation and the three types of adjustments to environmental stresses are not always distinct phenomena. Acclimatization occurring in childhood may result in permanent anatomical changes, as is often the case with malnutrition. When an acclimatization is successful in providing good health and longevity, it can give individuals a selective advantage in passing on their genes to the next generation. This can have a strong determinant effect on the direction of evolution. In turn, genetic change can play a significant role in adjustment since the ability to acclimatize is ultimately dependent on genetic makeup.

Adaptability to specific environmental stresses varies from person to person and from population to population. We are not all biologically equal. For instance, some groups of people are more successful in adjusting to high altitudes. Others can better handle intense heat and high humidity. Adaptive responses tend to occur in spatial clusters around the world. Usually, the most efficient adaptations for specific environmental stresses are found in areas where those

stresses are most common. This is evidence that natural selection has occurred in the successfully adapting population.

Cultural Practices and Technology

It is important to remember that humans do not only interact with their environments biologically. We use culture as well. Over the last half million years at least, we invented technological aids that allowed us to occupy new environments without having to first evolve biological adaptations to them. Houses, clothing, and fire permitted us to live in temperate and, ultimately, arctic regions despite the fact we still essentially have the bodies of tropical animals.

This does not mean, however, that human-made technology eliminates the biological adaptive advantages of particular individuals or groups. People who have thicker layers of fat insulation under their skin still usually survive better in cold climates, while people who are slender do better in hot ones.

Adapting to Climate Extremes

Humans and many other mammals have unusually efficient internal temperature regulating systems that automatically maintain stable core body temperatures in cold winters and warm summers. In addition, people have developed cultural patterns and technologies that help them adjust to extremes of temperature and humidity.

Body size and shape are significant factors in how efficiently an individual responds physiologically to cold and hot climates. Two 19th century naturalists, Carl Bergmann and Joel Allen, formulated rules concerning these factors.

Skin adaptation

Skin pigmentation is a response to the body's need for vitamin D3 production and protection from UV light. It is an adaptation to the environment (fig.2). Jablonski and Chaplin proposed that human populations have undergone multiple adaptations from light to dark and back to light pigmentation as they migrated between areas of greater UV light exposure and less UV light exposure. These adaptations have taken place over relatively short, geological time periods.

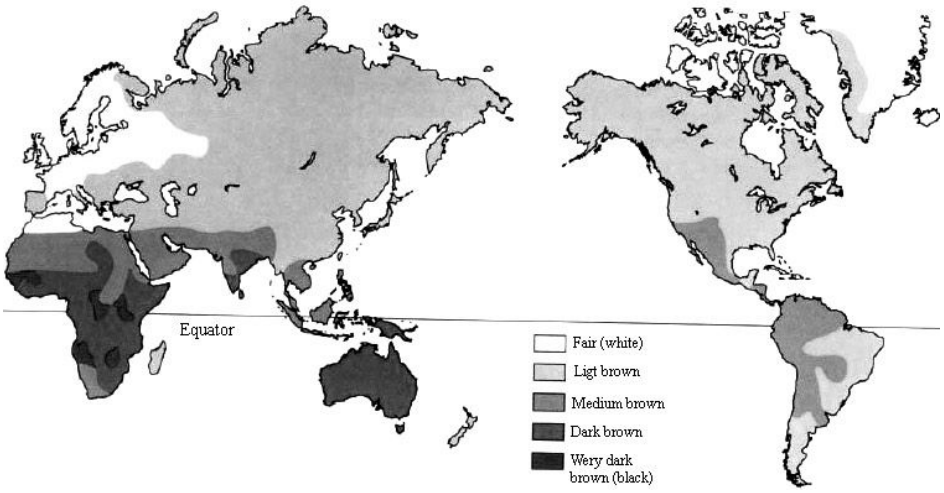

Fig.2. Skin color distribution on our planet.

Jablonski and Chaplin explain, "As the pace of human migrations has quickened in recent centuries, more and more populations are finding themselves living under UV irradiation regimes to which they are inherently poorly adapted (e.g., the English who settled in Australia in the nineteenth and twentieth centuries), with major public health consequences."

It is questionable how modern culture and transportation will affect skin color in the future, if there will be adaptation to frequent environmental changes; however, it can be argued that current migration is contributing to a greater incidence of disease related to UV light exposure and that greater attention to dietary needs is necessary to ensure adequate vitamin D3 and folate levels.

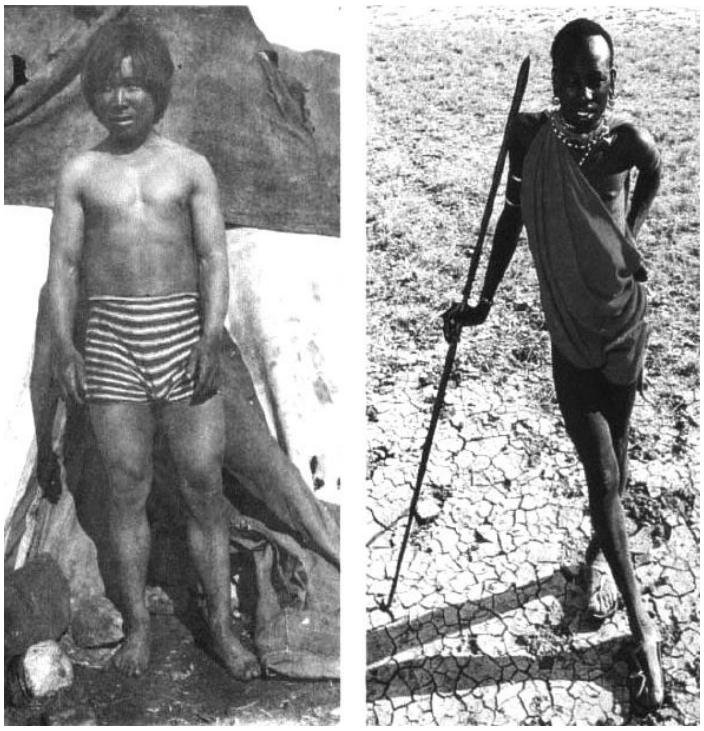

Fig.3. Buryats and African men.

Jablonski agrees that Curly hair was evolutionarily advantageous for pre-humans to retain the hair on their heads in order to protect the scalp as they walked upright in the intense African (equatorial) UV light. While some might argue that, by this logic, humans should also express hairy shoulders given that these body parts would putatively be exposed to similar conditions, the protection of the head, the seat of the brain that enabled humanity to become one of the most successful species on the planet (and which also is very vulnerable at birth), was arguably a more urgent issue (axillary hair in the underarms and groin were also retained as signs of sexual maturity). During the gradual process by which Homo erectus made a transition from furry to naked skin, their hair texture putatively changed gradually from straight (the condition of most mammals, including humanity's closest cousins—chimpanzees), to Afro-like or 'kinky' (i.e. tightly coiled). In this sense, during the period in which humans were gradually losing their straight body hair and thereby exposing initially the pale skin underneath their fur to the sun, straight hair would have been an adaptive liability. Hence, tightly coiled or 'kinky' Afro-hair may have evolved to prevent the entry of UV light into the body during the transition toward dark, UV-protected skin.

Body size and shape adaptation

Carl Bergman (German physiologist) observed that body size increases with decreasing body temperature. J.A. Alen an American scientist, added that protruding parts of the body, such as limbs, fingers ears tend to be shorter in the cooler region than in warmer regions (fig.3).

Impact of infectious diseases

Infectious diseases had a maximum effect on shaping human gene pool and leaving their scars on it, they are number one limiting factor to human population. Historical data lead us to believe that

HIV is a selective agent. The war against infectious diseases has been won by the other side: as we have radically altered the course of evolution in some microbial species, they have, in turn dramatically influenced our own evolutionary history, and today they continue to do so in an increasingly rapid manner.

Conclusions

In the light of the information presented above, we conclude that the human body reacts significantly and substantially to the environmental conditions it is present in.

Humans do react physiologically to the environmental changes, compensating for changes (homeostasis).

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BODY IMAGE, PROPORTIONS, BEAUTY AND HEALTH

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Summary
In the current article, a literary review is done, which describes the evolution of human ideas about body image and its relationship with notions of beauty, fashion and health.

Rezumat
Proporţiile corpului: moda, frumuseţea şi sănătate
În articol de faţă este prezentată analiza literaturii de specialitate pe această temă şi descrisă evoluţia ideilor umane despre imaginea corporală şi relaţia sa cu noţiunile de frumuseţe, modă şi sănătate.

News theme
Currently, in human society throughout different countries two harmful extremes are observed: there are a growing number of people suffering from obesity and those who, with the aim of achieving body perfection, come to anorexia. The problem of propagation of a healthy lifestyle has become one of the most current medical activities.

Aim
The purpose of this article is to contribute to healthy lifestyle propagation. To better understand the body's ideal proportions for healthier living, as well as, to eliminate common body image problems, and progress toward a healthier body as a whole.

Materials and methods:
Perform an analysis of literature that focuses on illuminating the evolution of proportionality of the human body. Using a performed anthropometric study of 200 women, develop tips on raising a healthy lifestyle and promoting self-evaluations in light of the principles that are not detrimental to health.

Body image problems and associated health complications
The term *body image* is defined as; a person's perception of the aesthetics and sexual attractiveness of their own body. Throughout history, human society has placed great value on the beauty of the human body, but a person's perception of their own body may not correspond to the cultural ideal of the time.