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In my previous blog, “Will an RNA Vaccine Permanently Alter My DNA?”, I laid out several molecular pathways that would potentially enable the RNA in an mRNA vaccine to be copied and permanently integrated into our DNA. I was absolutely not surprised to find that the majority of people claimed that this prospect was impossible; in fact, I was expecting this response – partly because most people don’t possess a deep enough understanding of molecular biology, and partly because of other implicit

biases.

After all, we've been told in no uncertain terms that it would be impossible for the mRNA in a vaccine to become integrated into our DNA, simply because "RNA doesn't work that way." Well, this current research which was released not too long after my original article demonstrates that yes, indeed, "RNA does work that way". In my original article, I spelled out this exact molecular pathway.

Specifically, a new study by MIT and Harvard scientists demonstrates that segments of the RNA from the coronavirus itself are most likely becoming a permanent fixture in human DNA. (study linked below). This was once thought near impossible, for the same reasons which are presented to assure us that an RNA vaccine could accomplish no such feat. Against the tides of current biological dogma, these researchers found that the genetic segments of this RNA virus are more than likely making their way into our genome. They also found that the exact pathway that I laid out in in my original article is more than likely the pathway being used (retrotransposon, and in particular a LINE-1 element) for this retro-integration to occur.

And, unlike my previous blog where I hypothesize that such an occurrence would be extremely rare (mainly because I was attempting to temper expectations more conservatively due to the lack of empirical evidence), it appears that this integration of viral RNA segments into our DNA is not as rare as I initially hypothesized. It's difficult for me to put a number on the probability due to data limitations present in the paper, but based on the frequency they were able to measure this phenomenon in both petri dishes and COVID patients, the probability is much greater than I initially anticipated. Due to this current research, I now place this risk as a more probable event than my original estimation.

To be fair, this study didn't show that the RNA from the current vaccines is being integrated into our DNA. However, they did show, quite convincingly, that there exists a viable cellular pathway whereby snippets of SARS-CoV-2 viral RNA could become integrated into our genomic DNA. In my opinion, more research is needed to both corroborate these findings, and to close some gaps.

That being said, this data can be used to make a conjecture as to whether the RNA present in an RNA vaccine could potentially alter human DNA. This is because an mRNA vaccine consists of snippets of the viral RNA from the genome of SARS-CoV-2; in particular, the current mRNA vaccines harbor stabilized mRNA which encodes the Spike protein of SARS-CoV-2, which is the protein that enables the virus to bind to cell-surface receptors and infect our cells.

This was thought near impossible. Based on this ground-breaking study, I would hope that the highly presumptuous claim that such a scenario is impossible will find its way to the trash bin labeled: "Things We Were Absolutely and Unequivocally Certain Couldn't Happen Which Actually Happened"; although, I have a suspicious feeling that the importance of this study will be minimized in quick order with reports from experts who attempt to poke holes in their work. It's important to add that this paper is a pre-print that is not peer-reviewed yet; but I went through all of the data, methods, and results, and I see very little wrong with the paper, and some gaps that need closing- but, at least from the standpoint of being able to answer the question: can RNA from the coronavirus use existing cellular pathways to integrate permanently into our DNA? From that perspective, their paper is rock-solid. Also, please take note that these are respected scientists from MIT and Harvard.

Quoting from their paper:

> "In support of this hypothesis, we found chimeric transcripts consisting of viral fused to cellular sequences in published data sets of SARS-CoV-2 infected cultured cells and primary cells of patients, consistent with the transcription of viral sequences integrated into the genome. To experimentally corroborate the possibility of viral retro-integration, we describe evidence that SARS-CoV-2 RNAs can be reverse transcribed in human cells by reverse transcriptase (RT) from LINE-1 elements or by HIV-1 RT, and that these DNA sequences can be integrated into the cell genome and subsequently be transcribed. Human endogenous LINE-1 expression was induced upon SARS-CoV-2 infection or by cytokine exposure in cultured cells, suggesting a molecular mechanism for SARS-CoV-2 retro-integration in patients. This novel feature of SARS-CoV-2 infection may explain why patients can continue to produce viral RNA after recovery and suggests a new aspect of RNA virus replication."

Why did these researchers bother to investigate whether viral RNA could become hardwired into our genomic DNA? It turns out their motive had nothing to do with mRNA vaccines.

The researchers were puzzled by the fact that there is a respectable number of people who are testing positive for COVID-19 by PCR long after the infection was gone. It was also shown that these people were not reinfected.

The authors sought to answer how a PCR test is able to detect segments of viral RNA when the virus is presumably absent from a person's body. They hypothesized that somehow segments of the viral RNA were being copied into DNA and then integrated permanently into the DNA of somatic cells. This would allow these cells to continuously churn out pieces of viral RNA that would be detected in a PCR test, even though no active infection existed.

Through their experiments, they did not find full-length viral RNA integrated into genomic DNA; rather, they found smaller segments of the viral DNA, mostly representing the nucleocapsid (N) protein of the virus, although other viral segments were found integrated into human DNA at a lower frequency.

In this paper, they demonstrate that:

1) Segments of SARS-CoV-2 Viral RNA can become integrated into human genomic DNA.

2) This newly acquired viral sequence is not silent, meaning that these genetically modified regions of genomic DNA are transcriptionally active (DNA is being converted back into RNA).

3) Segments of SARS-CoV-2 viral RNA retro-integrated into human genomic DNA in cell culture. This retro-integration into genomic DNA of COVID-19 patients is also implied indirectly from the detection of chimeric RNA transcripts in cells derived from COVID-19 patients. Although their RNAseq data suggests that genomic alteration is taking place in COVID-19 patients, to prove this point conclusively, PCR, DNA sequencing, or Southern Blot should be carried out on purified genomic DNA of COVID-19 patients to prove this point conclusively. This is a gap that needs to be closed in the research. The in vitro data in human cell lines, however, is air tight.

4) This viral retro-integration of RNA into DNA can be induced by endogenous LINE-1 retrotransposons, which produce an active reverse transcriptase (RT) that converts RNA into DNA. (All humans have multiple copies of LINE-1 retrotransposons residing in their genome.). The frequency of retro-integration of viral RNA into DNA is positively correlated with LINE-1 expression levels in the cell.

5) These LINE-1 retrotransposons can be activated by viral infection with SARS-CoV-2, or cytokine exposure to cells, and this increases the probability of retro-integration.

Instead of going through all of their results in detail (you can do that if you like by reading their paper linked below), I will answer the big question on everyone's mind – If the virus is able to accomplish

this, then why should I care if the vaccine does the same thing?

Well, first let's just address the big elephant in the room first. First, you should care because, "THEY TOLD YOU THAT THIS WAS IMPOSSIBLE AND TO JUST SHUT UP AND TAKE THE VACCINE." These pathways that I hypothesized (and these researchers verified with their experiments) are not unknown to people who understand molecular biology at a deeper level. This is not hidden knowledge which is only available to the initiated. I can assure you that the people who are developing the vaccines are people who understand molecular biology at a very sophisticated level. So, why didn't they discover this, or even ask this question, or even do some experiments to rule it out? Instead, they just used superficially simplistic biology 101 as a smoke screen to tell you that RNA doesn't convert into DNA. This is utterly disingenuous, and this lack of candor is what motivated me to write my original article. They could have figured this out easily.

Second, there's a big difference between the scenario where people randomly, and unwittingly, have their genetics monkeyed with because they were exposed to the coronavirus, and the scenario where we willfully vaccinate billions of people while telling them this isn't happening. Wouldn't you agree? What is the logic in saying, "Well, this bad thing may or may not happen to you, so we're going to remove the mystery and ensure that it happens to everyone."? In my best estimate, this is an ethical decision that you ought to make, not them.

Third, the RNA in the vaccine is a different animal than the RNA produced by the virus.The RNA in the vaccine is artificially engineered. First, it is engineered to stay around in your cells for a much longer time than usual (RNA is naturally unstable and degrades quickly in the cell). Second, it is engineered such that it is efficient at being translated into protein (they accomplish this by codon optimization). Increasing the stability of the RNA increases the probability that it will become integrated into your DNA; and, increasing the translation efficiency increases the amount of protein translated from the RNA if it does happen to become incorporated into your DNA in a transcriptionally active region of your genome. Theoretically, this means that whatever negative effects are associated with the natural process of viral RNA/DNA integration, these negative effects could be more frequent and more pronounced with the vaccine when compared to the natural virus.

As a side note, these researchers found that the genetic information for the nucleocapsid "N" protein was, by far, the largest culprit for being permanently integrated into human DNA (because this RNA is more abundant when the virus replicates in our cells). The vaccine, on the other hand, contains RNA that encodes the Spike (S) protein. Therefore, if the mRNA from the vaccine (or subsegments thereof) were to make its way into a transcriptionally-active region of our genome through a retro-integration

process, it will cause our cells to produce an over-abundance of Spike protein, rather than N protein. Our immune system does make antibodies to both N and S proteins, but it is the Spike protein which is the prime target for our immune system because it exists on the outside of the virus. If our cells become permanent (rather than temporary) Spike Protein producing factories due to permanent alteration of our genomic DNA, this could lead to serious autoimmune problems. I would imagine that autoimmunity profiles arising from such a scenario would be differentiated based on order of events (i.e., whether or not someone is vaccinated before or after exposure to coronavirus).

Again, this is a theoretical exercise I am presenting for consideration. I am not making the claim that an mRNA vaccine will permanently alter your genomic DNA, and I didn't make this claim in my first article, although it appears that troll sites made the fallacious claim that I did. I simply asked the question, and provided hypothetical, plausible molecular pathways by which such an event could occur. I believe this current research validates that this is at least plausible, and most likely probable. It most certainly deserves closer inspection and testing to rule this possibility out, and I would hope that a rigorous and comprehensive test program would be instituted with the same enthusiasm that propelled the vaccine haphazardly through the normal safety checkpoints.

Obviously, even given this information, people are still free to get vaccinated, and will do so according to the overall balance of risks and rewards that they perceive in their mind. The purpose of my article is to make sure you can make that assessment fairly by possessing all potential risks and rewards, rather than an incomplete set. For something as important as this, you should not be operating in the dark.

I would encourage you to share this article to let others know of the potential risks and rewards.

Referenced Article:

Zhang, Liguo, Alexsia Richards, Andrew Khalil, Emile Wogram, Haiting Ma, Richard A. Young, and Rudolf Jaenisch. "SARS-CoV-2 RNA reverse-transcribed and integrated into the human genome." *bioRxiv* (2020).

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