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First Author: Felipe Salazar-Ramírez
Cátedra de Cardiología y Medicina Vascular, Escuela de Medicina, Tecnológico de Monterrey
Col. Real de San Agustín San Pedro Garza García
Mexico
Phone: +528110772627
felipe000@gmail.com

First Author is a: Medical Student
First Author is a member of: Not a Member of a Host EB Society
First Author Degree:

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Sponsor: Gerardo García-Rivas
Sponsor Phone: +528188880472
gdejesus@itesm.mx
Sponsor's Society: Physiology - The American Physiological Society (APS) - Host Society
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Developing a new polymeric system for release of immunomodulators for treatment of heart failure

Felipe de Jesús Salazar-Ramírez[1], Omar Lozano[1], Hector Chapoy-Villanueva[1], Guillermo Torre-Amione[1], Gerardo García-Rivas[1,2]. [1]Cátedra de Cardiología y Medicina Vascular, Escuela de Medicina, Tecnológico de Monterrey, San Pedro Garza García, Mexico, [2]Centro de Investigación Biomédica, Hospital Zambrano Hellion, Tecnológico de Monterrey, San Pedro Garza García, Mexico

During recent years the role of the immune system in the progression of heart failure (HF) has become an area of interest to better understand the physiopathological mechanisms of its progression. Some immunomodulators have been tested for efficacy in reducing inflammatory mediators in patients with HF. However, one of the greatest limitations encountered when trying to bring those treatments to patients is the side effect of these drugs. Keeping this in mind, nanotechnology has been advancing rapidly during the past few years. Nanoparticles can carry medications and have active tissue targeting properties, and such characteristics could increase the drug tolerance, which are known to have a narrow therapeutic window. Using this knowledge we used a well-known immunomodulator, either free or encapsulated in a polymeric nanoparticle to treat a murine model of HF by inducing an anti-inflammatory effect, and thus, reduce the progression ventricular dysfuction. Methods: The immunomodulator was encapsulated in a polymeric nanoparticle by an oil-in-water emulsion. The resulting nanovector was analyzed in terms of size, surface charge, drug loading and release profile. Results: The nanovector was of ~ 100 nm in size, -30 mV in surface charge, 95 % entrapment efficiency, and a release profile consistent with reported data. Mice model of HF shown fibrosis and cardiac remodeling, however this damage was reduced in the animals that received the immunomodulator (1 mg /Kg week). Likewise, a 4-fold increase in the production of IL-10 was observed. Moreover, the use of polymeric nanoparticles required a lower dose to reach a similar cardioprotective effect.

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