

Research on the Obstacles of Medical Treatment to Human Evolution

Xiupu Zhao

Qingdao No. 39 Middle School, Shandong, China

Keywords: Medical Treatment, Gene Therapy, Normal Medical Treatment.

Abstract: It is relatively well-understood how natural selection took place in the distant past. But the study on how natural selection act in the present is still ambiguous, Plus, humanity owns the unique skill that can cure themselves effectively using external treatments, which might interfere the natural selection on current human. Here, we quote the study on global heart disease, ancient insects gene therapy and high cholesterol to support the idea that medical treatments would block the natural selection process of humanity. Plus, article also points out the factors that make such block not thorough.

1 INTRODUCTION

Compared to other species, humanity evolved extraordinarily quickly from the Dryopithecus. And humans evolved even more rapidly since the emergence of social organization. The difference between human and other vertebrate are recognized as owning the ability to use tools to fulfill their purposes such as hunting, searching for food, building the shelter. As ancient ape's brain capacity raised caused by the preference of natural selection upon the smarter individual, the natural selection have happened significantly on humans in ancient times. (Hawks 2012)

Humanity had evolved in a macroscopical span, and there is evidence pinpointing that humans have been always keeping evolving and speed up the process. To demonstrate, the DNA related to lactose tolerance of ancient European people before last 6000 years did not exist in the population, but such DNA sequence widely exists among European settlers around 5000 B.C.E. (Wilde 2014) That is because people in Europe in that range of time, human were used to obtaining food by hunting, fishing and gathering fruits and nuts. As long as settlers start operating agriculture, and drinking milk produced from livestock, people's diet changed. Then, the people who owned the gene that allowed them to absorb more nutrients and to tolerate intaking more amounts of milk are more likely to survive, and pass their gene to the next generation. Thus, the gene of lactose tolerance widely appeared in the population. Plus, research done by Henry C. Harpending's team

shows that selection has accelerated greatly during the last 40,000 years, and more than 1800 genes speeded up. They assumed that this phenomenon is matched with human's settled life and increasing population. (Qin 2009)

But as for the rapid improvement of medical care, which mainly took place from the second industrial revolution, it made humanity became the first species that can use effective external treatments to improve their health level. For the doubt whether this difference will interfere with the process of natural selection, some scientists had offered their theory. According to Steve Jones, a genetics scientist, and professor at London university, address that the effect of natural selections had been decreased by 70% compared to hundreds of years ago for our humanity, because the number of elder fathers (procreate at an age after 35) decline, which means less possibility for spermatocyte's gene to mutate. Then the genetic diversity of offspring will be limited, which will slow down the evolving process. Jones also addressed that in the past there would be less than half of the total number of kids could live longer than 20 years old, but now in the western country, 98% of kids could live longer than 21 years old. (Wilde, Timpson, Kirsanow, Kaiser, Kayser, Unterländer, Hollfelder, Potekhina, Schier, Thomas, Burger 2014)

Here, we divide the entire medical treatments into two main categories, the normal treatment and gene therapies. The standard is that the normal treatments refer to the medical treatments that cure disease by using medicine, operations, radiation or other methods without modifying patients' genetic

material. And gene therapy Refers to the introduction of exogenous normal genes into target cells to correct or compensate for diseases caused by defects and abnormal genes to achieve the purpose of treatment.

In this article, we will comprehensively analyze two types of medical treatments, and using the data from UN and some global long-lasting study to support the idea that medical treatments hindrance the evolution of human being. And here, we will also point out that medical treatments will not stop the people, due to different rational affluence level and the disability to some particular diseases. (British scientist declare that human evolution 2008)

2 THE INTERFERE OF NORMAL MEDICAL TREATMENTS ON HUMANITY EVOLUTION

2.1 Normal Medical Care Hindering Humanity’s Evolution

During the whole history of the evolutionary process for humanity (started from Dryopithecus), it is known that ancient human beings would use spittle to cleans their wound, which is just like other animals did. And later, they would use the cloth to cover the wound to stop bleeding. Nevertheless, this advance still is not effective, patients still would die from infections or left Sequelae. Based on that, we can figure out that whether people own a stronger body or better physical conditions was still determined to survive in their circumstance, in other words: avoid being eliminated. And this principle was dominant until the second industrial revolution, which made a significant change in medical care. (QIAO 2011)

After experience the secondary industrial evolution, Health care had unprecedented innovation compared to the past. People are more concentrated on finding the methods to cure patients by science and effective medicine, and doing the operation on patients to clean up the wound. The disinfect method provided by Louis Pasteur lowered the probability of getting infected while experiencing injure, surgeon, and giving birth. For the medical treatments, they help people to survive when they suffer from physical injure both spontaneous and induced by external factors. Based on that, the weaker in the aspect for the physical condition would not be eliminated. (Besenbacher, Hvilsom, Marques-Bonet, Mailund, Schierup 2019)

The rapid decline in mortality of infants took place in current society can perfectly demonstrate this

case. Infants with hereditary spontaneous heart disease before the great development of medicine were very likely to die before the age of 18, and their genes are not likely to be delivered, so they are been eliminated. But for now, the death rate of people owning spontaneous heart disease who will survive from it is much lower in the past. According to the research on the systematic analysis for the global burden of congenital heart disease from 1990 to 2017, congenital heart disease caused 261247 deaths (95% uncertainty interval 216567–308 159) globally in 2017, a 34.5% decline from 1990, with 180 624 deaths (146825–214178) being among infants (aged <1 year). Congenital heart disease mortality rates declined with increasing Socio-demographic Index (SDI). (Hawks, Wang, Cochran, Harpending, Moyzis 2007)

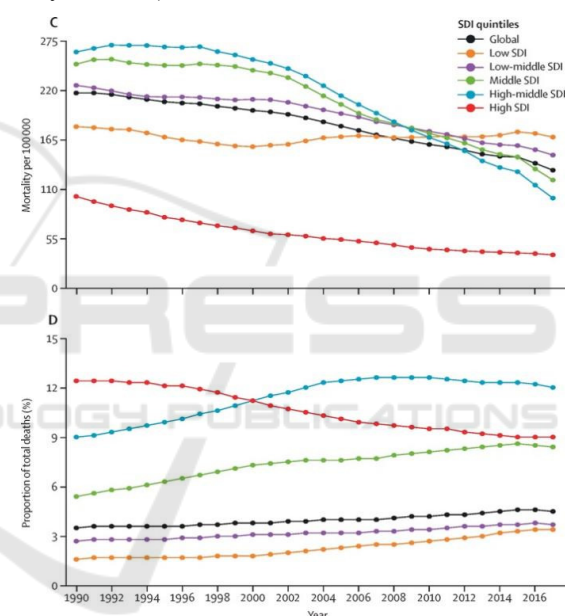


Figure 1: Mortality of congenital heart disease in children under 1 year of age, 1990–2017.

2.2 The Incompleteness of the Hindrances Due to the Normal Medical Treatments

Based on the above case, we can also infer another important point: The hindrance due to the normal medical treatments is existing, but cannot totally block the selection. Because first: many diseases that due to the mutate happened to patients’ genes or some genetic disease, is difficult to be cured by the normal treatments, which like hemophilia, red-green colorblindness, rheumatism and thalassemia. Those genetic diseases are hard to be cured by taking

medicine or using normal medical treatments. In such cases, those diseases would permanently become the barriers for patients to live a normal life, and which can affect bearing children. (GBD 2017 Congenital Heart Disease Collaborators, Global, regional, and national burden of congenital heart disease, 2020) Then, individuals with those particular genetic diseases that are hard to be controlled by normal treatments are likely to be eliminated, which means that natural selection is still operating. Second: people's reproductive rate would be interfered with more or less if they own the genetic diseases, even though their genetic diseases have gotten control for the level of trials. This can be proved by long-lasting research done by the team of Sean G. Byars. They estimate the total cholesterol of different and their reproductive success in their lifetime, both male and female residents. (Byars, Ewbank, Govindaraju, Stearns 2010)

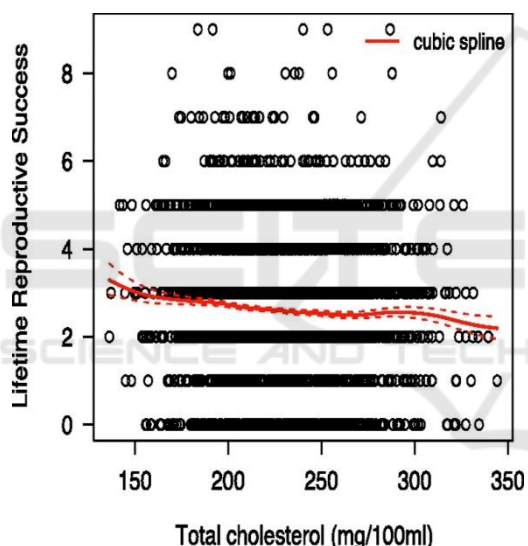


Figure 2: The effect of total cholesterol upon the reproductive during lifetime.

They found out that there is a linear relationship between two factors, and it is slightly negative, which shows that the cohorts with higher total cholesterol tended to own less reproductive success time during their lifetime. And this will then reduce the frequency of genes of high cholesterol (Wilde, Timpson, Kirsanow, Kaiser, Kayser, Unterländer, Hollfelder, Potekhina, Schier, Thomas, Burger 2014). However, this can apparently only be viewed in a huge population, which means the individual can hardly feel this tiny difference, and would not likely to take drugs to increase their fertility success rate. Based on that, the frequency of related genes would

gradually decline. Thus, normal medical treatments cannot totally block the selection process. (UN Inter-agency Group for Child Mortality Estimation, data for infant mortality rate for each country.)

Besides, the differences in local regional economic level also makes normal medical treatments can't stop evolution of humans. To be more specific, the hindrance caused by the medical treatments is in proportionality with the local health care, which can be reflected by the level of affluence. For the people who live in a prosperous area, once any individuals got the illness, they will timely take medical care, and the medical treatments will cover up the original undesirable trials quickly and efficiently through accurate diagnosis and effective pharmacy medicine or surgery. Then the hindrance would be dramatic, because, among them, those inheritable traits can't be eliminated, and be delivered to the next generation. For the people who live in a poor area, they cannot receive and get appropriate, normative medical care. In such a case, only the stronger individuals that resist those diseases, or the individual without those disease-cause genes can survive, which means the selection process is still operating dramatically. (Tvedte, Logsdon, Forbes 2019) This can be proved by the statistical data from the UN Inter-agency Group for Child Mortality Estimation (Figure 4). It can be easily analyzed that the more developed an area is, the smaller rate for infant mortality, and also the smaller rate for child mortality aging under five. For the poor area, they own a higher rate for infant mortality and child mortality aging under five. Consequently, the individual with harmful variance will be eliminated relatively quickly in the poor area. For the prosperous area, the individual's harmful variance will be more likely to be reserved because of the medical care making block to the natural selection to eliminate the weaker.

2.3 Summary

The hindrance of natural selection due to the normal treatments exists. However, the hindrance is limited, which can be seen when individuals own some particular and severe genetic diseases or chromosomes mutates, the natural selection that happened on them could still be dramatic. And the hindrance caused by medical treatment will in proportional to the local health care, which can be reflected by the level of affluence.

Table 2: Infants mortality rate (death per thousand live infants) from 1990 to 2019 for World Bank Low Income Economies and World Bank Upper-Middle Income Economies.

Geographic area	:Sex	Time period	Observation Value	Reference Date	Interval
WBLI/WBUMI	_T: Total	Jun-90	109.463446509862/42.7815011606326	1990.5	1
WBLI/WBUMI	_T: Total	Jun-95	100.922626747199/37.0132344311526	1995.5	1
WBLI/WBUMI	_T: Total	Jun-00	88.6047895128807/29.908538620655	2000.5	1
WBLI/WBUMI	_T: Total	Jun-05	73.8161550778262/22.6922795024222	2005.5	1
WBLI/WBUMI	_T: Total	Jun-10	62.4996950995103/17.052156472951	2010.5	1
WBLI/WBUMI	_T: Total	Jun-15	53.4542695157647/13.3918464099905	2015.5	1
WBLI/WBUMI	_T: Total	Jun-19	47.9118341480216/11.3477289544356	2019.5	1

WBLI refers to the World Bank Low Income Economies; WBUMI refers to the World Bank Upper-Middle Income Economies; Observation value refers to the infant mortality per one thousand of live infants.

3 THE INTERFERE OF GENE THERAPY TREATMENTS ON HUMANITY EVOLUTION

3.1 The Further Hindrance to the Natural Selection of Human Being Due to Gene Therapy

Heritage and mutation are two ingredients for species evolution. And neither of them should be absent. In another word, only when both of them are satisfied, species evolutions are keeping processing. When one species never mutates, then the genetic sequence of such a creature will never change, and its gene will remain the same without any evolution. However, this would never occur under the current circumstance, because all species' genetic material would mutate with a very low probability. When the mutation process of one species is blocked, assume the mutate rate follows the normal, the mutate can't always be delivered or can't be delivered. This will cause the evolution speed of such species to slow down. Phasmatodea is one of the species that some of its genetic sequences cannot be delivered. Phasmatodea owns a unique reproduction method, we called them clonal or hemiclonal reproduction. However, hemiclonal reproduction is more usual. In clonal reproduction, sperm only play a role in activating the embryo. During hemiclonal reproduction, the oocyte just sweeps away the paternal genes and then integrates with the sperm. The most typical species with hemiclonal reproduction is Phasmatodea. In such case, the meiosis will not occur in the formation of the egg cell. And then the genetic recombination would not occur as well, which will greatly lower the mutation rate.

This would cause less variability for their genes, which makes their genes stable for millions of years. So it is obvious that either of them is blocked, the evolution speed would slow down. Gene therapy can fix the original undesirable gene, and replace it with the new and external gene that controls the correct trials, which means the delivery of the mutation is blocked. In such situation, nature could not eliminate the weaker, because once a harmful genes carrier came out, they can be detected and fixed, then the trial would be modified as well, and then hardly do weaker exist. Then, the evolution is apparently blocked by analogizing. (Ye, Chang, Lin, Sun, Yu, Kan 2009)

With the import of gene therapy, many diseases can be further and radically cure, such as hemophilia, red-green colorblindness, rheumatism and thalassemia. According to the report published on PNAS, the innovation of reprogramming somatic cells to induced pluripotent stem cells provides a possible new approach to treat β -thalassemia and other genetic diseases such as sickle cell anemia. They Induced pluripotent stem (iPS) cells that are made from these patients' somatic cells, and the mutation in the β -globin gene is corrected by gene targeting, and the cells differentiated into hematopoietic cells to be returned to the patient. Based on the dramatic effect of genetic therapy, it raises the possibility of using iPS cells to treat patients with homozygous β -thalassemia. A similar strategy of treatment may also be applied to sickle cell anemia, as has been demonstrated in a mouse model (20). Somatic cells such as skin cells can be cultured from the patients and reprogrammed into iPS cells. The mutation in the β -globin gene in β -thalassemia or sickle cell anemia can be corrected in the cultured fibroblasts or following their reprogramming into iPS cells by the gene targeting

method. The iPS cells can then be differentiated into hematopoietic cells for the treatment of the patients. As the cells are the patient's own, immune rejection is avoided (Ye, Chang, Lin, Sun, Yu, and Kan 2009). Also, parents can get a gene test for their fetus if there are any possible genetic diseases. In such way, parents can fix their disease-causing genes. With the effective treatments to diseases, humanity who receive the gene therapy will all then converge in aspect for physical condition. And after conducting those treatments, their physical condition will no longer be the barrier to get a higher social status due to the combination of normal treatments and gene therapy, which means they would own the equal opportunity to live well. Thus, natural selection is being further blocked in aspect for better cure effect. (Wipfler, Letsch, Frandsen, Kapli, Mayer, Bartel, Buckley, Donath, Edgerly-Rooks, Fujita, Liu, Machida, Mashimo, Misof, Niehuis, Peters, Petersen, Podsiadlowski, Schütte, Shimizu, Uchifune, Wilbrandt, Yan, Zhou, Simon 2019)

3.2 The Incompleteness of the Hindrance Due to the Gene Therapy

Likewise, the hindrance due to gene therapy would also be incomplete, it can be reflected that some genetic diseases like Polygenic, which would make the treating process very sophisticated and evenly impossible to be eradicated.

In addition, the hindrance caused by the medical treatments is in proportionality with the local affluence level, which can be reflected by the level of affluence. Residents in the rich area are more likely to afford the expense of gene therapy, and the hindrance will be strong. For the poor area, people can't afford such expense of gene therapy, and the natural selection preference would be still significant. Thus, the block effect due to medical treatments can also not be thorough.

3.3 Summary

Gene therapy blocks natural selection more deeply. Because gene therapy's trials of inheritable. Likewise, the hindrance can also be incomplete due to the disability to inheritate diseases like Polygenic, and the differences in health care levels.

4 CONCLUSIONS

Medical treatments will block the natural selection both for normal treatment and gene therapy. However, this hindrance caused by both normal treatments and gene therapy will not be thorough due to the realistic objective factors. Plus, both of the hindrances for two kinds of treatments are in proportionality with the prosperity level.

REFERENCES

- B. Wipfler, H. Letsch, P. B. Frandsen, P. Kapli, C. Mayer, D. Bartel, T. R. Buckley, A. Donath, J. S. Edgerly-Rooks, M. Fujita, S. Liu, R. Machida, Y. Mashimo, B. Misof, O. Niehuis, R. S. Peters, M. Petersen, L. Podsiadlowski, K. Schütte, S. Shimizu, T. Uchifune, J. Wilbrandt, E. Yan, X. Zhou, S. Simon, *Evolutionary history of Polyneoptera and its implications for our understanding of early winged insects*, PNAS, February 19, 116, 3024-3029 (2019).
- British scientist declare that human evolution had stopped. www.chinadaily.com 2008 10 08
- E. S. Tvedte, J. M. Logsdon Jr., A. A. Forbes, *Sex loss in insects: causes of asexuality and consequences for genomes*, *Current Opinion in Insect Science*, February, Volume 31, Pages 77-83 (2019).
- GBD 2017 Congenital Heart Disease Collaborators, *Global, regional, and national burden of congenital heart disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017*, *The Lancet Child & Adolescent Health*, March, Volume 4, Issue 3, Pages 185-200 (2020).
- J. Hawks, E. T. Wang, G. M. Cochran, H. C. Harpending, R. K. Moyzis, *Recent acceleration of human adaptive evolution*, PNAS, December 26, 104, 20753-20758 (2007).
- John Hawks, *Longer time scale for human evolution*, PNAS, September 25, 109, 15531-15532 (2012).
- L. Ye, J. C. Chang, C. Lin, X. Sun, J. Yu, Y. W. Kan, *Induced pluripotent stem cells offer new approach to therapy in thalassemia and sickle cell anemia and option in prenatal diagnosis in genetic diseases*, PNAS, June 16, 106 9826-9830 (2009).
- QIAO Yu-cheng, *Evolution and Degeneration: The Evolution of Human Physique and Its Cause Analysis —From the Perspective of Physical Anthropology*, *SPORT SCIENCE*, Vol.31, No .6 (2011).
- Qin S i-he, *The Exploration of the Momentum for the Evolution of Vertebrate into Human Being*, *Medicine and Philosophy (Humanist ic &Social Medicine Edition)*, Vol.30, Total No.394 (2009).
- S. Besenbacher, C. Hvilsom, T. Marques-Bonet, T. Mailund, M. H. Schierup, *Direct estimation of mutations in great apes reconciles phylogenetic dating*, *Nature Ecology & Evolution* page Feb, 286-292 (2019).

- S. G. Byars, D. Ewbank, D. R. Govindaraju, S. C. Stearns, Natural selection in a contemporary human population, PNAS, January 26, 107 (suppl 1) 1787-1792 (2010).
- S. Wilde, A. Timpson, K. Kirsanow, E. Kaiser, M. Kayser, M. Unterländer, N. Hollfelder, I. D. Potekhina, W. Schier, M. G. Thomas, J. Burger, Direct evidence for positive selection of skin, hair, and eye pigmentation in Europeans during the last 5,000 years, PNAS, April 1, 111, 4832-4837 (2014).
- UN Inter-agency Group for Child Mortality Estimation, data for infant mortality rate for each country.

