

# Nanotechnologies for the Prevention of Brain Cancer

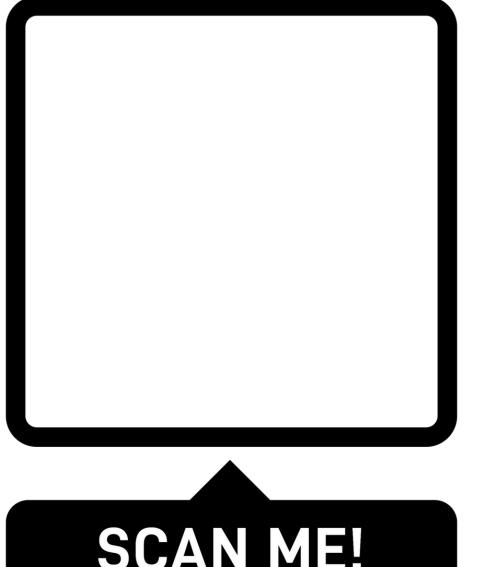
## CRISPR Technique

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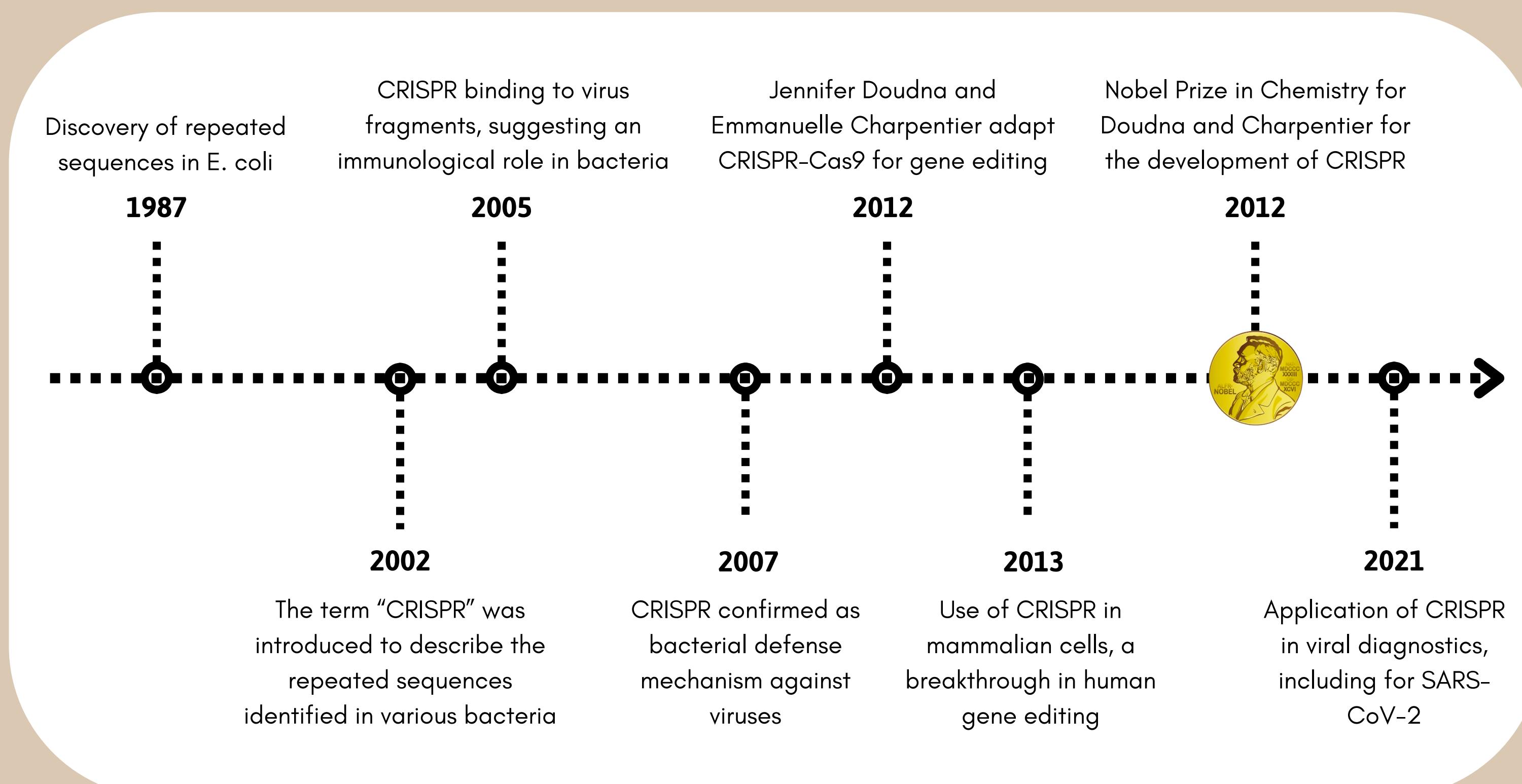
2020

Nobel Prize of Chemistry



## Introduction

Nanotechnology is revolutionizing the approach to brain cancer, enabling earlier diagnosis and more precise treatment. With nanoparticles capable of crossing the blood-brain barrier, it is possible to target drugs directly to cancer cells, increasing efficacy and reducing adverse effects [1].



Brain cancer is described as a condition in which there is an abnormal growth of cells in the brain, giving rise to tumors. These can be benign (non-cancerous) or malignant (cancerous) and can disrupt abnormal brain functions due to their growth and pressure on surrounding tissues [1].

### Statistical data

Based on statistics from the "National Brain Tumor Society" [1]

78.000

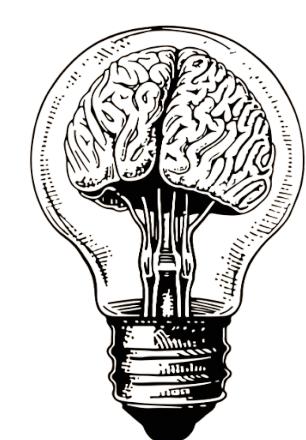
Diagnosed with malignant brain tumors in the US each year

16.616

Brain cancer deaths

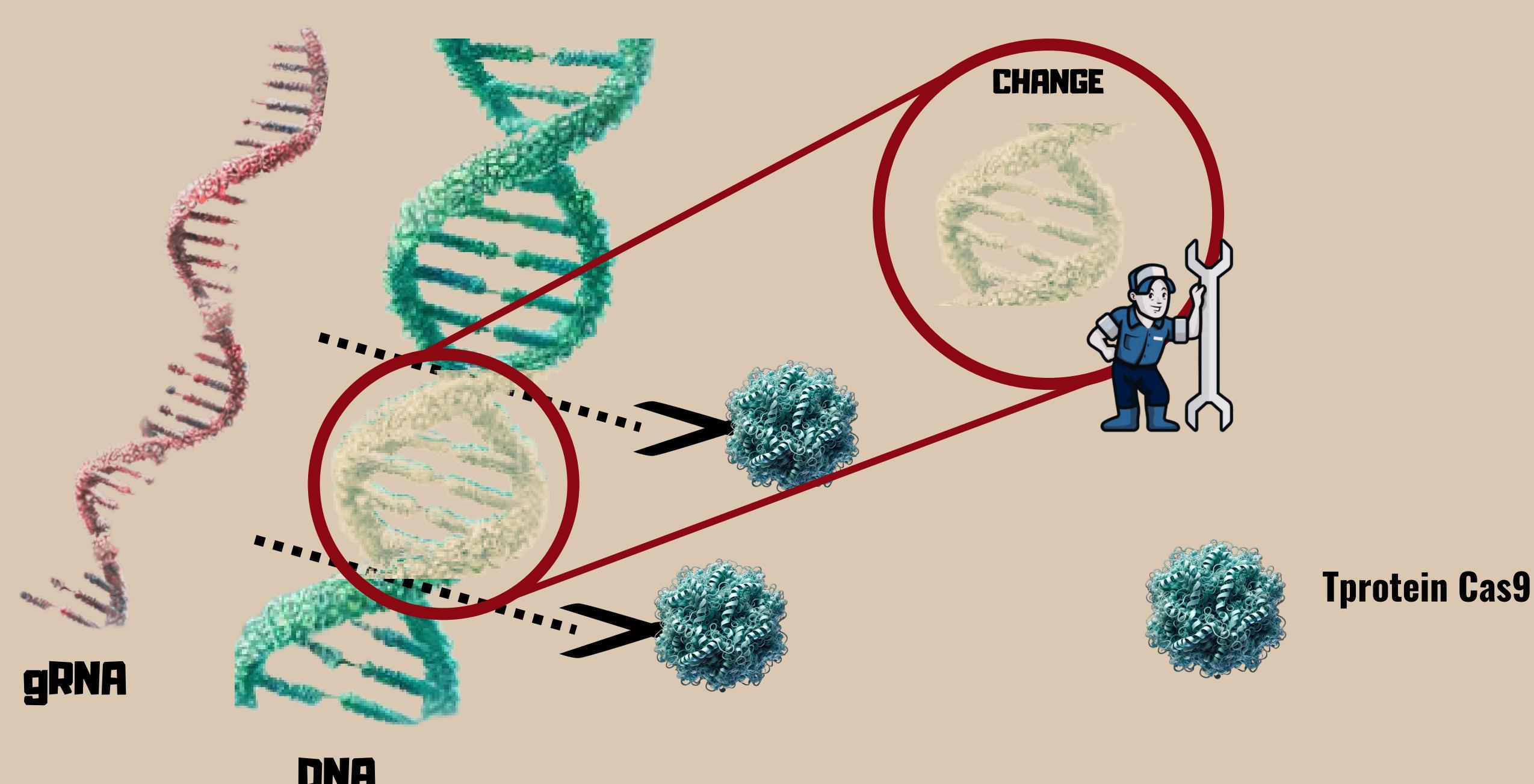
### Classification of brain tumors [1]

Low Grade  
Grade I  
Grade II  
High Grade  
Grade III  
Grade IV



## Technique

The CRISPR/Cas9 technique is a genetic editing tool that allows DNA to be modified in a precise and targeted manner [4].



## Solution

Personalized Treatments [5]



Regenerative Medicine [5]



Genetic Disease Correction [5]



Cancer Therapies [5]

## Experience

The CRISPR method for treating brain cancer identifies target genes in the tumor and uses guide RNA (gRNA) to direct the Cas9 enzyme, enabling DNA editing to inactivate oncogenes or correct mutations. Delivery to the brain is achieved through nanoparticles or viral vectors. It can also modify immune cells to attack the tumor, enhancing the body's natural defense mechanisms. Additionally, CRISPR allows for precise and targeted treatment, minimizing damage to surrounding healthy tissues. Preclinical trials assess efficacy and safety [3].

### Step 1



Encapsulation

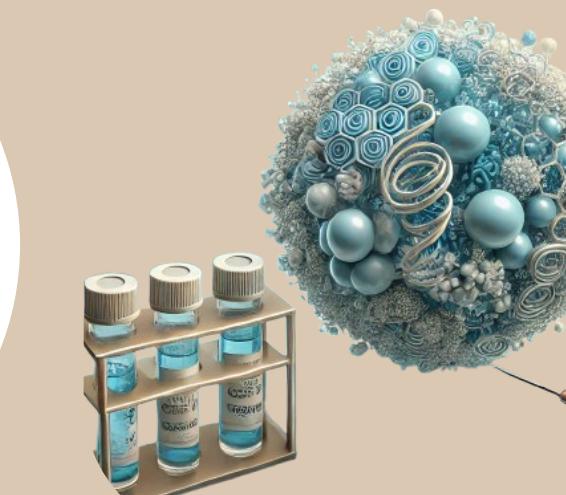


specific lipid nanoparticles + CRISPR-Cas9

### Step 2

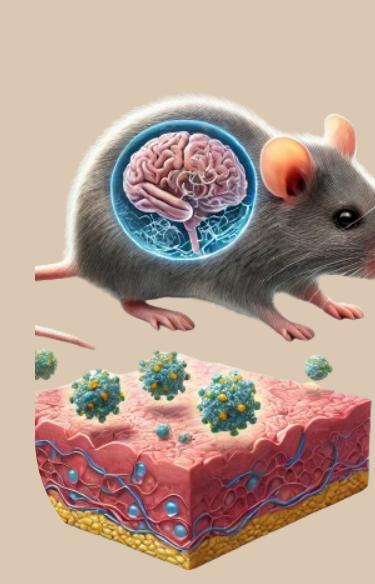


Selection and identification of target genes, inactive using the CRISPR-Cas9 system [3].



They designed specific guide RNAs (sgRNAs) for the target gene [3].

### Step 4



Implants of glioblastoma cells were made and then administered nanoparticles with CRISPR-Cas9 [3].



CRISPR-Cas9 was successfully delivered to the tumor cells, editing the target gene [3].

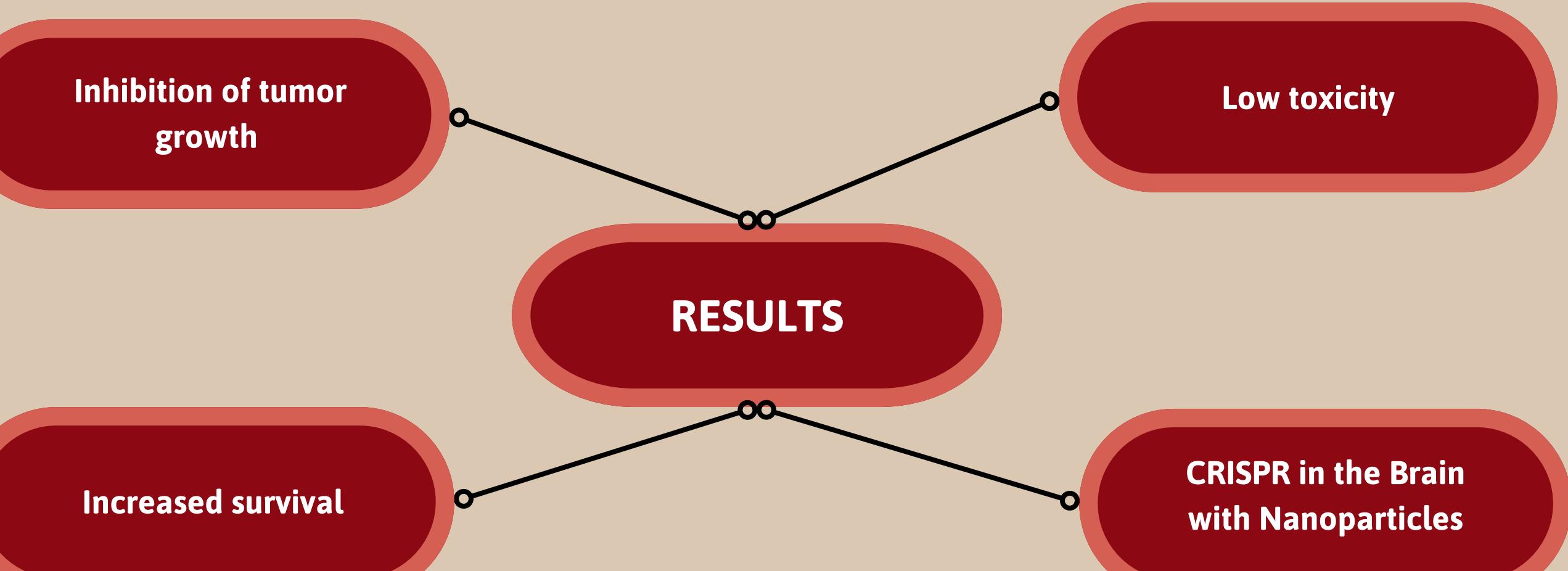
### Step 6



They measured the volume of the brain tumor over time using imaging techniques such as magnetic resonance imaging. The survival of the mice was monitored to check the impact of the therapy [3].

## Results

The delivery of CRISPR-Cas9 by lipid nanoparticles significantly reduced tumor growth and increased survival in mice, demonstrating efficacy and safety in the treatment of glioblastoma (an aggressive type of brain cancer that originates in glial cells) [3].



## Conclusion and future prospects

CRISPR technology promises to revolutionize cancer treatment with personalized therapies, T-cell modification and advances in immunotherapy. Studies focus on safety and efficacy, addressing challenges such as off-target mutations, aiming for more precise and safer treatments [2].

## REFERENCES

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