perplexity

# please tell me about Pere Santamaria's autoimmune disease studies

Dr. Pere Santamaria, a distinguished immunologist and professor at the University of Calgary, has dedicated his scientific career to understanding and developing treatments for autoimmune disorders. His groundbreaking research, particularly focused on type 1 diabetes, has led to innovative therapeutic approaches that could potentially transform how autoimmune diseases are treated. His work is especially significant as it addresses the root causes of autoimmunity rather than merely suppressing symptoms.

## Personal Connection to Autoimmune Research

Dr. Santamaria's commitment to autoimmune disease research stems from personal experience. At age 15, he was diagnosed with myasthenia gravis, an autoimmune condition causing extreme muscle weakness that significantly affected his adolescence, preventing him from playing sports and participating in normal activities[1]. His condition required high doses of corticosteroids, which caused significant side effects including swelling "like a balloon"[1]. This firsthand experience with both an autoimmune condition and the limitations of conventional treatments that merely suppress the immune system without addressing underlying causes has profoundly influenced his research direction[2] [3].

As Santamaria himself expressed, "It had a tremendous effect on me personally," and it fueled his determination "to understand the diseases and mechanisms, with the hope I could eventually help others"[1]. Throughout his career, he has maintained this personal connection to his scientific work, developing additional autoimmune conditions himself over the years, which further motivated his research efforts[1].

## Academic and Professional Background

Pere Santamaria received his MD and PhD from the University of Barcelona in Spain[4] [5]. He completed his medical specialty in immunology at the University Hospital in Barcelona before pursuing postdoctoral research at the Institute of Human Genetics at the University of Minnesota[5] [6]. In 1992, he was recruited to the University of Calgary, where he currently serves as a Professor in the Department of Microbiology, Immunology and Infectious Diseases[7].

At the University of Calgary, Dr. Santamaria holds the position of Chair of the Julia McFarlane Diabetes Research Centre[4] [6]. He is also cross-appointed at the Institut D'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS) in Barcelona, Spain[5]. Throughout his distinguished career, he has authored more than 190 scientific publications, holds 92 patents, and has delivered over 250 lectures internationally[7]. His contributions have earned him recognition as a

Fellow of the Royal Society of Canada and an elected member of the Royal Academy of Medicine of Catalonia[5].

## Research Focus and Approach

The core of Dr. Santamaria's scientific career has been understanding the immunogenetics and immunopathogenesis of autoimmune disorders, with a particular emphasis on type 1 diabetes[8]. His research aims to identify potential targets for therapeutic intervention by investigating the relationship between genetic susceptibility and resistance to autoimmunity and T-cell tolerance[8].

Dr. Santamaria's work focuses on three key areas: autoimmunity, antigen-specific therapy, and nanotechnology[4] [2]. This multidisciplinary approach has enabled him to develop innovative solutions to complex immunological problems. His research specifically examines the cellular mechanisms that cause white blood cells to attack and destroy insulin-producing beta cells in the pancreas, furthering our understanding of the fundamental mechanisms underlying autoimmunity[5].

## The Navacims Breakthrough

Dr. Santamaria's most significant scientific contribution is the discovery of a novel therapeutic platform for treating chronic inflammatory disorders based on nanomedicine[8]. This revolutionary approach led to the development of Navacims, a new class of drugs designed to treat autoimmune diseases[9] [10] [3].

Navacims are sophisticated nanoparticles coated with disease-relevant peptide-major histocompatibility complexes (pMHCs)[10] [11]. These nanoparticles work by binding directly to antigen receptors on pathogenic T lymphocytes, altering their behavior in a counterintuitive manner[10] [12]. Rather than eliminating these T cells as might be expected, Navacims reprogram them to become regulatory cells capable of suppressing autoimmune disorders[10] [3] [11].

As Dr. Santamaria explains, "Essentially there is an internal tug-of-war between aggressive T-cells that want to cause the disease and weaker T cells that want to stop it from occurring"[11]. The nanoparticle vaccine works by expanding the number of peptide-specific regulatory T cells that can suppress the aggressive immune attack that destroys cells in autoimmune conditions[11].

## Mechanism of Action and Therapeutic Potential

The mechanism behind Navacims represents a paradigm shift in autoimmune disease treatment. When the nanoparticles bind to disease-causing T-cells, they trigger a remarkable transformation - the T-cells not only stop attacking the body's own cells but actually multiply and begin protecting the very cells they previously targeted[3].

This precision medicine approach is revolutionary compared to current broad immunosuppressive therapies. Traditional treatments dampen the entire immune system and merely address symptoms rather than providing a potential cure[3]. In contrast, Santamaria's approach triggers the formation of extensive antigen- and disease-specific networks of

regulatory T and B-cells that efficiently suppress the progression of various autoimmune disorders without compromising systemic immunity[8] [10].

The therapeutic potential of Navacims extends beyond type 1 diabetes. Research has shown that this approach can be tailored to treat different autoimmune diseases by simply changing the peptides displayed on the nanoparticles[12]. The technology has been tested in multiple mouse models of autoimmune diseases, showing promising results across different disease types and genetic backgrounds[12]. Potential applications include treatments for celiac disease, inflammatory bowel disease[9], multiple sclerosis[5], and potentially any chronic inflammatory condition[12].

## Research Models and Clinical Development

To develop and test his therapeutic platform, Dr. Santamaria employs sophisticated research models. His laboratory uses mice humanized with peripheral blood mononuclear cells from patients to select candidate nanomedicines for clinical development[8]. This approach bridges the gap between animal models and human applications, increasing the potential for successful translation to clinical therapies.

In studies with diabetic mice, researchers using Santamaria's nanoparticle vaccine were able to successfully cure mice with type 1 diabetes and slow the onset of the disease in mice at risk for developing it[11]. Importantly, research also demonstrated that nanoparticles containing human diabetes-related molecules could restore normal blood sugar levels in a humanized mouse model of diabetes, suggesting potential translatability to human patients[11].

## From Laboratory to Clinical Applications

Dr. Santamaria's commitment to translating his scientific discoveries into real-world treatments led him to found Parvus Therapeutics in 2008 as a vehicle to bring his therapeutic platform to the clinic[6] [3]. As the scientific founder and chief scientist of this biotechnology company, he has guided the development of Navacims toward clinical applications[5].

The company's efforts gained significant momentum in 2019 when Parvus Therapeutics secured a major licensing agreement to develop Navacims drugs[7]. This agreement followed earlier partnerships with pharmaceutical companies, including Novartis, which enabled Parvus to continue critical pre-clinical work while allowing larger companies to invest resources into clinical development and commercialization[10] [3].

These collaborations highlight the potential impact of Dr. Santamaria's work on patients with autoimmune conditions. As he states, "My ultimate goal is to bring this new class of drugs to patients in need"[7]. This dedication to translational medicine represents the culmination of decades of research driven by both scientific curiosity and personal experience with autoimmune disease.

## Scientific Recognition and Impact

Dr. Santamaria's innovative research has earned him numerous accolades and recognition within the scientific community. His honors include the Canadian Diabetes Association Young Scientist Award, the Outstanding Leadership in Alberta Technology Award, and the Juvenile Diabetes Research Foundation Gerold and Kayla Grodsky Award[7]. In 2021, he was named one of Canada's Top 25 Immigrants for his discovery of new drugs to treat autoimmune diseases[9].

The impact of his work extends beyond academic recognition. The Juvenile Diabetes Research Foundation has funded Dr. Santamaria's research, recognizing its potential to transform treatments for type 1 diabetes[10] [11]. As expressed by Juvenile Diabetes Research Foundation Vice President of Discovery Research Julia Greenstein, "Dr. Santamaria's work to target the immune system dysfunction that causes type 1 diabetes represents the kind of innovative work that JDRF believes will eventually get us to a cure for this disease"[10].

## Conclusion

Dr. Pere Santamaria's research into autoimmune diseases represents a significant advancement in our understanding and potential treatment of these conditions. His personal experience with autoimmune disease has informed a scientific career dedicated to developing more effective, targeted therapies that address the root causes of autoimmunity rather than merely suppressing symptoms.

The development of Navacims, nanoparticles that can reprogram the immune system to halt and potentially reverse autoimmune diseases, offers hope for millions of people suffering from these conditions worldwide. As this technology continues to move through clinical development, it may fundamentally change how we approach autoimmune disease treatment, potentially offering cures rather than merely managing symptoms.

Dr. Santamaria's journey from a teenager diagnosed with myasthenia gravis to a pioneering immunologist developing revolutionary treatments exemplifies the powerful intersection of personal experience and scientific innovation. His work stands as a testament to the potential of targeted, precision medicine approaches to address complex immunological disorders and improve the lives of patients worldwide.

⁂


1. https://www.newscientist.com/article/mg26535322-100-inside-the-new-therapies-promising-to-finally-beat-autoimmune-disease/
2. https://www.albertadiabetesfoundation.com/blog/santamaria
3. https://www.rciscience.ca/100-lives/pere-santamaria
4. https://profiles.ucalgary.ca/pere-santamaria
5. https://mscanada.ca/ms-research/our-research-program/dr-pere-santamaria
6. https://sciforschenonline.org/journals/autoimmune-infectious/pere-santamaria.php
7. https://canadianimmigrant.ca/canadas-top-25-immigrants/canadas-top-25-immigrants-2021/dr-pere-santamaria
8. https://cumming.ucalgary.ca/departments/microinfect/faculty/primary-members/pere-santamaria

9. https://cumming.ucalgary.ca/news/snyder-institute-member-dr-pere-santamaria-named-one-canadas-top-25-immigrants-his-discovery-new
10. https://parvustx.com/author/jguettler/
11. https://www.sciencedaily.com/releases/2010/04/100408121054.htm
12. https://www.nature.com/articles/nrrheum.2016.33