

Fusogens: Chemical Agents that Can Rapidly Restore Function After Nerve Injury

Salma A. Abdou¹, BA; Peter W. Henderson², MD, MBA

¹Hansjörg Wyss Department of Plastic Surgery, NYU School of Medicine, ²Division of Plastic and Reconstructive Surgery, Icahn School of Medicine at Mount Sinai

INTRODUCTION

- Fusogens are a heterogeneous group of chemical agents which can achieve cellular membrane fusion.
- The current approach to nerve injury repair of epineurial coaptation does not address the fundamental insult of axon membrane transection.
- Fusogens have been shown to achieve axon membrane fusion.
- We sought a unifying system for classifying fusogens in order to better understand their role in cell fusion.

METHODS

- A comprehensive literature review was conducted to identify the most commonly cited chemical fusogens, their structures, mechanisms and clinical applications to date.

RESULTS

- Seven fusogens were identified [Table 1]
- Chemical fusogens achieve cell fusion by one of two ways [Figure 1]:
 - Cell aggregation*: bring cells in close enough proximity to each other so that the inherent fluidity of the phospholipid membrane allows for their rearrangement
 - Membrane modification*: modify the surface charges of the membranes so that their repellent charges are diminished.

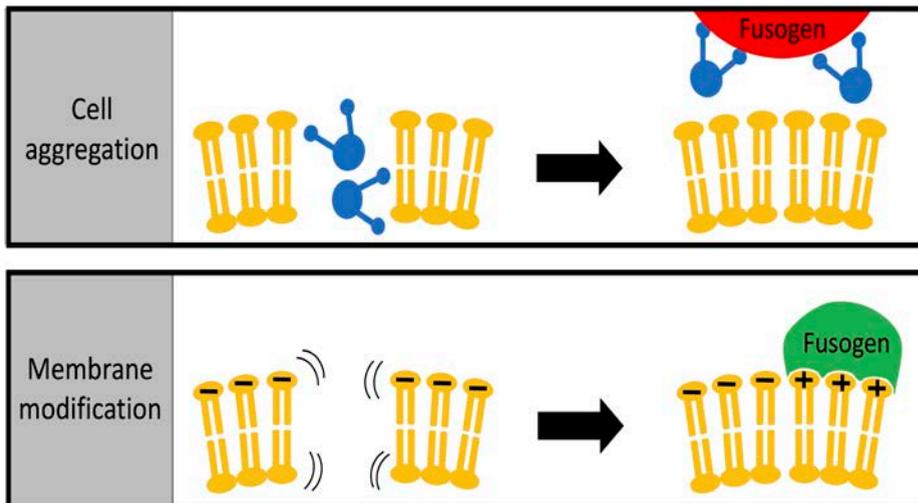


Fig. 1 Cell aggregators bring cells in close enough proximity to each other so that the inherent fluidity of the phospholipid membrane allows for their rearrangement. Membrane modifiers alter the surface charges of the membranes so that their repellent charges are diminished.

CONCLUSION

- Chemical fusogens could be grouped into two mechanistic categories: cell aggregators and membrane modifiers.
- For axonal membrane fusion, either a combination of both types of fusogens or a single fusogen capable of both mechanisms can be utilized for optimal results.
- Fusogens are promising agents for advancing peripheral nerve injury outcomes via a combined chemical and surgical intervention.

	Structure
Polyethylene glycol (PEG)	Hydrophilic polymer
Chitosan	Polysaccharide
Dextran sulfate	Branched polymer of d-glucose
N-nonyl bromide	Small organic polymer
Calcium	Cation Ca^{2+}
Sodium nitrate	Salt
H-alpha-7	Glycoprotein (chimeric measles virus hemagglutinin)