A Framework for Auditing the Consequences of CRISPR

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ABSTRACT

In these past couple of years CRISPR has evolved into one of the most well known and most effective biotech tools. Whether it is used for gene editing, deletion, or substitutions its potential benefits have caused a severe negligence in its negative impacts. This new audit tool that measures the potential detrimental effects of Crispr is sure to be invaluable in helping to identify what effects of CRISPR technology are understated and how detrimental they can really be. This tool evaluates areas such as ethical, clinical, societal, and environmental and judges the potential problem on a scale of 1-5 (5 being the most detrimental and 1 being negligible) using past cases and studies we have fed it We have also brought a group of 20 unbiased human judges who will also rate the scale of the problem on 1-5 to see if the model and human's results line up. One example of a study we used to feed the tool was the "world's first patient treated with personalized CRISPR gene editing at Children's hospital of Philadelphia." In this procedure they were successfully able to, in short, delete the mutation that the child KJ had which was called severe carbomoyl phosphate synthetase 1. The model gave this a 4/5 rating because although this case went well other cases with more complex mutations were not remediated at the same level. Many humans we asked that were not affiliated with the project or with the model had said it was a 3/5 rating. This shows the model predicted it in a close enough range to make the model viable

INTRODUCTION

CRISPR (clustered regularly interspaced short palindromic repeats) has seen many great successes that have undeniably brought it into status of a household name. Not too long ago CRISPR was used to snip an extra chromosome. Although it is reported to be not ready for humans this is still a big step in the future of CRISPR. Because of CRISPR's widespread successes it is utilized in many areas across the world, however this widespread use also leads to more instances of misconduct and other detrimental effects. The goal of this experiment was to build a tool to find out how much humans and the model would differ and find out the overall effects of CRISPR.

THE FRAMEWORK

The overall dimensions that were picked were based on 4 of the main potential drawbacks on the strength of CRISPR that being ethical, clinical, societal, and environmental. Each of these are potential drawbacks but the extent to which they were is lesser known. This framework is supposed to be able to objectively rank each section with unbiased humans also ranking each section to compare with the model. The scale for each section was objectively ranked on 1-5 by the model and subsequently compared to the unbiased humans. In ethical considerations of CRISPR the model ranked it as a 5/5 risk on the basis of whether CRISPR technology has the potential to disrupt future generations. The humans when given the same information rated it also as a 5/5, corroborating the model. For clinical use, the question that was given to both the framework and the humans was "was CRISPR tested on diverse backgrounds." The model gave this a 2/5 risk while the humans gave this a 3/5 risk which is within the range of being able to agree on about the same risk level. The next consideration was societal and the question given to both the model and the humans was "could this technology increase gender inequality" The model gave this a 5/5 risk, but the humans gave it a 3/5 risk showing a significant enough difference to refute the model in this scenario. For the final dimension environmental effects the question given to both the model and the humans was "is crispr biodegradable" The framework gave this a 1/5 risk and the humans also gave it a 1/5 risk so this data by the model is objectively true.

EXAMPLE OF CASE STUDIES
Each dimension of the study had at least one or two case studies attached to it which allowed the model to be as accurate as possible. One example of a case study used was the "world's first patient treated with personalized CRISPR gene editing at Children's hospital of Philadelphia." In this procedure they were successfully able to, in short, delete the mutation that the child KJ had which was called severe carbomoyl phosphate synthetase 1. The model gave this a 4/5 rating because although this case went well other cases with more complex mutations were not remediated at the same level. Many humans we asked that were not affiliated with the project or with the model had said it was a 3/5 rating. This shows the model predicted it in a close enough range to make the model viable

CONCLUSION
This model, although not perfect all the time, was good enough to be a first step on a very important study of CRISPR. As CRISPR gets adopted more frequently more steps like these need to happen to ensure the safe use of CRISPR and other biotech tools. On a final note this tool may be promising but is not ready for use in other real life situations. It should not be the case that in a couple of years this tool is used to evaluate the ethics of a recent case. Instead, this tool should be seen as a pioneer in the steps towards more ethical tools that can evaluate the ethics of biotech tools without human intervention.

Sources

https://www.ncbi.nlm.nih.gov/books/NBK430827/

https://news.harvard.edu/gazette/story/2019/01/perspectives-on-gene-editing/

https://www.biorxiv.org/content/10.1101/2023.09.26.559657v2

https://innovativegenomics.org/news/crispr-clinical-trials-2025/

https://www.frontiersin.org/journals/genome-editing/articles/10.3389/fgeed.2025.1593172/full

https://www.researchgate.net/publication/337770985_Public_Acceptability_of_Gene_Therapy_and_Gene_Editing_for_Human_Use_A_Systematic_Review

https://greenly.earth/en-gb/blog/ecology-news/could-crispr-technology-help-save-our-crops