**Latin America Online Summit**

# Title: Polymer nanofibers produced by solution blow spinning method – an innovative experimental prototype tool to spinal cord injury


**Authors**

André de Oliveira Arruda a,b

a: University of Caxias do Sul, Master´s Student in Health Sciences Postgraduation Program, Rio Grande do Sul, Brazil.

b: AOSpine member, Spine surgeon, Cajuru University Hospital, Curitiba, Paraná, Brazil.

Asdrubal Falavigna a,c

a: University of Caxias do Sul, PhD, Course Director and Professor Medicine, Coordinator Postgraduation Program in Health Sciences.

c: AOSpine International Board Chairperson

Leonardo Engler a

a: University of Caxias do Sul, Chemical Engineer student, Rio Grande do Sul, Brazil.

Lucas Dall Agnol a

a: University of Caxias do Sul, PhD Student in Postgraduate Program in Materials Science and Engineering, University of Caxias do Sul, Rio Grande do Sul, Brazil.

Natália Fontana Nicoletti Roxo a

a: University of Caxias do Sul, PhD, Cell Therapy Laboratory, Caxias do Sul, Rio Grande do Sul, Brazil.

Fernanda Trindade Gonzalez Dias a

a: University of Caxias do Sul, Postdoc in Materials Science and Engineering, Caxias do Sul, Rio Grande do Sul, Brazil.

Janete Eunice Zorzi a

a: University of Caxias do Sul, PhD Materials Science, Professor, Caxias do Sul, Rio Grande do Sul, Brazil.

Otavio Bianchi a

a: University of Caxias do Sul, PhD, Materials Science and Engineering, Professor, Caxias do Sul, Rio Grande do Sul, Brazil.



**Keywords**: spinal cord injuries; polymers; biodegradable nanofibers; tissue engineering; in vitro studies.


**Introduction** Spinal cord injury (SCI) has drastic effects, having limited results by actual available therapeutic. Focusing on the need of control of secondary lesion, the regenerative medicine through tissue engineering brings promising options. Applying polymers in nanofibers can be a rational approach, once acting directly on lesion site. There are many techniques for that, being the solution blow spinning (SBS) easier and with possibilities of effective translation. Never tested before in literature of spinal cord injury, polymer nanofibers produced by SBS can be a promising strategy to fill in the macroscopic gap of lesion besides a positive functionality of material applied – controlling or minimizing the secondary lesion cascade. This project aims to investigate the potential of PVA - poly(vinyl alcohol) – nanofibers

in aqueous solution produced by SBS as a translational therapeutic prototype for SCI. **Materials & Methods:** SBS apparatus system was constructed and applied for tests, with three different PVA types (molar mass and solution concentration variations), gas pressures range, distance to collector variance and thermal blowers usage; for nanofiber analysis, FEG-SEM images were obtained and histograms of diameters were associated; cell cytotoxicity tests were performed by MTT assay, DAPI, and Live/Dead cells methods (cell lines – VERO, 3T3 and resident spinal cord cells). Based on an *ex vivo* model, the medullary adhesiveness and degradation rate were estimated. **Results:** a 30-cm working distance (from outer nozzle to collector) allowed fiber deposition with good entanglement and no residual droplets; an outer nozzle diameter of 0.5 mm did not become clogged an allowed solution exit as a cone formation; gas pressure applied on a 7 bar system was able to drag the polymer solution smoothly and regularly; the concurrent use of 2 thermal blowers helped significantly with other solvent evaporation; PVA 2 in 18% (w/w) concentration was defined as best option. For cell tests, applying the elution nanofibers technique, MTT, DAPI and Live/Dead methods showed reduction in cell all cell populations metabolic activities and proliferation after 24 and 48 hours exposition. On the other hand, from 72 hours until 7 days accumulated exposition, all cell lines, including the resident spinal cord cells showed increased numbers, meaning positive effect of SBS PVA nanofibers over cell micro-environment. *Ex-vivo* test showed instantly adhesiveness of SBS PVA nanofibers to medullary tissue and high degradation rate. **Conclusions:** The solution blow spinning technique proved to be an achievable technique to produce PVA polymer nanofibers with standardized characteristics, considering the application of a biomaterial solution in distilled water as solvent. Cell tests and *ex vivo* model demonstrated a positive interaction with polymer PVA nanofibers, resulting in determination of a prototype with translational potential to spinal cord injury therapeutic context and constituting a new strategy for subsequent investigations.

**Acknowledgments: AO Spine Latin America Master´s Scholarship Program, University of Caxias do Sul.**

**References (Title Times New Roman 12, bold):** List reference quoted sequentially in the text and marked as [n].