

## REVIEWER'S REPORT

Manuscript No.: IJAR-53030

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**Title: Plasma-Induced DNA Damage and Repair Mechanisms: Investigating Genetic Impact and Cellular Response Pathways**

### Recommendation:

**Accept as it is .....YES.....**

Accept after minor revision.....

Accept after major revision .....

Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality			✓	
Techn. Quality			✓	
Clarity			✓	
Significance		✓		

Reviewer Name: Dr Aamina

### Reviewer's Comment for Publication.

### Summary of Content:

The paper presents an in-depth exploration of the interactions between Cold Atmospheric Plasma (CAP) and biological systems, focusing on its potential to cause DNA damage and the subsequent cellular repair responses. It reviews the formation of various DNA lesions induced by reactive oxygen and nitrogen species (RONS), such as single-strand breaks, double-strand breaks, base modifications, and crosslinks. Additionally, it highlights the major DNA repair pathways, including base excision repair (BER), nucleotide excision repair (NER), and homologous recombination (HR), activated to counteract plasma-induced genetic damage. The paper underscores the balance between CAP's therapeutic potential and its genomic safety in biomedical applications.

### Strengths:

- The abstract provides a concise yet comprehensive summary of the paper's scope, integrating both the benefits and risks associated with CAP.
- The research addresses a highly relevant topic in the emerging field of plasma medicine, particularly concerning DNA integrity and cellular safety.

## REVIEWER'S REPORT

- The focus on RONS as the primary mediators of DNA damage establishes a clear mechanistic link between CAP exposure and genetic effects.
- The inclusion of multiple DNA repair pathways adds depth and demonstrates the complex cellular response to plasma-induced damage.
- The introduction provides a solid scientific context for CAP, clearly differentiating it from other states of matter and highlighting its biomedical potential.

### Scientific Quality:

The work is comprehensive and well-grounded in the current scientific understanding of plasma medicine. It integrates knowledge from biophysics, molecular biology, and clinical research to present a holistic view of the subject. Citations to foundational studies (e.g., Fridman et al., 2008; Keidar, 2015) further reinforce the scientific credibility.

### Relevance and Impact:

This paper is highly relevant for researchers and clinicians working in plasma medicine, oncology, regenerative medicine, and microbiology. By emphasizing the dual role of CAP as both a therapeutic tool and a potential genotoxic agent, it highlights the importance of ensuring genomic safety in clinical applications.

### Overall Evaluation:

The paper provides a thorough and scientifically sound overview of CAP-induced DNA damage and repair mechanisms. Its balanced presentation of therapeutic opportunities and safety considerations makes it a valuable contribution to the field of biomedical plasma research.