Weekly Homework 6

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April 5, 2020

1 Model organisms

Model organisms are defined as creatures used as substitutes for experimenting with different scientific curiosities. They represent the first line when experimenting, since they are usually low maintenance, and easy to reproduce. These creatures are used in several branches from fields such as Biology and Genetics, but not only. The beauty and cosmetics industry also makes use of such models for testing their new products. For a better understanding, let's name one of the most popular model organism, the mouse. It is known that in terms of DNA similarity, humans and mice vary by only a couple of percent, so in many cases results proven on mice are highly correlated to the way a certain experiment would act on human beings.

One important question that I've asked myself for this assignment is why do scientists use model organisms? Can they be trustworthy in terms of how a certain thing would act on us humans? I've found a video which presents three examples that are widely used for experiments and discuss why they are chosen and how each one of them contributes. Firstly, it starts by discussing the similarities between humans and fruit flies. Even though humans tend to be a lot more similar to mice, it looks like us and fruit flies still share about 60% of the whole genome, and about two-thirds of those genes that are involved in different types of cancers are also shared by us and fruit flies. Therefore, fruit flies, but some other model organisms nevertheless, are often preferred, since experiments on an actual human beings are often prohibited, unethical or highly expensive. One example given in that video is how

fruit flies are used for finding treatment for Down Syndrome and other related conditions. Anyway, Down Syndrome in particular seems to be caused by an excess of a certain protein that leads to neurons overgrowth. This condition seems to be solved for fruit flies by inducing a certain cancer medicine, so now this experiment may be moved on to an actual human study group. Another well known and popular model organism is the yeast, the bacteria that helps bread and other bakery products grow and become more fluffy. One use case for yeast is for analyzing how each cell moves to the location where they are needed in case of any type of injury or out of order context exactly at the right time. Results coming from this experiment may be useful for several types of cancer when cells no longer follow their corresponding task and start multiplying without any sense. Anyway, yeast was the model organism used in 5 Nobel winning researches, demonstrating its usefulness and applicability in numerous domains. The third example is C. elegans, some incredibly small transparent worms that are used for testing the behavior of our senses, such as vision. Even though these worms do not possess eyes, they are still receptive to light and its intensity. Furthermore, they even possess receptors that recognize light more efficiently than the human eye, so we could use those receptors for better identifying the sun's harmful rays or other injurious types of rays for developing better anti-rays protection.

2 TedxTalks - Supplementary videos

There are four Ted Talks, each one of them approaching a slightly different view of the same topic which is CRISPR. I'll first talk about to one that gives an overview about what we all need to know about CRISPR, I'll move on to the second and third video which are covering the actual subject of DNA editing and moreover, how can CRISPR change an entire specie now, and I'll end up with the video which mainly discusses the ethical issues of gene editing especially for babies. Starting with the first video, Ellen Jorgensen firstly presents the CRISPR mechanism, which is basically composed out of two parts: the Cas9 protein and the so-called guide RNA. The guide RNA is the one that searches for a match in the DNA and when it finds one, the Cas9 protein cuts out that exact part. Afterwards, she discusses how we can replace the part that has been cut out, and when replacing that certain cell

can be fooled by only keeping the ends, but editing components from within. She continues by dismantling a couple of preconceived ideas, such that CRISPR is cheap and easy to do technology. At that time, there was an ongoing battle for CRISPR/Cas9 patent between BROAD Institute and Berkley University, so there were no supplementary prices to pay, but one would still need a fully-equipped professional laboratory. Regarding the 'easy' aspect, she discusses the risks that may appear when trying to do even small changes inside a whole organism, because these minor changes usually occur by introducing a virus with CRISPR, but that virus may also cause some collateral damages. Moving on to the second video, it presents a few examples of how CRISPR was already used for a couple of organisms, such as mice and monkeys, but researches didn't stop at that point. Researches from China performed a gene-editing procedure for human embryos, which raised a lot of ethical and moral issues. Anyway, she also discusses the CRISPR technology and how its done, showing an example of mice which only had one gene-modified. Only from that gene, those mice had white pigment instead of black pigment. The last video talks about a slightly different view of CRISPR, which is the ethical dilemma that most of us have when it comes to actual gene editing in human embryos. In starts by presenting a future scenario, where some children would still be normal, without any genetic modifications, but others masterfully crafted from a bunch of embryos, so that the child that would come out will have a perfect combination of possible genetic material from both parents. Even though there are some major upsides to the condition of genetically designed children such as low health maintenance, there are also some other compartmental issues that may appear. Moreover, at the beginning of this era, there will be a high discrepancy between normal children, and those genetically engineered. Anyway, in some countries, only the idea of doing such thing is illegal, but in others, such as the USA there's no law prohibiting such thing. One of those countries that until recently considered genetically engineering to be illegal, the United Kingdom, passed a law which allows only such modifications for preventing or curing a rare or very dangerous disease. With such small steps being made, it looks like the world is moving on to a more lenient way of thinking, which may lead in the near future to disastrous consequences.