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Студ. В. В. Демидов
Науч. рук. преп. А. В. Шавель
(кафедра межкультурных коммуникаций и технического перевода, БГТУ)

BIO-HACKING

We live in a great era of high technologies. Surrounded by smart devices and modern facilities, we have even stopped noticing how much the quality of our life has risen in comparison with the 19th – 20th centuries. The level of scientific and medical researches has increased tenfold, which positively effects not just the standard of living but the pace of technical development too. At the same time, when it comes to the topic of technologies of the 21th century, it is almost obvious to mention the phenomenon of Bio-Hacking.

First of all, by Bio-Hacking is often meant the alternative way of self-development along with medicine and sport. The best way to explain the difference between these conceptions is to illustrate the main directions of Bio-Hacking. Bio-Hacking is divided into three fundamental categories.

The first one is called Nutritional Genomics or just Nutrigenomics – science which studies the relationship between the human genome and the quality of a person's nutrition. To be more exact, a diet has a significant impact on chronic diseases and health in general. Researches in the field of functional genomic methods could determine the biological activity of food components. The term "genomics" stands for "the study of all the nucleotide sequences, including structural genes, regulatory sequences, and non-coding DNA segments, in the chromosomes of an organism" [1] while functional genomics is used to describe "application of global (genome-wide or system-wide) experimental approaches to assess gene function" [1]. Many bio-hackers stand for ketonutrition based on a ketogenic diet. "The ketogenic diet is a high-fat, adequate-protein, low-carbohydrate diet aimed at stimulating normal body growth and repair" [2]. It has also found its application in medicine, where it is used to treat advanced cases of epilepsy among children. Bio-hackers like Dr. Dominic D'Agostino recommend to include more meat and seafood in the daily diet and consume more vegetable oils like avocado, olive or coconut ones. Grain products are also considered suitable for this diet.

The second way of Bio-Hacking development is called Quantified Self which intersects with Nutrigenomics in some aspects, but it has found its wide application in our daily life. Quantified Self starts when you begin to measure something that can influence your health, such as climatic conditions. Various devices like smart watches and bands, pulse and breathe detectors, humidity, temperature and pressure sensors may be related in some

way to Quantified Self type of Bio-Hacking. A continuous analysis of the heart rate, sleep quality, caloric intake and physical activity in strict relation with human's state of health makes it possible to find the best way of improving all above mentioned characteristics.

A new level of Bio-Hacking, also known as DIY-Biology, starts where Quantified Self type ends. This way, which is often called "grinder", radically differs from two previous ones. This form of Bio-Hacking is represented in implanting and embedding devices subcutaneously with all its risks and dangers. Even though this method may seem unscientific and ridiculous, people who practice this branch of Bio-Hacking use knowledge in the spheres of microbiology, neurobiology, bio-mechanics, engineering, including physics and mathematics, chemistry and even physiology. It provides risk takers with a sustainable scientific background, allowing them to avoid errors during the process of designing and integrating devices. But subcutaneous embedding is not always applied, because bio-hackers often prefer on-skin devices.

At the same time, Bio-Hacking does not only mean taking care of your health and activities, this modern phenomenon also affects the lifestyle. People can use it to simplify their routine as many Swedes have already done. Thousands of people integrated under-skin chips using NFC technology of wireless data sharing. "The chip itself essentially acts as a digital keychain" [3]. The surprising fact is that the technology of the chip integration was firstly used in late 2014 – 2015. Swedes also practice digital tattooing which allows to unlock smart devices and home doors without using keys, but in prospective the technology of digital tattoos, as experimenters noticed, can be used to control smart home equipment, can provide you with the exchange of data in real-time with your phone, etc.

Some of the most creative bio-hackers even "invent" their own way of self-development without usage of any technological devices. Practicing breathing techniques, cold tempering and meditations, as they think, enhances immune system, improves sleep, reduces stress and provides with energy.

In accordance with all of the above, it is quite important to establish the range of negative and positive aspects that Bio-Hacking technologies provide us with. Even though Bio-Hacking can simplify our daily routine and increase the quality of our life, it still has contradictions with classical medicine which is aimed not only at efficiency, but at safety too. Methods that are applied to reach the aim of Bio-Hacking are quite specific and implantation of any devices on or under the skin, like any other interference with the functioning of the human body, its organs, and even DNA, requires strict medical supervision to prevent any allergic or inflammatory reactions. One more dangerous side of DIY-Biology is the cost of the DNA sequencing

procedure, which has been falling rapidly since the 1990s. Rob Carlson, the managing director of Bio-economy Capital and the principle at Biodesic consulting firm, noticed the similarity of this constant price reduction with the famous "Moore's law" – "Gordon Moore, of Intel fame, claimed that computing power available at a given price would double nearly every 18 months. Carlson says that an equivalent concept may be at work in the biologic sphere [4]. It means, that self-experimentation tends to become more affordable for the general public. The other negative aspect of Bio-Hacking connected with device implanting is data security. When it comes to devices that measure your characteristics and share them with local data base or just your smartphone, they are inevitably exposed to all sorts of software failures, hardware problems, and even threats of hacking. At last, the sphere of Bio-Hacking cannot make any provisions or forecasts on how all these under-skin gadgets will affect your health in a long-term perspective.

At the same time, technologies that are known as dangerous are applied by thousands of people (RFID chips, magnets, led lamps) and there is no official information of any death cases linked somehow with their DIY-activity.

Summing up, the phenomenon of Bio-Hacking has appeared as a result of the desire to improve and prolong the human life. Even taking into account all risks and hazards of making changes to the native organism, it is obvious that the advancement of this biotechnological scientific field is inevitable, as there are too many life aspects it provides benefits in. Technologies are constantly and unceasingly moving forward, and it is absolutely impossible to stop the development of them. The only way out is to accept them and advantages they offer, considering all possible disadvantages, even though we have no idea about them, because, as Marie Curie once said, "Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less".

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