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### **Mission**

The **SOUTHERN JOURNAL OF SCIENCES** is a double-blind peer review, open access, **multidisciplinary** Journal dedicated to publishing high-quality content and is intended to fill a gap in terms of scientific information for Southern Brazil. We have set high standards for the articles to be published by ensuring strong but fair refereeing by at least two reviewers. The Journal publishes original research articles in all the fields of Engineering, Mathematics, physics, Chemistry, Biology, Agriculture, Natural resource management, Pharmacy, Medicine, and others.

Occasionally the Journal will include review papers, interviews, and other types of communications. It will be published mainly in English, and at present, there are no page charges.

We hope this Journal will provide a forum for disseminating high-quality research in Science and are open to any questions and suggestions.

The responsibility for the articles is exclusive to the authors.

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Dear Readers,

I am pleased to present this special issue of the Southern Journal of Sciences, devoted to celebrating the Second Southern Science Conference. This prestigious event will be held in the beautiful city of Mendoza, Argentina, from November 7th to 9th, 2024.

To commemorate this exciting conference, we have put together a collection of interviews with the esteemed speakers and invited guests who will be sharing their expertise and insights. Through these interviews, we aim to provide our readers with a glimpse into the cutting-edge research and discoveries that will be presented at the conference. We have entrusted our amateur reporter with conducting the interviews for this special issue, and we will continue to rely on his enthusiasm and dedication until a more experienced candidate emerges.

The Second Southern Science Conference promises to be a platform for scientific exchange, collaboration, and networking among researchers, academics, and industry professionals from across the southern hemisphere and beyond. Mendoza, known for its stunning landscapes, rich culture, and renowned wine production, will serve as the perfect backdrop for this gathering of brilliant minds.

We hope that this special issue will not only generate enthusiasm for the upcoming conference but also inspire and inform our readers about the latest advancements in various scientific fields. We extend our gratitude to all the speakers and invited guests who took the time to share their thoughts and experiences with us.

As always, we at the Southern Journal of Sciences remain committed to delivering high-quality, peer-reviewed content to our readers. We look forward to your continued support and engagement as we strive to promote scientific excellence and foster international collaboration.

Sincerely,

Walter José Peláez, Ph.D., [walter.pelaez@unc.edu.ar](mailto:walter.pelaez@unc.edu.ar), Argentina, UNC.  
Editor-in-Chief  
Southern Journal of Sciences

## UNRAVELING THE COMPLEXITIES OF CARDIOVASCULAR MEDICINE: A CONVERSATION WITH DR. PETER MCCULLOUGH (EXTENDED EN-US VERSION)

Dr. Peter Andrew McCullough<sup>1</sup>; Luis Alcides Brandini De Boni <sup>2\*</sup>

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**NOTE:** Version of the translation transcription. 1.0.

Dear friends, the interview transcription was done by machine and later reviewed. We are aware that it is imperfect. If you wish to collaborate with improvements, you are welcome to contact us southbchem@gmail.com

### ABSTRACT

**Background:** This interview covers Dr. Peter McCullough's medical career, experience as an editor of medical journals, and his expertise in areas such as cardiomyopathy, myocarditis, and pericarditis. **Aims:** The primary aim is to understand Dr. McCullough's perspectives on various medical topics, including his journey as a cardiologist, the importance of peer review, the phenomenon of Pheidippides cardiomyopathy, the differences between myocarditis and pericarditis, and the significance of ethical principles like the Nuremberg Code and the Declaration of Helsinki. Additionally, the interview aims to explore his concerns about censorship during the COVID-19 pandemic. **Methods:** The interview follows a question-and-answer format, with the interviewer posing questions to Dr. McCullough on various topics related to his medical career, research interests, and ethical considerations. **Results:** Dr. McCullough shares his insights on topics such as cardiomyopathy, myocarditis, and pericarditis, emphasizing the importance of peer review, identifying potential biases, and balancing scientific rigor with timely dissemination of findings. He also highlights the significance of the Nuremberg Code and the Declaration of Helsinki in ensuring informed consent and preventing coercion in medical research and treatment. **Discussion:** Dr. McCullough expresses concerns about censorship during the COVID-19 pandemic, which he believes impacted the ability of medical professionals to freely discuss and disseminate health-related information. He also discusses the potential role of COVID-19 vaccines in causing myocarditis and the need for transparent communication about treatment options and potential complications. **Conclusion:** The interview provides valuable insights from Dr. McCullough's extensive medical experience and expertise, covering a range of topics from cardiovascular conditions to ethical principles and the challenges posed by censorship during the COVID-19 pandemic.

**Keywords:** *Peter McCullough, Medical Ethics, Myocarditis, Pericarditis, Censorship.*



**Luis:** Today, we have the honor of interviewing Dr. Peter McCullough.

Our interview will be published in Portuguese by the *Periódico Tchê Química* in English by the Southern Journal of Sciences, and we will share this interview with a local television station, Conecta Mais TV. The content of this interview will be shared under a Creative Commons license.

Dr. McCullough, thank you very much for this opportunity to speak with you. I would like to start our interview by asking about your medical career. Why did you become a cardiologist, and how did you get to where you are today?



**Photo:** Peter McCullough. 2024.

**Dr. McCullough:** Since I was young, I have always loved the idea of using science to help people, and medicine is the best combination of applying biological sciences and helping people through difficult times, illness, and prevention of hospitalizations and deaths.

I grew up in Texas. I am traveling through Texas by bus now, as you can see in the background.

I completed my undergraduate degree at Baylor University, followed by the University of

Texas Southwestern Medical School. I did my internal medicine residency in New York City, Washington, and Seattle. I did three years of rural health and the third year of public health and epidemiology training.

I continued my specialization in cardiology at the Oakland University William Beaumont School of Medicine and held academic leadership positions across the country in cardiology.

I maintained my board certifications in both internal medicine and cardiology, and I have published extensively on many topics. Thank you very much, Dr. McCullough.

**Luis:** To avoid delays, I'll move on to our next question.

Regarding your career as an editor of medical journals. How has your experience as an editor of prestigious medical journals influenced your approach to assessing research and scientific evidence?

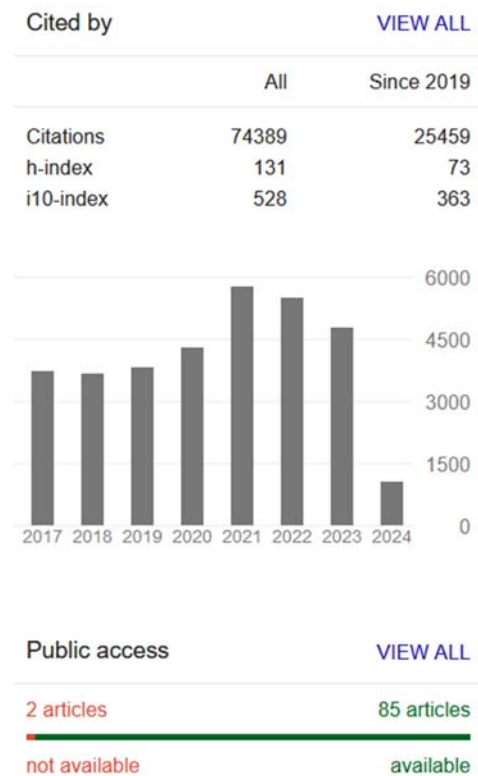
**Dr. McCullough:** The peer review process is fundamental to the advancement of clinical science and certainly to medical progress, and we rely on the peer review process. I have been a manuscript reviewer for over three decades.

I have served as the editor-in-chief of two widely read journals: *Reviews in Cardiovascular Medicine* and *Cardiojuvenil Medicine*. These are longstanding positions. I am still a very active reviewer of various manuscripts today. This means that I have truly seen and examined more evidence and more data, as well as interpreted the information.

Under my supervision as an editor, **I have never retracted an article. Never.** Peer review process, and we rely on it. I may not agree with every article published, but my agreement is not what matters. What matters is the formal scientific evaluation of the peer review.

As an author, I have nearly 700 citations, now listed in the National Library of Medicine and PubMed.

I have published over a thousand medical communications overall, and I continue to be very active in academic medicine.



**Image:** McCullough's Publications.  
 Image source: [https://scholar.google.com/citations?view\\_op=list\\_works&hl=en&hl=en&user=LzqEaOkAAAAJ](https://scholar.google.com/citations?view_op=list_works&hl=en&hl=en&user=LzqEaOkAAAAJ)

**Luis:** Very good. Thank you.

What are some of the biggest challenges you face in ensuring the integrity and quality of research published in the field of medicine?

**Dr. McCullough:** One of the greatest threats to validity is what is considered investigator bias. This is the bias of the authors of the manuscripts being published. They may be biased by their sources of funding, whether federal, private, or pharmaceutical industry sources. They may be biased according to the treatments they have taken as individuals.

We have seen this really manifest now in the COVID-19 vaccine crisis, which we will cover later. However, investigator bias, that is, the bias of the article authors, is very, very important to assess. That is why we ask for disclosures, to interpret conflicts of interest.

Of course, there are many other threats to validity, including bias at the level of reviewers, editors, and publishers, and hopefully, the peer review process takes care of that.

We have various forms of study bias and funding issues with internal and external validity,

biological plausibility, and all of that we use in this peer review process to help the scientific community and the general public arrive at this scientific truth.

**Luis:** Thank you very much, doctor.

My last question regarding your work as Editor.

How do you balance the need for scientific rigor with the importance of disseminating potentially innovative findings in a timely manner?

**Dr. McCullough:** The peer review process is slow and laborious, and one of the things that has emerged during the pandemic, which I think is a positive development, is the use of preprint servers. This is the publication of data, widely disseminated before peer review. Preprint servers explicitly inform the reader that the information has not been peer-reviewed. We tend not to give much weight to the author's conclusions, but simply want to see the data in tables and figures. This allows for almost immediate dissemination of information. Recently, many reputable journals have a preprint option that allows information to be released in preprint. Many journals have last-minute clinical trials or expedited review processes. All are important for getting information out quickly, but I want people to understand that often the peer review process for a fully revised manuscript can take up to two years.

**Luis:** Perfect.

I love that perspective.

**Dr. McCullough:** Thank you very much.

**Luis:** If you allow me, I'd like to ask about your expertise in Pheidippides cardiomyopathy. Could you explain this phenomenon and its connection to your research interests?

**Dr. McCullough:** Personally, I have been a marathon runner for many years, so I became interested in this issue of sudden cardiac death among marathoners.



**Image:** Pheidipedes.

Image Source: Gerado com IA · 24 March de 2024 às 9:06 AM. Ideogram.

Pheidippides was the Greek herald who ran a tremendous distance between two cities during one of the wars that influenced Greece. Now, it turns out he ran much more than a marathon. A marathon is 42.195 kilometers (26.2 miles). He probably ran about 115 kilometers (72 miles) and then died of exhaustion. In fact, he collapsed to his death, and that's Pheidippides.

But, we've observed elite marathon runners suffering cardiac arrest, and there have been detailed studies of cardiac magnetic resonance imaging and biomarkers, and we've published many articles on this. And suffice it to say there may be a genetic predisposition.

A marathon is extreme stress for the body, and there are elevations in inflammatory factors and other markers of cardiac stress.

And actually, the part of the heart that is likely affected is the right ventricle.

There's probably chronic volume overload over about two to four hours that in some individuals, this right ventricular stretching can precipitate ventricular tachycardia that degenerates into ventricular fibrillation.

So, I'm interested in walking and running training techniques and other measures to help people avoid this complication because it's not a general heart disease or a cold coronary disease. In fact, it's a marathon-induced form of right

ventricular cardiomyopathy.

**Luis:** Is it possible to prevent or treat it or does it happen when it happens?

**Dr. McCullough:** No, I think it's probably possible to prevent it with different training techniques.

We also want to understand the predisposing factors. And I think the main issue is that running marathons may not be safe for everyone. So, I want people to understand that running marathons, which is quite popular now, is not universally safe.



**Image:** Myocarditis representation.

Image Source: Gerado com IA · 29 de março de 2024 às 7:18 PM. Microsoft Copilot.

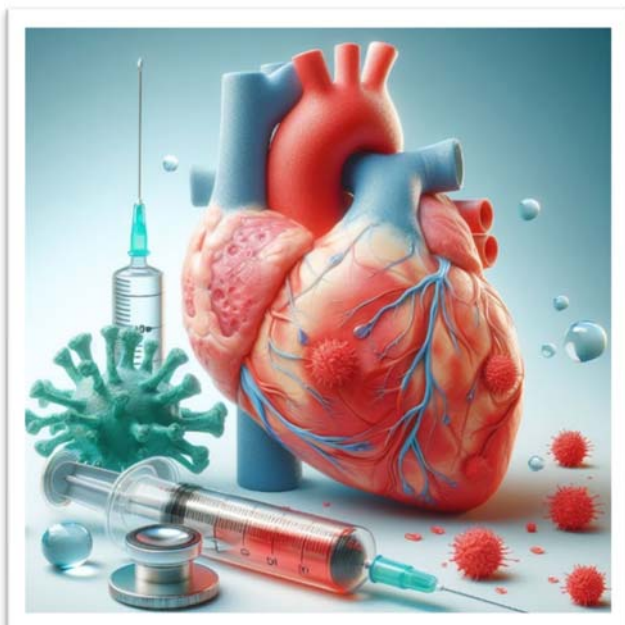
**Luis:** Perfect.

Regarding a new topic, myocarditis and pericarditis. My first question, I'm not a medical doctor. I'm a former chemistry professor. Could you describe the main differences between myocarditis and pericarditis and their possible causes and risk factors?

**Dr. McCullough:** Let's start with pericarditis, as it's more common. Pericarditis is the inflammation of the lining around the heart. The pericardium has two layers, one layer on the outer surface of the heart, and then it's a sac in the central part of the chest called the mediastinum.

And inside, there is fluid. The pericardium

can become inflamed, and this can be due to various viruses like the coxsackie virus, adenovirus, and occasionally influenza virus. It's also idiopathic, meaning we don't know what causes it. It's characterized by pain when breathing deeply and lying down. We can see obvious changes on the ECG and see fluid around the heart on an ultrasound. Then, it's treated with a main medication called colchicine, which is now the standard of care. It's a unique anti-inflammatory that interferes with the formation of microtubules in granulocytes, which are inflammatory cells present in the pericardial space and pericardial tissue. Idiopathic or post-viral pericarditis may predispose the patient to recurrent pains and sometimes adhesive and constrictive pericarditis. So, treatment is important and should probably be carried out for about a year. This has now been well-studied in clinical trials.



**Image:** Induced myocarditis representation.

Image Source: Gerado com IA · 29 de março de 2024 às 7:25 PM. Microsoft Copilot.

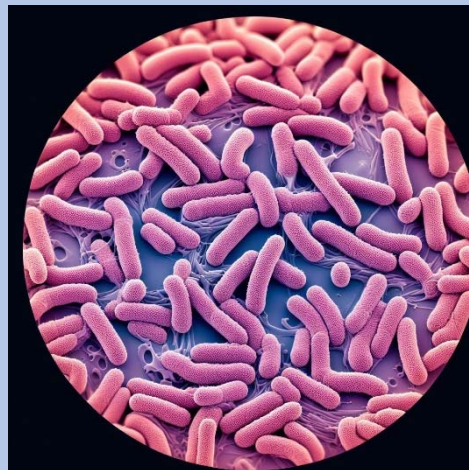
Myocarditis is the inflammation of the heart muscle itself. Myocarditis before the pandemic could be caused by parvovirus or other viral infections. And again, sometimes it's idiopathic.

There's a specific fatal form of myocarditis called giant cell myocarditis that doctors specifically perform a cardiac biopsy to try to diagnose, as these patients almost certainly need a heart transplant.

So, our approach to myocarditis again

depends on the use of colchicine, in some cases corticosteroids, plasma exchange, IVIG, and then even in advanced cases, we can use various forms of immunosuppressants like rapamycin.

## Nattokinase



**Image:** Nattokinase representation.

Image Source: Gerado com IA · 24 de abril de 2024. às 9:25 AM. Microsoft Copilot.

Nattokinase, an enzyme renowned for its cardiovascular benefits, originates from natto, a traditional Japanese fermented soybean dish. Natto is created by fermenting soybeans with *Bacillus subtilis* var. natto, resulting in a distinct texture and aroma. During fermentation, this bacterium produces nattokinase as part of its metabolism, enriching the natto with this enzyme.

To harness nattokinase for supplementation, natto undergoes processing to extract and concentrate the enzyme. This purification process isolates nattokinase from other components, yielding a potent extract. Regular consumption of nattokinase as a dietary supplement is favored for its potential to enhance cardiovascular health by promoting healthy blood circulation and clot dissolution.

Nattokinase supplements, available in various forms like capsules or powders, are marketed as natural cardiovascular support options. Despite its generally recognized safety, consultation with a healthcare professional is advised, especially for individuals with medical conditions or taking blood-thinning medications, due to potential interactions or effects on clotting times. Nattokinase's importance persists in scientific circles and among those seeking natural approaches to heart health.

We hope that in myocarditis, we avoid two main outcomes, which are the development of

heart failure or sudden cardiac arrest and sudden death, and so patients are carefully monitored.

I can say that in these conditions, often pericarditis and myocarditis occur together and can be severe and require joint therapeutic interventions, so we call it myopericarditis.

And again, before COVID, it was in all cardiology guidelines, guidelines, medical articles, and review articles that patients cannot be allowed to exercise because the increase in adrenaline with exercise in a patient with myopericarditis will precipitate cardiac arrest.

**Luis:** Regarding myocarditis, I recently saw the term. I believe it's "mild myocarditis". Is that possible?

**Dr. McCullough:** No, I don't think that's an appropriate term. We should take each case very seriously.

**Luis:** If someone has myocarditis, they have the risk of dying, correct?

**Dr. McCullough:** That's true.

And we learned that now with the pandemic, the COVID-19 respiratory illness in 2020 did not cause severe cases of myocarditis.

There were a handful of cases described in an article by Daniels and colleagues from collegiate athletic leagues and in community cases of COVID respiratory illness.

I saw a true case in my practice, and this was a case that required medical attention, including hospitalization and treatment, but with COVID-19 it's not common when patients are admitted with COVID-19 to the hospital an elevation in the cardiac component does not indicate myocarditis, that's not adjudicated myocarditis and it's this observation that led to a false narrative that myocarditis is common in infections.

What we know now is that COVID-19 vaccines often cause myopericarditis, this is in all FDA regulatory warnings, and in fact, COVID-19 vaccine myocarditis can present with cardiac arrest and sudden cardiac death.

## Bromelain



**Image:** Bromelain representation.

Image Source: Gerado com IA · 24 de abril de 2024, às 9:25 AM. Microsoft Copilot.

Bromelain, a potent enzyme derived from the stem and fruit of the pineapple plant (*Ananas comosus*), has a rich history originating from the tropical regions of South America, particularly in countries like Brazil and Paraguay where pineapples thrive. Traditionally, indigenous peoples recognized its medicinal properties, using it to treat various ailments like indigestion and inflammation.

Today, bromelain is extracted through a complex process involving crushing and juicing pineapple stems and fruit, followed by filtration and purification steps to isolate the enzyme. This concentrated form of bromelain is then utilized in various industries, including pharmaceuticals, cosmetics, and food processing.

Bromelain is available in supplemental forms such as capsules, tablets, powders, and liquids, known for its potential anti-inflammatory, digestive, and immune-supporting properties. It aids in reducing inflammation, improving protein digestion, and even tenderizing meat in culinary applications.

Whether consumed as a supplement or enjoyed through pineapple consumption, bromelain offers diverse health benefits, enriching both our health and culinary experiences. However, it's essential to consult with a healthcare professional before incorporating bromelain into your routine, ensuring safe and effective use.

**Luis:** Doctor, I'm sorry, I'll hurry our interview. I'll move on to the next topic, okay?

Regarding the Nuremberg Code and the Helsinki Declaration, again, I'm not a doctor, and this is not familiar to me. Could you explain the significance of the Nuremberg Code and the Helsinki Declaration in the context of medical ethics and research involving human subjects? Also, I would like to know if they are still valid today.



**Image:** Blood test representation.

Image Source: Gerado com IA · 30 de março de 2024 às 9:25 PM. ImageFX.

**Dr. McCullough:** They are the cornerstones of medical ethics regarding research and the use of innovative treatments or drugs. One of the cornerstones is the Helsinki Declaration, which states that every person deserves full, free, and informed consent, fully understanding the risks and potential benefits of participating or not participating in research or not taking a new product. And then the Nuremberg Code, which arose from the Nuremberg trials after the fall of Nazi Germany, where individuals in Germany were forced into unsafe and unethical research conducted by Nazi doctors, in the Nuremberg Code, the first item is an important statement and it says that 'The voluntary consent of the human subject is absolutely essential.'

There must be free choice, and there must be no threat to that individual in any way.

**Luis:** So, should the practice of coercing people to participate in medical trials be avoided?

**Dr. McCullough:** It should be prohibited.

## Curcumin



**Image:** Curcumin representation.

Image Source: Gerado com IA · 24 de abril de 2024, às 9:25 AM. Microsoft Copilot.

Curcumin, the active compound in turmeric (*Curcuma longa*), traces its origins to the vibrant cultures of South Asia, notably India, where turmeric has been esteemed for its medicinal properties for millennia. Harvested from the rhizomes of the *Curcuma longa* plant, turmeric undergoes a meticulous process: washed, boiled, dried, and ground into a fine powder, rich in flavor and color. Within turmeric lies curcumin, the bioactive compound responsible for its renowned health benefits.

To extract curcumin, turmeric undergoes solvent or supercritical fluid extraction, followed by purification to isolate curcuminoids. This yields concentrated curcumin extracts used in supplements like capsules, tablets, powders, and liquid forms. Known for its potent anti-inflammatory and antioxidant properties, curcumin is studied for managing arthritis, cardiovascular issues, and certain cancers. It also enriches culinary traditions, enhancing both flavor and color in dishes.

From its sacred origins in South Asian cultures to its modern medicinal and culinary applications, curcumin fascinates with its rich history and health-promoting properties. However, its low bioavailability prompts the inclusion of compounds like piperine or specialized delivery systems in supplements. Consulting a healthcare professional before integrating curcumin into one's routine is advisable, particularly for those with medical conditions or taking medications.

**Luis:** Yes, prohibited. A much better term. Thank you.

I'm having a great class today with you. Thank you.

If you allow me to delve a little deeper, thank you. I would like to ask another question.

I saw some research commenting on an image that I believe I saw on your website, okay? It's about the use of bromelain, nattokinase, and curcumin. Could you talk a little about this? How can this improve conditions?

**Dr. McCullough:** The McCullough Protocol: Spike Protein Detox (BSD), which is now a trademark in Europe, and has a pending patent application in the United States, is a breakthrough.

Two publications in the Journal of American Physicians and Surgeons and in the Biomedical Sciences Journal of Springer Nature, Curious Journal, made this proposal based on preclinical and clinical data that nattokinase enzyme, derived from soy fermentation, bromelain, which is a family of enzymes derived from pineapple stems, and then curcumin, which is an anti-inflammatory derived from turmeric, all available in supplement form in capsules, work together to help degrade the S protein, which is the harmful part of viral infection, the backbone on the virus surface. It's also the dangerous part of the product protein that's in COVID-19 vaccines or is produced from genetic vaccines in an uncontrolled infection that accumulates in the body. This nattokinase, 2,000 units twice a day, bromelain 500 milligrams per day, and curcumin 500 milligrams twice a day as an initial program is a reasonable detox approach for a minimum of three, often up to 12 months, to help reduce the S protein burden in the body and hopefully decrease symptoms and reduce the risk of severe complications.

**Luis:** One more brief question. People talk about clots forming and blood tests, 'D-dimer,' I believe it is. How do they relate? And can these clots be dissolved in the body or never again?

**Dr. McCullough:** D-dimer has been found to be an indicator of micro and macro thrombosis precipitated by the S protein, both in natural infection and in patients who have received the vaccine. So, I routinely measure D-dimer in both post-infection and post-vaccine patients. When it's

elevated, the interpretation is that it indicates microthrombosis.

## D-dimer



**Image:** D-dimer blod test representation.

Image Source: Gerado com IA - 24 de abril de 2024, às 9:25 AM. Microsoft Copilot.

The D-dimer blood test is a crucial diagnostic tool for assessing blood clotting disorders. D-dimer, a protein fragment produced during clot breakdown, indicates clotting events in the body. Typically drawn from an arm vein, blood samples undergo laboratory analysis, where various methods, like ELISA, detect D-dimer levels.

Elevated D-dimer suggests clot presence, guiding diagnosis for conditions such as deep vein thrombosis (DVT) or pulmonary embolism (PE). Conversely, normal levels help rule out significant clotting disorders, reducing the need for invasive tests.

However, D-dimer elevation isn't exclusive to clots; it can occur in pregnancy, surgery, trauma, inflammation, or cancer. Thus, the test complements clinical assessments to ensure accurate diagnosis.

By aiding diagnosis and management, the D-dimer test improves patient care and outcomes. It's particularly valuable in ruling out clots when results are normal. This comprehensive approach enhances decision-making, reducing unnecessary testing and ensuring efficient treatment.

It's a call, at minimum, for the use of aspirin. I think it's an excellent call for the use of nattokinase and bromelain. And then, in some patients who actually have detectable thrombosis by ultrasound or imaging, we add more serious anticoagulants, including direct oral

anticoagulants or warfarin.

**Luis:** Thank you very much, doctor.

We are approaching the final round of questions, and I would like to ask about censorship in the United States and abroad.

From your point of view, how has the issue of censorship impacted the ability of medical professionals and researchers to freely discuss and disseminate information related to public health matters, both in the United States and internationally?



**Image:** Censorship representation.

Image Source: Gerado com IA · 30 de março de 2024 às 8:25 PM. ImageFX.

**Dr. McCullough:** Intentional censorship practiced by governments worldwide through complicit media, including social media. Bringing public truth about multidrug early therapy for COVID-19 and vaccine safety has cost a large number of lives. Effectively, censorship has killed people worldwide. The public deserves the opportunity to always learn about new advancements on how to prevent hospitalizations and deaths from COVID-19 and how to treat, manage, and avoid vaccine injuries, deficiencies, and deaths. And censorship has been targeted against any hope of people obtaining treatment or avoiding complications. Censorship has actively promoted endless mass vaccinations, and it's now on trial in the US Supreme Court in the case of Missouri versus Biden. The Supreme Court heard this case last week, and I can say it will likely take a month or

two to deliberate and get a response. But it is known that the US government is within social media and mainstream media, and the Supreme Court will decide whether to allow the government and its agents to remain with their influence or to withdraw the government from the media so that scientists and doctors can have uncensored free speech. I think it's a critical case, and we will keep you updated on the outcomes.

**Luis:** Just for the record, today is March 22, 2024, so we can have a follow-up for the future.

Regarding the issue of censorship, I imagine highly qualified professionals like yourself would never be censored. Have you ever experienced anything like this?

**Dr. McCullough:** For decades, I studied the interface between heart and kidney diseases. I published as I am doing now, gave lectures, and appeared in a variety of media. I testified before Congress's Oversight Panel before the pandemic. I have never seen censorship in my career until the COVID-19 pandemic arose. And the pandemic brought unprecedented actions taken against scientists like me. I am deeply concerned that all the actions that have occurred regarding censorship and retaliation have harmed innocent civilians, to harm the public worldwide, created fear, suffering, hospitalization, and death.

And we must all come together to end this censorship and allow people like me and people in my circle to bring the truth to you.

**Luis:** Doctor, it was a pleasure speaking with you.

I know you are an extremely busy man. On behalf of the newspapers I am representing, I would like to say thank you very much. It was a great opportunity.

We hope to have the chance to speak with you again in the future.

**Dr. McCullough:** Thank you.

**Luis:** Thank you very much. It was a pleasure.

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## DECLARATIONS

**1. Limitations:** The interview is limited to its content.



**2. Funding source:** The host funded this interview.

**3. Competing Interests:** The host has worked for the journal for many years, and this may have influenced the interview.

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To know more, visit: <https://McCulloughfnd.org>

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### Conference invitation.

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Dr. McCullough is an internist, cardiologist, epidemiologist holding degrees from Baylor University, University of Texas Southwestern Medical School, University of Michigan, and Southern Methodist University. He manages common infectious diseases as well as the cardiovascular complications of both the viral infection and the injuries developing after the COVID-19 vaccine in Dallas TX, USA. Dr. McCullough has broadly published on a range of topics in medicine with > 1000 publications and > 685 citations in the National Library of Medicine. His works include "Pathophysiological Basis and Rationale for Early Outpatient Treatment of SARS-CoV-2 (COVID-19) Infection" the first widely utilized treatment regimen for ambulatory patients infected with SARS-CoV-2 in the American Journal of Medicine and subsequently updated in Reviews in Cardiovascular Medicine. Subsequently he published the first detoxification approach titled "Clinical Rationale for SARS-CoV-2 Base Spike Protein Detoxification in Post COVID-19 and Vaccine Injury Syndromes" in the Journal of American Physicians and Surgeons. He has dozens of peer-reviewed publications on the infection and has commented extensively on the medical response to the COVID-19 crisis in TheHill, America Out Loud, and on FOX NEWS Channel. Dr. McCullough testified multiple times in the US Senate, European Parliament, Texas Senate Committee on Health and Human Services, Arizona Senate and House of Representatives, Colorado General Assembly, New Hampshire Senate, Pennsylvania Senate, and South Carolina Senate concerning many aspects of the pandemic response. Dr. McCullough has had years of dedicated academic and clinical efforts in combating the SARS-CoV-2 virus and in doing so, has reviewed thousands of reports, participated in scientific congresses, group discussions, press releases, and has been considered among the world's experts on COVID-19.

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## THE ROLE OF THE MEDITERRANEAN DIET IN PREVENTING MALE INFERTILITY: AN INTERVIEW WITH DR. MIGUEL FORNES (US-EN VERSION)

Dr. Miguel Fornes<sup>1</sup>; Luis Alcides Brandini De Boni<sup>2\*</sup>

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Dear friends, the interview transcription was done by machine and later reviewed. We are aware that it is imperfect. If you wish to collaborate with improvements, you are welcome to contact us southbchem@gmail.com

### ABSTRACT

**Background:** Dr. Miguel Fornes is a researcher at CONICET and director of the Andrological Research Laboratory of Mendoza, Argentina. His research focuses on how dietary fat excess and hypercholesterolemia affect sperm physiology and male fertility. **Objectives:** The primary objective of Dr. Fornes' research is to investigate the effects of a high-fat diet on sperm function, capacitation, acrosomal reaction, and fertilization. He aims to develop translational animal models to study these effects without using human subjects. **Methods:** Dr. Fornes and his team use rabbit models to induce hypercholesterolemia through a high-fat diet. They then study the physiology and function of sperm cells from these hypercholesterolemic rabbits. Key parameters analyzed include cholesterol content in sperm membranes, ability to undergo capacitation and acrosomal reaction, and fertilization capability. **Results:** The studies revealed that hypercholesterolemia caused by a high-fat diet leads to increased cholesterol levels in sperm. This interferes with the normal physiology of sperm cells. In particular, many sperm from hypercholesterolemic rabbits were unable to properly undergo the acrosomal reaction, a crucial step for successful fertilization of the oocyte. This suggests high-fat diets could contribute to male infertility. **Conclusions:** The research highlights the importance of diet and lifestyle on male reproductive health. Dr. Fornes recommends a balanced diet like the Mediterranean diet, rich in fruits, vegetables, and olive oil, to maintain healthy sperm function and fertility. Replacing animal fats with olive oil may help prevent hypercholesterolemia-related infertility. The findings have implications for dietary guidelines and clinical interventions to support male fertility.

**Keywords:** *Mediterranean diet, Male infertility, Sperm physiology, Hypercholesterolemia, Dietary interventions.*

**Luis:** Hello, Dr. Miguel. Good afternoon from Brazil.

**Dr. Fornes:** Hello, good afternoon from Argentina, in the city of Mendoza. This is a city in western Argentina, close to the Andes Mountains. We have good wine. If you want to visit Mendoza, it is an opportunity to enjoy good wines.



**Image:** Dr. Miguel Fornes. 2024.

**Luis:** I'm looking forward to it. I hope to be in Mendoza by the end of the year and enjoy some very good wines.

**Dr. Fornes:** OK, OK.

**Luis:** We have a mutual friend, Dr. Quinteros. He is doing very good advertising for Mendoza wines. In the south of Brazil, we also have good wines.

**Dr. Fornes:** Yes, it's true, it's true. From both sides, both are good. Yes, I visited some wineries there, and the wine is OK. I believe that the terroir, the specific landscape, gives the wine some characteristics. And Brazil has a special one,

Mendoza, South Africa, you know, different places, different possibilities.

**Luis:** Yes, Mendoza is very famous for its excellent wines. So please allow me to thank you for taking the time to welcome us.



**Image:** Wines from Argentina e Brazil.

Image Source: Generated with AI · March 26, 2024 at 7:25 PM. Microsoft Copilot.

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Dr. Miguel Fornes is a researcher at CONICET. He is the director of the Mendoza Andrological Research Laboratory, a professor at the Faculty of Medical Sciences at the National University of Cuiú, and at the Faculty of Medical Sciences at the University of Aconcagua.

With a notable trajectory in the study of male infertility linked to hypercholesterolemia generated by diets rich in fat. Also, in the treatment of hypercholesterolemia by, a high-fat diet with foods from the Mediterranean diet, such as olive oil.

Dr. Fornes, did I include everything, or did I leave something out?

**Dr. Fornes:** No, it's okay. You are on the right track.

The diet we normally follow and the foods we eat seriously impact our health. You know that the excess fat or fat we eat affects different tissues, specifically the coronary vascular, heart, and brain, and promotes various diseases.

But in the reproductive tract, people don't pay attention. However, it is also a tissue that manages, for example, cholesterol. Cholesterol is a molecule that has a different function in many types of cells. However, in a sperm cell, it is a key molecule for many of the functions the sperm must perform before coming into contact with the oocyte.

For example, capacitation is a term that describes a period when sperm are in the female genital tract. It undergoes several biochemical changes during this time and loses cholesterol from the plasma membrane. This allows the activation of different functions.

This allows the sperm to come into contact with the egg and fertilize it. For this reason, cells adjust their cholesterol content to a limit, a very, very specific limit.

**Luis:** When you eat too much fat, can it change the balance (of fats)?

**Dr. Fornes:** Yes, the question is, of course, there are fats that we eat normally, they can be good or bad. The bad ones, for example, come from the type of animal cholesterol, fatty acids, and different types of greases. And on the other side are grains that come from vegetables. Most vegetables also have types of sterol, and most of them can be used by our body. This was the origin of a healthy diet.

A healthy diet includes many vegetables, and most of them have cholesterol or other molecules that will be beneficial to people. In this way, the Mediterranean diet specifically appears.

We say, what is the Mediterranean diet? People living around the Mediterranean Sea ate a specific diet in the past. Today, they are probably Westernized, like many people or us. But in the past, they ate fish, fruits, and vegetables produced there. The main fat or oil consumed was from vegetables, specifically olive oil. Olive oil has good reasons to be healthy.

Probably the way to carry out a good Mediterranean diet is to replace the fat coming from cows, for example, or from pigs that we

normally consume a lot with this olive oil. And there are different types of olive oil because the method of extracting the oil is different. But normally, extra virgin olive oil comes from the first pressing you do on the olive.



**Image:** Olive production.

Image Source: Generated with AI · March 26, 2024 at 7:25 PM. Microsoft Copilot.

**Luis:** The cold pressing.

**Dr. Fornes:** Yes.

And this produces a juice that, when you leave it, separates the water from the oil. And that was a very pure product. It's really a fruit juice and very, very healthy because it has a specific component. For example, hydroxytyrosol, a molecule present in olive oil, has a specific function in several pathways in the cell. They withstand the stress that the use of a high-fat diet represents. Because when you eat a lot of fat, it puts pressure on the cells and the cells react.

But there is a limit. At this point, different cell responses to this stress emerge. And if you use olive oil, the cell cannot go into stress. And that was the reason why we recommended using olive oil.

**Luis:** As for this moment where we are talking about the intake of oils and fats, this is a difficult question that arises for people who live in the south of Brazil and I believe in Mendoza as well.

When we eat barbecue, is it potentially negative?

**Dr. Fornes:** Well, but the question is how often do you eat meat during the week? Probably if you eat it once a week or month, not every day. This shouldn't be so bad. But the problem is the hidden fat. For example, when you eat bread, it usually has salt and fat in it. Is it necessary? It probably is not, but it's good for people. But there is an excess of salt and fat. And the government's recommendation should probably be to reduce all these components.



**Image:** Cold pressing of olive oil.

Image Source: **Generated with AI · March 26, 2024 at 7:52 PM.**  
Microsoft Copilot.

**Luis:** Yes, and well, if barbecue can be bad, I suppose fast food is even worse.

**Dr. Fornes:** Yes, fast food is typical of the Western diet. It's negative, it has an impact. There are probably other situations. You know that obesity is now considered an epidemic and it can mean obesity because many people have obesity. This is associated with another disease, specifically chronic disease in adults. And these diseases start early in people's lives. You can see children, young people, obese or very obese. And most of them have fertility problems. For this reason, losing this excess weight is a good recommendation. And one of the ways to lose this

weight is to use a Mediterranean diet. Of course, this Mediterranean diet uses olive oil or another vegetable oil. There are different types.



**Image:** Mediterranean diet.

Image Source: **Generated with AI · March 26, 2024 at 7:52 PM.**  
Microsoft Copilot.

**Luis:** Once, in Brazil, I saw a survey on television talking about coconut oil. Is this also a positive oil?

**Dr. Fornes:** I think there are different types of oil. Coconut could be one, but others probably come from green vegetables that are better than coconut. But, of course, vegetable oil is better than one that comes from cow or pig, you know.

**Luis:** OK, thank you, doctor.

Dr. Miguel, can you provide an overview of the research carried out at the Mendoza Andrological Research Laboratory under your supervision?

**Dr. Fornes:** Yes, we work from different points of view. Some of us worked on the development of sperm that was produced in the testicle. It's how spermatids are the first cell and how those cells turn into a sperm. Other people seek the training I was talking about earlier. Another study acrosomal reaction. There are many fields or points of view in which to study these cells. But in recent years, we've been using a model in which we can promote hypercholesterolemia by increasing cholesterol in the body.

How does this cholesterol impact a sperm

cell? This model is called a translational model because it is similar. This was happening in humans, but in this case in rabbits. The idea and objective are to have a model developed, and we can somehow manipulate this model without a person or a human model.

Yes, and the sperm cell is an interesting cell because it is produced in the testicle, but it takes a long journey to reach the female egg. It is one of the unique cells because it can be exported outside the body and continue to live. And to do this, they must adjust many of the cell's shapes and physiology to accomplish this incredible journey because they must traverse the female genital tract to reach the egg. And that was a long trip for a small cell.

**Luis:** Yes, considering the size, it is a very long distance.

**Dr. Fornes:** Yes. And specifically, the testicle is made up of several tubules called seminiferous tubules, which are the sperm factory. There, of a cell, there must be several divisions, transform the morphology, and make many steps to be a sperm cell. And some of them involve a spectacular transformation because they must develop a flagellum or cilium to allow the cells to move, many other changes. These changes are very precisely orchestrated in the type and space that are arranging cells specifically well in a hypercholesterolemic model.

Some of these steps must be altered or have changes that produce morphologically abnormal sperm, abnormal sperm, and not all, but some of them. And this can influence the fertility of these men or pregnancy in mothers.

**Luis:** Can morphologically abnormal sperm and defective cells still be viable for reproduction?

**Dr. Fornes:** Well, the changes are minimal. It's not that sometimes it's not the big change, but it does have an influence. Sperm morphology is one of the parameters that people look at in semen to tell whether it is fertile or not. And you must count the cells, but not just count how many sperm are present, how many normal sperm are present, because this is a parameter that indicates whether the man is fertile or not fertile. And sometimes it's a minimal change.

For example, if the sperm has two retrogrades or minimal retrogrades, those cells are not as good. And if you have too many of these

sperm cells, fertility is likely to decrease.

**Luis:** Regarding the counting method, is it done when you are looking under the microscope, does software do it or do you need to count?

**Dr. Fornes:** Well, there are many laboratories that all have a specific method. But, in general, in andrology, in the hospital or clinic, they have an automatic sperm count called CASA, CASA, and it is monitored by the computer, by the software, and it counts very quickly. And you can see many samples in a single morning.

However, it is necessary to carefully analyze the samples. Because telling a man that he is infertile or not infertile is a difficult moment. I think the andrologist takes the time to see and analyze specifically.

**Luis:** Yes, it's very bad news for anyone, even for a man or a woman, it's a difficult thing to do.

**Dr. Fornes:** You know that infertile couples are on the rise. Right now, we don't know how or why, but many, many couples are unable to have a child.

**Luis:** if you allow me, I can divert my question a little. I was talking to a colleague who recently had the coronavirus pandemic. We heard that this may have impacted female fertility in some way. Could this also be applied to male fertility?

**Dr. Fornes:** There are a few articles, or rather more than a few. There are a good number of articles, but it is not a conclusive final statement. However, some people encountered a problem during this period, and others do not see a big issue. But I think there is still a good question because there are viruses that compromise the testicles (for example paramyxovirus ) and coronavirus could be one of them. More than the flu that normally influences, you know, which we've had in the past many. Well, it's still an open question.

**Luis:** It is something that we will have to wait for the future to see results.

**Dr. Fornes:** I think there are a lot of studies on the coronavirus, but the number is decreasing. There are still people working on it. I think we should expect some interesting results.

**Luis:** What specific findings or *insights* has your research revealed about the effects of dietary fat content on sperm health and function?

**Dr. Fornes:** Yes, the fat we eat is absorbed and circulates in the body and promotes an increase in blood cholesterol. It impacts different tissues, brain tissues, hair, kidneys, and testicles. The testicles have not been studied previously, but our laboratory and we have paid attention to this issue because one of the fats present is cholesterol. Cholesterol is associated with many of the chronic diseases in other people. Cholesterol is also an important molecule in the life of sperm, which is why it is increased.

The cell cannot complete a specific step or a specific function to fertilize the oocyte.

**Luis:** Thank you, doctor.

Can you discuss with us some of the notable results or promising results that have emerged from your investigations into sperm physiology and dietary influences?

**Dr. Fornes:** Well, one of the problems with the high-fat diet is the negative effect on the sperm cell. The amount of cholesterol present in sperm is increasing, and this interferes with its normal physiology.

For example, it cannot support the acrosomal reaction. The acrosomal reaction is a specific step that must be done before fertilizing the oocyte. If the acrosomal reaction does not appear, the sperm cannot fertilize the oocyte. In sperm obtained from rabbits with hypercholesterolemia, some of these sperm cannot carry out the acrosomal reaction. Not all, but a large number of them. And for this reason, infertility is possible to see.

**Luis:** That's very interesting.

How do you envision the implications of your research results for clinical applications or interventions related to male reproductive health?

**Dr. Fornes:** Yes, I think the recommendation as a doctor is that people should change their lifestyle. You know that diet is more than food. It's people exercising, just going for walks or doing some exercise. Not like a professional sport, but this is also combined with a healthy diet. For example, Mediterranean diet, should include fruits, vegetables and, of course, olive oil is important.



**Image:** Healthy diet.

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Microsoft Copilot.

Because it's probably not the big intervention, but the sum of small interventions that men need to improve fertility. It's not the only approach the doctor has, but it's a good one. Because it's natural, it's not that expensive and good for your health, not just your fertility.

**Luis:** Yes. Once, a long time ago, I studied in Portugal, where there was amazing olive oil. And at a very low cost compared to Brazilian costs.

**Dr. Fornes:** Well, that's a problem, the cost of olive oil, because it's increasing over time, people discover olive oil and a lot of people want to use it. However, the number of hectares and plants that produce olive oil in the country that produces olive oil is decreasing. For example, here in Mendoza, some of these producing areas were used to make a neighborhood and the olive trees disappear. This situation is seen in many countries, also in Italy and Spain, because we need to redesign the landscape that was used to produce fruit, vegetables or olives, into the shape of a neighborhood, into the city.

Because the soil is specific, grapes, olives, or any plant, need nutrients from the soil. That was interesting.

**Luis:** In Portugal, when I was there, we were talking about the olive tree cycle and they told me

that in order for them to join the European Union, they were asked to suppress a lot of trees.

**Dr. Fornes:** Yes, but international trade creates some barriers. It's incredible. But that's one of the reasons. Some many olive oils or countries can produce olive oil. For example, Brazil is close to Mendoza or close to Argentina. You can get olive oil from here at a cheap price.

**Luis:** That's another thing to look for in Mendoza. Wine and olive oil. Good combination.

**Dr. Fornes:** Yes.

**Luis:** Doctor, let me move on to my next question. For my last question. Doctor, in what ways has your collaboration with other researchers or institutions influenced or enriched your research on male reproductive health?

**Dr. Fornes:** Yes, we are members of different groups that are interested in reproductive health men's health. For example, the Andrology Group, the Latin American Andrology Group, and other European or American groups. They invite us to speak or discuss the results of different meetings. And it's a great opportunity to discuss our results, our problems and what we should do in a scientific meeting. Because the problems in a laboratory in Brazil are probably similar to those we face here in Mendoza. And we can exchange information and opinions. And it's good for us.

**Luis:** Well, and finally, thank you again for granting us this interview and giving us such valuable insight into your research. We truly appreciate your time and expertise. So, Dr. Miguel, have a great day.

**Dr. Fornes:** See you soon, see you soon, see you soon.

**Luis:** Thank you for your attention.

**Dr. Fornes:** Bye.

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- 3. Competing Interests:** The host has worked for the journal for many years, and this may have influenced

the interview.

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Dr. Fornes will be a speaker at the *Second Southern Science Conference* to be held in the beautiful cities of Mendoza, Argentina, and Vassouras, Brazil, from **November 7th to 9th, 2024**.





## Confirmed speakers



Dr. Miguel Walter Fornes, MD PhD, conducts primary research at the National Research Council of Argentina (CONICET) and the Institute of Histology and Embryology in Mendoza (IHEM). He oversees the Mendoza Andrological Research Laboratory (LIAM), focusing on sperm physiology. The laboratory is committed to unraveling the intricacies of sperm formation and physiology within the seminiferous tubule. Our investigations highlight the significant influence of diet on various parameters such as morphology, spermatid capacitation, and ejaculated sperm count. We particularly explore the effects of dietary fat content, with a keen interest in supplementing unhealthy diets with olive oil. Our research has shown promising results in reversing sperm failure induced by high-fat diets. The LIAM team delves into the underlying mechanisms, both positive and negative, to provide comprehensive insights into sperm health and function.

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Interview

## THE ROLE OF EDUCATION IN FOSTERING ENTREPRENEURSHIP AND INNOVATION: INSIGHTS FROM DR. BHAVNA AMBUDKAR

Dr. Bhavna A.<sup>1</sup>; Luis Alcides Brandini De Boni <sup>2\*</sup>

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**NOTE:** Version of the translation transcription. 1.0.

Dear friends, the interview transcription was done by machine and later reviewed. We are aware that it is imperfect. If you wish to collaborate with improvements, you are welcome to contact us southbchem@gmail.com

### ABSTRACT

**Background:** Dr. Bhavna, an experienced leader in education and innovation, has held various leadership positions, including head of department, dean of alumni relations, and president of the institutions innovation council. She has been instrumental in initiating the alumni cell at her previous organization and establishing world-class state-of-the-art laboratories in collaboration with the automotive sector. **Aims:** Dr. Bhavna's efforts aim to create an ecosystem for innovation and entrepreneurship within the institute and beyond, encouraging learners to consider entrepreneurship as a career option and fostering innovation in the electronics manufacturing domain. **Methods:** Dr. Bhavna's approach involves raising awareness about innovation and entrepreneurship among learners, fostering collaborations between academia and industry, and establishing world-class state-of-the-art laboratories to bridge the gap between academia and industry. **Results:** Dr. Bhavna's efforts have resulted in a strong alumni network, with graduates across the globe contributing to various domains and positions. She has also established world-class laboratories in collaboration with the automotive sector, fostering innovation and startups in the electronics manufacturing domain. **Discussions:** The Ministry of Electronics and Information Technology plays a significant role in initiating innovations and startups in the electronics manufacturing domain. They have generated a separate vertical for startups, which poses challenges to innovators. If a solution is validated, the ministry handholds the innovators, incubates their ideas, funds them, and helps them reach the market at the national and international levels. **Conclusions:** Dr. Bhavna's vision and efforts toward fostering an ecosystem for innovation and entrepreneurship within the institute and beyond are commendable. Her experience and achievements in various leadership roles, including as the head of the department and president of the institutions innovation council, have added significant value to her professional and personal life.

**Keywords:** Bhavna Ambudkar, innovation, Entrepreneurship, Electronics, Healthcare and Agriculture

**Luis:** So, good morning from Brazil, Dr. Bhavna Ambudkar. It's a pleasure to speak with you again.

**Dr. Bhavna:** Same here. Good morning, Dr. Luis. Yeah, and it's happy to be on this forum, which we can say is a precourse for the Southern Journal of Sciences conference, which will be held in 2024.



**Photo Dr. Bhavna Ambudkar. 2024.**

**Luis:** Yeah. It will be held in Mendoza, Argentina, and Vassouras, Rio de Janeiro, Brazil.

Today, our interview will be published in Portuguese by the Periódico de Química in English by the Southern Journal of Sciences, and we will share our interview with a local television station. The content of our interview will be shared under a Creative Commons license.

Dr. Bhavna, thank you for taking the time to receive me.

It's a real pleasure to speak with you again. I believe it's almost two years since our last interaction.

So, to join the spirit of our interview, could you please present your engineering career and how you achieved your current position?

**Dr. Bhavna:** First of all, thank you, Dr. Luis, for allowing me to share really what I have dealt with over the years. Looking back, as you asked me about my career, I was passionate about being an engineer, although I excelled in biology and sciences, I would say. So, ideally, I would be academically fit for a medical line.

But then I was a passionate candidate at that moment to choose engineering.

And that is how my engineering career started. I did my engineering in electronics and telecommunication background because that was when India was established in various domains.

I was fortunate to get a seat in this field, and I graduated with a degree in engineering in the field of electronics. Post it, I did my master's in electronics and telecommunication. Subsequently, I went for my doctorate in electronics and telecommunication engineering. I was fortunate enough in my initial years to join an industry that worked in core electronics related to capacitors. So I got an experience.

Then, I started my journey with a research and development organization working on a power supply, or, as we can say, an uninterrupted power supply. But then I got a deviation towards research, and I thought that this power electronics may not help me in my career. This is not the right call for me, but research is a call for me.

From there, I moved into academics, leaning towards research. And since then, I have been an educator. Over some time, I have taken many roles because I do not like to stick to one thing. So, being an academician is my basic profession. But along with that, I do several things. As I said, I do research. I develop certain things which surely would help not only me because I am the last in the priority list, but obviously to someone in and around the society, the community. And it may not be a very big research, which really should be appreciated because I don't go for it. But surely I will make it a mark that it is work which will help to solve, which might be some small percentage of the problem. And that is how I work. And this academic has given me the strength to do this with a team of students and aspirants who are in and around.

So, it has ever helped. And that is how I think I have moved into my career. Today, I would say I am not only an academician because I have 25-plus years of experience in this academic field

as a professor in the academic category. But along with that, I am an innovator. I am an entrepreneur. I am a design thinking expert. And this is how I would say my career has asked me to move further. So this was a bit of the thing what I would say I would like to share.

**Luis:** That's very good. If you allow me, I would like to ask you another question regarding the beginning of your career. When you decided to choose engineering, not biology or medicine, did your family support your choice? How was that path?

**Dr. Bhavna:** I think it's a big story. Moving from a completely different domain was a 180-degree flip, if I would say because my father was dreaming or too passionate to look into his to look towards his child as someone who serves society.

He was a real social reformer. And he used to work for society. He always dreamed that my children should serve society in one way or another. And that was the basic reason why he was looking towards his children as a medical, I being the eldest. And somehow, even my academic growth has shown that my academic excellence was also in biology. Various ways I used to get connected with nature all went very well. So it was everywhere that it could be said that she could be a medical doctor and surely that she could go with the society.

But I don't know. As I grew up, I came across certain things and am an avid reader. So I used to read books a lot. And among this how I grew, I don't know if I look back, I would say during those days tried to recollect, I would say, I should have something concrete way, which will really revolutionize and might be, unfortunately, although I was ever blessed to have the exposure to all the, I would say, updates and the knowledge which is required at that age. But typically, when I compare, I think either I learned or got influenced towards that engineering field, it went into my mind, or it was somewhere some consciously which I caught up is that engineering will help you to make this concrete rather than this biology. And that was the simple reason from where I knew. So this was the base of it.

Now, how it took a turn? It was really, I would say, a war between my father and me, typically not my mother, because she supported me in this. But my father typically looked me over and over, wherein people look forward to getting admission to this public medical university, and I

got it. And now again, moving from there to this side was a big game.

So it took many efforts for both of us, not only for me, but even for my father, to mentally prepare himself for what he was looking for. She excelled and got a seat in that academic domain as a medical academic.

Still, she wants, and she is at that moment. I would say I was a bit stubborn about it, but no, I'll go for engineering. So I stood, and then I think, okay, it's okay, that is how my journey started. But again, that's not the end of the story. Let me tell you. I realized this over time, and I don't know for the last ten years. I'm working in the medical field with engineering. So I worked in health care a lot and then realized somewhere inside me that I'm a medico, but I wanted to do engineering with medical sciences, and this is what I'm doing today.

**Luis:** That's very good. It was quite a turn that your father had to take, and you two, and I'm glad you took this path because we can talk about it today. It's very good.

**Dr. Bhavna:** Yes, so maybe we should share. I feel we should share because someone somewhere must be in the position where I was in a dilemma some years back.

**Luis:** Yes, I can say that, at least in Brazil, engineering it's not a common path for ladies to take. So it's very rare, not very rare, but it's not as common as other courses. That's what I mean. So moving on because I believe that you are busy. Okay, let me make my next question. As an experienced professional, what are your thoughts in integrating entrepreneurship and innovation into engineering education curricula?

**Dr. Bhavna:** Thank you for the question. This is my passion, and this is what drives me today.

The simple question is, as I said, why I moved from medical to engineering.

So why? I had given a question because I had never looked into that. I wanted to make that change concretely, which I thought at that moment may not be possible with medical. Maybe I was short of my thoughts.

I do agree.

Today, when we do engineering and have many years of engineering experience, I see people, or the aspirants or the candidates, engineering undergrads, work on projects, build certain projects, and study certain subjects. At the end of the career, if we really try to ask to have learned 40 subjects over a period of your course of undergraduate engineering, what does that which is going to help you further?

And then they don't have any answer because they get confused. The thing is, they are not clear about it. So the question here is, then, I went into reverse engineering. Let me share it with you. And the reverse effect told me, what is this? Why does this happen? So, that was from the point of view of an academician. This is the question. My students do not have any answer to this. So what is the answer to this? Because they don't know where to apply for the subject and at what point in time.

So, I got the answer to the first question. Second, if they want to apply to any course they are learning at that point, how should they do it?

There is a curriculum called project-based learning in undergraduate education, and they should apply that. But is it really happening? And then I found out it was not happening. How should it happen? And from there, I took over something called innovation and innovation. Then how do you start with it? So, the first thing to do is to start with it.

Do not go with the mindset that you want to build a project. Go with a mindset that you want to build something that will help resolve something, apply something, or for usability. If you find out something about this, you will get to find a solution. So that is innovation.

If you find out this, the second thing is why someone should use it. If I say Dr. Luis, I do have something, why will Dr. Luis use it? Unless it is tasted. So, if it is to be tasted and validated, it is a product. So, in simple words, it is entrepreneurship. That is how I embedded innovation and entrepreneurship into academics, playing the three roles together.

**Luis:** Thank you very much.

That's a very nice way to start the students on this path. And it's very important. As the chief

mentor in charge of the entrepreneurship promotion and innovation cell, Dr. Bhavna, what are your goals and vision for fostering the entrepreneurial ecosystem within the institute where you work and beyond?

**Dr. Bhavna:** Thank you, Dr. Luis, once again, for helping me to share my vision for this.

Being in charge of this entrepreneurship promotion and innovation cell at Symbiosis Institute of Technology, a constituent of Symbiosis International University at Pune in India, I would say the vision here goes to spread the or to create the ecosystem for innovation and entrepreneurship. Because the first thing today is the aspirants, the learners are not aware of what innovation is and what is to be done with this innovation.

So, I think this is much needed for each of us. The first thing to know is what it is and how it will help anyone develop oneself.

The second thing is that once they are aware of this innovation, then the second step would be to go for entrepreneurship. I agree because today if we look into it, less than 3 percent of learners would say I would like to be an entrepreneur. There are ample reasons for this, and the reasons might be pressures from family, society, several things, liabilities, and all those things we agree on.

But then, as the head of the cell, I would really look into bringing it to the notice to the students that with all these constraints, why not to attempt for this when there are less liabilities during your undergrad, I would say the undergrad tenure. So, liabilities are less. Test yourself, and consider whether you can innovate or be an entrepreneur.

If it gets succeeds, it is okay. If it does not, it is also more okay because you will have a number of learners, and you can start with your career. So, that is the basic vision of creating this ecosystem for innovation and entrepreneurship.

The second thing is obvious: we look towards having more entrepreneurs than employees. So that is one of the goals.

I would say the third thing is how we can resolve the problem at the local, regional, and planet levels. So, we should create people who can resolve the problems for ourselves and the society, the community, and the planet at large.

And the last term, when you say commercial, is because without commercial, nothing can move.

So you should educate learners to the extent that they start generating not after graduating but when they are in the tenure of learning as an undergraduate to get an instance of entrepreneurship. So that is the vision, I would say.

**Luis:** Thank you very much for sharing your vision with us. Dr. Bhavna, moving to our next question. You have held various leadership positions, including head of department, dean of alumni relations, and president of the institutions of Innovation Council. What have been your key learnings and achievements in these roles?

**Dr. Bhavna:** So, very first thing, over some time, I would say that among all these leadership positions, I held the dean of alumni association position in my previous organization for almost 23 years.

**Luis:** It's a long time.

**Dr. Bhavna:** It's been a very long time, and I would say I was fortunate to get the chance to initiate this. So, I initiated the institution of the alumni cell at my previous organization.

Yes, so I would say what I got educated on today might be more of the experiences which have been given by my alumni rather than me getting learn or me learning every day. So that is the best part of my life, I would say. Twenty-three years, and you would say all those years, the graduates who moved out of the institution. They are connected with you. They are across the globe. They are doing wonders. They are in many domains. They hold many positions. They are not only employees. They are employers. They have come up with certain new things. They have done which is immeasurable. Contribution to society, the nation, the community, the planet, and something else, and you just think you are a person who communicates with them every other moment while holding this position, which adds value to you both professionally and personally. Let me tell you, I still remember LinkedIn was launched in the early 20s. So 2000, 2000, 1, 2. I guess so. I was not knowing. I had my account on it, and I was wondering how this happened because it was thus my alumni who would see

that. Now, just see for a while, I would say as an educator, as an academican, it's my prime duty to see that my student gets educated or the aspirant or the learner who really is looking towards getting educated gets educated, but now the role gets flipped. My alumni would ever see ah mamma is there everywhere.

So what more do you need? And the last statement I ever say I'm so blessed that I feel I'm the just person in the world because my bank balance is with so many pure hearts who go towards me in my bank balance.

**Luis:** That's very good.

**Dr. Bhavna:** That was the experience of being and being of that alumni association. The second experience as a head of the department obviously has aided me a lot to my professional life because every day you come up, you start your day not only for yourself, but you are supposed to see that there are 500 lives to whom you are to add value every other day and to these 500 lives there are 50 people who are going to add value to these lives. You will plug for all these 550 people to make the outcome at the end of the day. So this is just to add value, but then you will have to plan the day and how the resources would be in place. Do you need to add something to them so they can have certain things added to their life? What is the network that needs to add value to this complete process of adding something to others' lives? So that was the most enriching experience because it was day-to-day, and you had to handle it.

So that was the biggest experience. Obviously, I would have tons of gratitude to the management and the organization who gave me this experience for a very big life tenure by their trust in me. And the third thing you asked was now the Innovation Institutions Innovation Council president. So, that is completely related to the Institutions Innovation Council is one of the ideas of the Government of India's Ministry of Education's Innovation Council. So, every university or educational organization should establish this council in association with the Ministry of Education, which is the Government of India's dream or a way to enable this innovation and entrepreneurship ecosystem. Again, I was fortunate enough to get this opportunity in this organization and a previous organization because I worked closely with the Ministry of Education's council. I got an opportunity to be a frontier in all the plannings, all the visions, and points they came up with, and in fact, to their examination, I turned

up as a scholar, I would say. Hence, I was blessed enough to be a president to be. I would say someone who was appreciated the Institutions Innovation Council, which I headed as a president for four years. It was always the highest ranked across the nation institute, and then with this even, I got an opportunity to mentor five higher education institutes in this domain. So it was a lot of enriching for me, and it happened to me in my professional and personal life.

**Luis:** Dr. Bhavna, thank you for sharing your career with us.

Now, moving on to my next number of questions,

It's regarding the production of electronics in India, okay? As an experienced professional in the fields of electronics and telecommunications, what is your assessment of India's current capabilities and challenges in the production of electronics?

**Dr. Bhavna:** You had posed the right question. Yes. I think this was done by the Government of India a few years back. What are the challenges for the production of electronics and related fields in our nation today happy to say before I touch upon your question that the Government of India has taken a deal, and we are already driving the semiconductor mission of producing the things in India itself.

So now, touching directly upon your question, yes, today the thing is as if I will say yeah, India has always seen itself in the production of electronic components, and that is how we grew. It was not today. In fact, when I shared the start of my career, I said I worked in an industry which was producing capacitors so they were Asian capacitors, which ABB now overtakes because ABB is a well-known industry related into electronics, so I was working I started my career with it so India is always into the production of electronics components but moving with the pace of the industry growth and today's thing that is semiconductor obviously we have to reach that, and that is what is taken over so at this stage we are working simultaneously, Government is driving this, and with this driving for last three years, India has come up with certain of its semiconductor chips which are already into the market called as making India.

So, for certain processors anyway, as everyone knows, the fastest processor paramp computer was devised in India and Pune. I take pride in being a Pune in India, so it was in Pune itself. So similarly, we are coming up with certain things like we have devised our own chips, we have devised our microcontrollers, we have come up with our number of things, and yes, we face for the acceleration of this production of semiconductors typically, which we call as electronics domain is the highest today in the world.

**Luis:** I see that reading the news, sometimes we see Indian aerospace companies that manufacture airplane radars and many parts. Are those parts made in India, or are they bought and assembled in India?

**Dr. Bhavna:** Not only that, even space tech missions have been taken a lot, and it's not only space tech missions but making India for that complete space tech mission is also one of the things which is taking an accelerated pace in India.



**Image:** Space tech missions from India.

Gerado com IA (Microsoft Copilot) · 11 de junho de 2024 às 6:18 PM

**Luis:** It's very, very important that I wish India all the best of luck. I hope to see Indian products here in Brazil as well, and maybe someday we can manufacture them in Brazil, too. It's a big step, but I have hopes.

**Dr. Bhavna:** Yes, the third part, just to add on to this, even India is working a lot into two more domains. There are a number of domains, specifically related to electronics, healthcare devices, and medical devices, coming up every other day as India is being made up with new innovations. That is also a great thing that is happening the most in India.

The third thing related to electronics, which I would like to bring to your focus, is something telecommunication 5G and 6G are on a roll everywhere across the world, but the Government of India has taken the motto of developing 6G completely by making India, and we are towards it.

**Luis:** I believe that's really in the future. In Brazil telecommunications, we are in 5G now. Are you already working on 6G?

**Dr. Bhavna:** Yeah, we have started working

Luis: I would love to see the results as soon as possible.

**Dr. Bhavna:** Yeah, I hope so. Let's keep our fingers crossed because this world is looking towards it, and India has taken the challenge to make it, so it's our next vision.

**Luis:** Very good. Please allow me to ask another question regarding the collaborations between academia and the industry. Is that okay? How can academia and industry collaborations be strengths to boost domestic electronics production?

**Dr. Bhavna:** So number of steps are happening now which was not in place few years ago I would say but it's already in place because the very first thing is academia as well as industry has taken one of their verticals to show the outcome in a year that how much academia is signing its or I would say handshaking with the industry similarly industry how much is contributing towards academics to grow in terms of industry because always there is a gap we ever see there is a gap between academia and industry so to bridge this certain things are already happening at a very accelerated pace, I would say, and hence with this what is happening center of excellence which are being I would say which are being initiated by the industry are coming to the academia I would like to share with this the

organization which I am working with **Symbiosis Institute of Technology Symbiosis International University of Pune** has recently developed the world-class state-of-art laboratories which are being given by one of the best I would say automotive sector on that is Bajaj. Because Bajaj is one of the famous industries worldwide that is developing motorbikes and they have come up with the big center of excellence at Symbiosis, this is one step ahead, which goes with your question.

The second thing that will happen with this is a separate curriculum that develops the skills of the students who will be educated in these specifically installed laboratories. So, it will typically be hands-on with the advanced technology in these advanced equipped infrastructure laboratories so that they can be directly a part of the industry working with this advanced technology, which is the most happening thing at this moment in India.

**Luis:** That's very good. Fundamentally, the student has already gotten out of academia and into the industry.

**Dr. Bhavna:** Yes.

**Luis:** That's amazing integration.

**Dr. Bhavna:** In fact, I would really like to take a step ahead, and I would invite Brazilian universities to visit the Symbiosis International University of Pune to see this to see how, at the first floor, the students move into the academic classes and then move to the second floor to these state-of-the-art advanced laboratories to get themselves educated with the advanced technology.

**Luis:** I hope to see it.

**Dr. Bhavna:** Most welcome. Yeah.

**Luis:** So my next question Dr. Bhavna. What role do you envision for incubation centers and startups in driving innovation and self-reliance in the Indian electronics manufacturing sector?

**Dr. Bhavna:** Already in place, I would say it might be Dr. Luis must be thinking whatever I start with, I said this is happening this is happening, and I would say yes, India is at the very right time wherein things are already in place.



India's government vertical is called the Ministry of Electronics and Information Technology. So, this is playing a very, very big role in initiating typical innovations and startups in the domain of electronics manufacturing. So, how is it happening? I'll just give you a few examples of how it is happening. What I'm sharing with you is that they have generated a separate vertical for something called startups, and these startups pose certain challenges to the innovators.

Yes, you will have to apply your solution to these challenges and the rest of the thing if it is validated that this is worth this idea. The Ministry of Electronics and Ministry of Electronics and Information Technology, which is abbreviated as MITEI, the next role to handhold and incubate these ideas to register them as startups to fund them to build and validate their idea to hand hold them that they reach the market to further handhold them to reach the market at the national and the international level. So, a complete channel is built by the Government at universities like ours. Symbiosis International University is the Symbiosis Center for Entrepreneurship and Innovation and Incubation Center. So, this incubation center works fully on this idea of incubating the students or the team who has such an idea. They incubate, they nurture, they further help them, they guide them, to build their idea, to validate their idea.

They network with other organizations and other government agencies like MITEI to raise funding with investors to grab the funding and see that these ideas are built concretely and brought to the market. So, this is how it is happening, and at this moment, my vision also goes like this.

**Luis:** Those are several important steps, and it's very important to see the government support for nursing the projects to the initial phase to the market phase, correct?

**Dr. Bhavna:** Yes. So it's not only academia, universities, organizations, and startup culture but also the Government that drives all those things to take it to a flourishing end.

**Luis:** That's very interesting. We see the process of deindustrialization in many places, and in India, we see a growing and flowering industry. It's very nice to see these things. Congratulations.

So allow me to ask one of your passions. The electronics in healthcare. In your curriculum, I saw that you mentioned some projects. I believe that it was with your former university Dr. Patil Institute of Technology, correct?

In the fields of physiotherapy and dental college, could you elaborate on the applications of electronics in healthcare that you explored during your time at Dr. Patil Institute of Technology?

**Dr. Bhavna:** Yeah, so I would say more. I could explore that only because it was 25 years of my association with the previous organization, as you mentioned. Yes, for last, almost even, thank you for remembering that that is my passion.

So last ten years working in this domain, exploring what I would say with all verticals, what I had to do professionally as head of the department, dean role, or various other roles. What I was exploring with, fortunately, I had a mentor who is no more, but I really like to say something about it. I would say Dr. Madhu Patil was a scientist with NASA and then was invited to India sometime long back when I was born. He was in India working on certain very, I would say important projects for the Government of India, which I may not be able to share.



**Image:** Eletronics in healthcare.

Gerado com IA (Microsoft Copilot) · 11 de junho de 2024 às 5:43 PM

But then again, his other line of passion was medicine, medical electronics, and some of the law of attraction worked, and I got my mentor and Dr. Patil with his guidance, I think my passion

took over. So, somewhere inside, I wanted to work, so that was his guidance and my passion. So, I worked on a number of projects. I might not have taken everything to the market, but really wherein I had given my input, and I'm working on certain projects today also.

So, as you rightly mentioned, one of the projects I would like to say was related to physiotherapy. It was in association with the College of Physiotherapy with the previous organization, which is on the floor, I would say, and which is still working in the OPD for the patients. So it's a simple thing: any person who is having knee pain at a certain age has knee pain or had a certain accident, which lessens their strength in the muscles so that they cannot have a normal walk. In that case, physiotherapy people try to strengthen the muscle with muscles with various techniques. Now, what happens?

They try to strengthen the muscles, but they cannot gauge it to read the strength every other day, and then to date, there is something that happens very manually to gauge it.

So, we have come up with these physiotherapy projects that automate the strength of your muscles.



**Image:** Eletronics in healthcare.

Gerado com IA (Microsoft Copilot) · 11 de junho de 2024 às 5:55 PM

**Luis:** That's very interesting.

**Dr. Bhavna:** So that's yes. That's the reading that gives the strength of the muscles that happen with the physiotherapy treatments or the settings that are given to the patient. The second thing if there is something I would say a neurological disorder might be with age or with some accident. People are not able to do motor functions. Their reading their sense I would say their reading, as well as their hearing, may get delayed due to the lethargy in the neurons that are called motor functions.

So again, the device, the product which is being developed and which is working with the OPD of the hospital, works on this. It tells you what the delay is with that patient and what sort of therapy the physiotherapist should add on so that this goes nearer to accuracy. So that is physiotherapy I would say the product which is developed I was a part of it along with the physiotherapist Medico from the previous organization, and both of us has developed it. In fact, the doctor has achieved so many appreciations and laurels because she has presented it in various international conferences, and we are even having a patent for that. We have developed a patent, so I would say that about the first product.

As you said, The second product with the organization is still ongoing because a prototype was developed, and we are in the phase of developing a product out of it. So, I would say a glucometer measures the glucose level of your body non-invasively. Luis: Very interesting for diabetes

**Dr. Bhavna:** Yes, non-invasively with your breath, breath analyzer, something like that. So, a prototype is developed, and the product is in the phase, which is the second thing I would say.

The third thing I still remember about your conference two years back was that I had given a keynote.

**Luis:** I was going to ask you about that I fell in love with that project, the non-invasive dialysis.

**Dr. Bhavna:** So this was something wherein my mentor was there, I would say Dr. Patel, and it was Dr. Patel's idea because the previous two ideas were solely of mine, but this idea which I, which was with Dr. Patel, my mentor

Dr. Madhu Patel, and it's a simple non-invasive device as you have heard earlier also to detoxify.

**Luis:** Yes.

**Dr. Bhavna:** Yes, so that it is, or you can see how things are detoxified from your body. So, it's one of the simplest and the non-invasive ways that does not hamper anyone. In fact, people who have to go into that mode of what we say who the **creatinine level** once it goes beyond. So, in that case, this is one of the helpful ways, but still, we haven't come up with the product because Dr. Patel is no more, and it is validated that the complete product is ready but not commercialized and not taken to market. I wish it happens soon.

**Luis:** Me too. I really enjoy this project. You know, it's a very nice, very interesting concept, and when you look at it, it's so simple. Can everybody say why it was not thought about before?

**Dr. Bhavna:** Yes, that is what innovation is.

Yes. So I just wish that very soon, it would get commercialized and it would go to society so that people could use it in a very easier way.

And the fourth thing that is coming up, which I'm currently working in almost our prototype ready because I've worked on parallel work for the last five years. I'm doing it's a very simple thing; the way we do headphones for hearing things, you will have a wearable band that will measure your brain signals. It might be right now Dr. Luis is in Brazil, and I'm here, and it might be Dr. Luis is wearing that band, and somewhere it is getting notified what are the brain signals showing Dr. Luis status of it, whether they are cool whether they are stressed whether it is in what domain it is. The moment it reaches, it indicates that it is at a stressed level. We will try to bring it to the normal level without you doing anything so that it does not impact your physical or mental health.

**Luis:** That's another very useful tool, and we could have had that sometimes during our day work when you have very stressful situations. It could allow us to go back to a more polite way of work.

**Dr. Bhavna:** yes

**Luis:** also I want to see that in the market it will be very good

**Dr. Bhavna:** Teah, sure, sure, very soon it will be there because it's on flow, yes, so I think I have shared three or four things. There are many things, but I think I have already shared three or four things with you.

**Luis:** What are some emerging trends or technologies in the field of electronics that could revolutionize healthcare delivery in India?

**Dr. Bhavna:** Very hard question because India is working in the healthcare domain and advanced technology. I would say it's nanotechnology.

**Luis:** Nanotechnology?

**Dr. Bhavna:** Yes, because whatever device, whatever medical device comes up, whatever we device, it should be of a sort which should be affordable not only in terms of economics, not only in terms of cost but, for example, as I said that I'm coming up with something which I called as read your mental state, I said a few minutes back in the previous question of years so it should be something a very small patch or a very small variable which no one else should be able to make it out then only and in that case it is nanotechnology which should help in doing the things so it's again a part of semiconductor have a chip development move further towards nanotechnology. So, that's the advanced technology, obviously AI; we cannot forget AI because artificial intelligence has to play a role in all of these things to see how things could be very intelligently settled, so these are the advanced technologies.

**Luis:** regarding AI, it's a very small question. Okay? I have seen several companies, most of which are Americans, developing AI products. We also have a Brazilian company that I became aware of today. I am very happy for them and hope they have a bright future. Is there any... Let me reformulate the question of how many companies in India are working on the development of AI.

**Dr. Bhavna:** I would have two or three different answers for this. Yes, you said America has companies working on AI. I would say companies are in America, but the people who work there are Indians.

**Luis:** yes, that's true.

**Dr. Bhavna:** Okay, coming because I would say India and AI are the questions, so I tried to map it. Second, two minutes back, you raised certain questions related to electronics in India, and I said the Government is doing this. Again, coming back here, the Government has taken a mission of AI development in India.

**Luis:** So, will the Indian government develop its own AI project?

**Dr. Bhavna:** The Indian Government will develop, already companies are developing, there are all the companies use you name a company might be it could be if I'm not to spell as we say the worldwide companies if you say IBM is working into AI. Suppose you say any other company, Google, that is in India. Google initially came up with two or three offices in India, but it only had one or two offices. The offices have grown, and people are working on AI in India. So, it's a complete Indians and AI sinking factor, I will say, and that is how it is.

To share with you, let me share again that Symbiosis International University has its own research center called SKY Symbiosis Center for Artificial Applied Artificial Intelligence, and it is doing wonders working in several research domains, including AI in the medical health sector, AI in engineering, AI in all the applications. So AI is the future somewhere, and yes, India will have India is having companies who are working to generate AI, who are working on the development of AI, who are working on applications of AI, and who are into developing AI, so it's complete all the domains are at this moment available for having a presence in India.

**Luis:** That's very good, and I don't think we will have to wait too long because AI is evolving so fast. I want to see amazing results and hope they bring us a better future.

So, I will go to my next question because it's a very important part of electronics in agriculture. I think that's a challenge that both India and Brazil face. My first question is, while your expertise lies primarily in electronics and telecommunications, have you explored or considered any electronics applications in the agricultural sector?

**Dr. Bhavna:** Yes, I have come up with two prototypes. The first is tasting the soil. Soil testing is already there because soil testing is in existence. There is nothing new in it, but the thing is, the farmer has to take the soil to the labs to get the results. So we have come up with a very low-cost simple thing which any farmer or which any person can have it just go and test the soil and find out what's the quality of the soil so that's the prime thing when you come to agriculture the prime thing you should have the quality soil so that whatever you are going to have the yield will be the highest that's the first thing.

The second thing now is that you need to have the proper climate. I would say this environment is not fertile, but it would be good to have a good yield, which is where everyone today is dealing. As you said, it might be India, or Brazil, because India is also a base agricultural land. The prime thing in India is agriculture, but then again, I would come up with something. The Government is working a lot into this. We are using drones into this agriculture system today, and drones are already a part of this. These drones are not only used for sowing the seeds. These drones are not only used to see the status of the plantation on the fields, but even the drones are used to see how can we water the plants? How can we look into what is not in line with the growth of the thing, which is an obstacle to the growth of the yield so all such research work and at a certain point of time things are brought in place things are going on it's a happening thing it is not yet happened, but things are moving in this direction.



**Image:** Drones for agriculture.

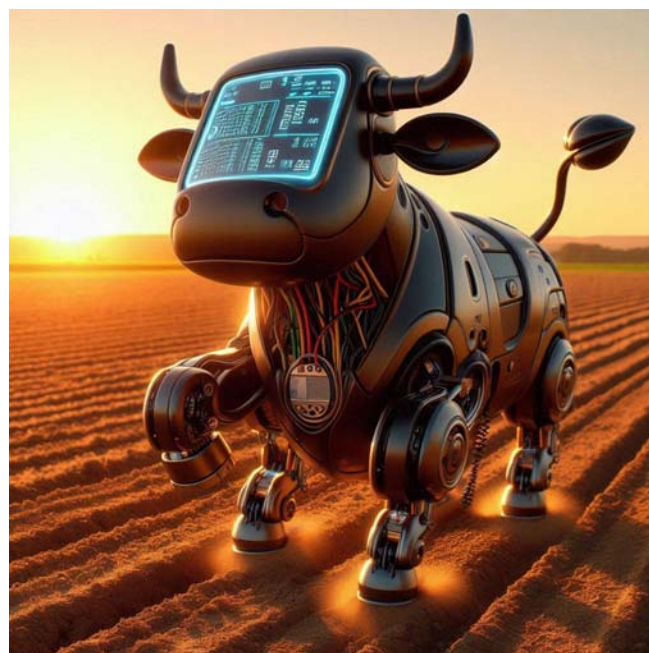
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Now, one more thing which I have come up with one of my team of undergrad students is very simple. In agricultural land, a basic nuisance, I would say it's called as a nuisance because no one can help it, and it abruptly comes up after any season you find that certain weeds come up, it's an undesired thing, but that's the law of the nature, so half of the manpower today goes into removing the weeds because this is and these are the undesired plants which comes up and if you don't remove this then your fertilizers your chemicals your bio-fertilizers these weeds will eat them so it's needed to remove these weeds and I came up with something a very very simple thing a simple robot which will help to remove these weeds instead of man labor. A very simple robot which works on solar and which works that that's remote control so where you need now ten people man labor of 10 people with 10 hours for three days, now it will take one hour with your simple mobile phone to work it remotely, and you'll get the plain land so certain things like this the third project which I worked with my team of undergrads this was a post-grad student, and this was the yield which you get might be you have certain fruits with you find out what's quality and what's the content because so many fertilizers chemicals used nowadays in agriculture. So, what's the quality of the result that you are going to get might be a vegetable or might be a fruit, and we have come up with a system that gives the contents of that fruit whether it is in a ripened state if it is in the ripened state what's the sweetness of it? What would be the sweetness content of it? What would be its chemical content of it? Something like this I have worked personally as you have asked the question other than that things are really coming up people have replaced so many things in India, making India has really created a revolution in this domain also Luis: Yes we I followed some developments from India, and everybody says it's very nice and impressive the accomplishments so allow me to go I have two more questions.

One is smart farming and precision agriculture. They have gained attraction globally. In your opinion, what role can electronics play in improving agricultural productivity and sustainability?

**Dr. Bhavna:** I think electronics is the major thing that will help sustainability and growth in agriculture. As you said, it should be precision agriculture or smart farming, so smart farming

consists of something that we call most of the things automated, and most of the things that will reduce man labor so that it gives accuracy. So, both things can be achieved with electronics, and let me share one of the things a colleague like me with one of from one of the universities who also works in the entrepreneurship domain. He has come up with something that we call as "electronic bull" because for cultivating lands to make them fertile every time before we grow something on the land to make it fertile we need to have bulls who go through this and make the land fertile so that's the process of farming agriculture. So now he has come up with the bull who will do all these things, he will help to make the land fertile in the expected shape, he'll help to sow the seeds, he'll help to cut the seeds, he'll help to collect the seeds and put it in one way. So that is one of the ways of smart farming he'll help to even spray the fertilizers that electric work, so that is one of the ways of smart farming because electronics will play a role in doing all these things you need to have some microcontrollers which will do all these automatic things.



**Image:** Electronic bull for cultivating lands.

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As you asked precision agriculture, I think I have worked on a project that will give you yield quality. So, that is precision agriculture, I would say. Really, go in a precise way. How much water content is required for your plantation right now? So that is, again, precision agriculture, find out the texture, the moisture, and the quality of the soil, define you need this much potassium right now in

your soil because that is needed for the best yield if you are going to have this crop. Find out you need this much water this is required, and this much more is needed so water accordingly that will be precision farming so that is again which will happen with without electronics it is not possible so electronics is the heart of all these things on top of it you add anything might be AI or everything that will work but without electronics, nothing is working.

**Luis:** That's true. Now allow me to go to my last question, and that's because of experience. I had some problems. How can we enhance the resilience and durability of electronic devices and systems to withstand harsh environmental conditions, enabling them to have a longer operational lifespan in the agricultural sector?

**Dr. Bhavna:** I think the electronic devices that come up are very sensitive. They are susceptible and not like something that we call as robust. We can build a robust device, but with making India, the first step is to develop a chip and a component. Once we do that, then that would be the next step to have a resilient or a robust electronic, not chip, not device, but a chip inside which will really withstand, but as far as right now, what I can say things are quite robust, yes, but you cannot say that they will go lifelong obviously.

**Luis:** it's impossible.

**Dr. Bhavna:** yes, we need to just work to see what quality results they will give over a longer time. That's what we can say. Yes, so resilience has to be there, but obviously, it will be within a defined period only.

**Luis:** that's very good. I have done some projects for pleasure, to say the least, and I have encountered some difficulties with the oxidation of the components. I hope to have more reliable things that will last longer.

**Dr. Bhavna:** I can resonate with what you are saying because we, too, have encountered, typically, certain things in the water tank because you are working into that domain, so I could relate to it very easily. I could resonate, and if you put something into that water tank after 13-14 months, it's absconding, I would say, because it gets rust and it melts. It's nowhere, it does not exist, so you come from that way. I got that question because that project came to my mind, how it got rusted,

and it got melted, and it's no more, so someday we had put some project, and now it's nowhere so that is bound everything and hence. I said the first thing right now is our vision is to develop things, and surely, we'll add quality to them so that they do not get rusted or cause certain things to get rusted. Yes, but certain projects are getting developed, and typically, I would say in this area because when you put a system inside water, as you said, the thing here is to find out the contents of that water might be. I'm just taking some examples so we can do it without entering the water also, there is something that has come up that...

**Luis:** that will be the future.

**Dr. Bhavna:** Yes, no, no, it might be a place people use. Research work is going into this domain, so we'll take off something like that. We can have one more discussion on this letter at some time related to this because I know this is of your fashion, this is your ink

**Luis:** yes.

**Dr. Bhavna:** I know that, yes

**Luis:** Dr. Bhavna, I'm sorry. In the name of the journals and the conference, I would like to thank you very much for taking the time to receive me. I really want to see you at the conference; it will be a pleasure to hear from you again.

**Dr. Bhavna:** yeah, so thank you for this opportunity to share my views, and really, again, I also wish that I represent Symbiosis International University Symbiosis Institute of Technology in your conference, which is going to be a collaboration of a number of universities ten plus universities as you had shared I know, so we can even add Symbiosis International University to this list of 10 that is what I would like

**Luis:** yes, thank you. It will be a very good collaboration if we can get to a, how can I say, agreement, and it will be a pleasure to receive you virtually students and, if possible, one more speaker because you are already with us. Thank you very much

**Dr. Bhavna:** thank you

**Luis:** It is my pleasure to speak to you. Good morning to you.

**Dr. Bhavna:** Thank you, and good evening.

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## DECLARATIONS

- 1. Limitations:** The interview is limited to its content.
- 2. Funding source:** The host funded this interview.
- 3. Competing Interests:** The host has worked for the journal for many years, and this may have influenced the interview.
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### Conference invitation. (now related to the interview)

Visite o site da *Second Southern Science Conference* que será realizada nas belas cidades de Mendoza, na Argentina, e Vassouras no Brasil, de **7 a 9 de novembro de 2024**. <https://www.sscon.org/>

## Confirmed speakers



Bhavna Ambudkar is a seasoned professional with expertise in electronics, telecommunications, research, teaching, entrepreneurship, and innovation. With over 25 years of experience in Electronics & Telecommunication, she excels in Computer Networks, Digital Electronics, Healthcare, Innovation, and Educational Technology. Bhavna holds a Doctor of Science (D.Sc.) degree in Engineering, along with a Ph.D. and Masters in Electronics & Telecommunication Engineering. She has authored over 50 research publications and holds 10 patents, showcasing her ability to bridge academic research with practical applications. In addition to her academic achievements, Bhavna has been instrumental in nurturing entrepreneurship and innovation. She has mentored numerous start-ups and entrepreneurs, facilitating idea development and funding acquisition. Bhavna's contributions have earned her recognition at national and international levels, bolstering her extensive networks and collaborations across various domains. Certified by Cambridge International and Dale Carnegie, she is adept at building and fostering professional relationships. Bhavna's multifaceted expertise and commitment to innovation continue to shape her impactful contributions to academia and industry alike.

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## SUSTAINABILITY, INNOVATION, AND INTEGRATION: PROFESSOR RIBAMAR'S VISION FOR BRAZIL'S CHEMISTRY PROFESSION

Dr. José de Ribamar Oliveira Filho<sup>1</sup>; Luis Alcides Brandini De Boni <sup>2\*</sup>

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**NOTE:** Version of the translation transcription. 1.0.

Dear friends, the interview transcription was done by machine and later reviewed. We are aware that it is imperfect. If you wish to collaborate with improvements, you are welcome to contact us at southbchem@gmail.com

### ABSTRACT

**Background:** The interview with Professor José de Ribamar, conducted by Luís de Boni, addresses various aspects of his career and contributions to chemistry in Brazil. The conversation includes his experiences in teaching, research, and university administration, as well as his role as President of the Federal Council of Chemistry (CFQ). **Aims:** The primary aim of the interview is to highlight Professor Ribamar's achievements and challenges throughout his career, and to explore his views on chemistry and its impact on scientific and educational development in Brazil. **Methods:** The interview was conducted in a question-and-answer format, allowing Professor Ribamar to share his experiences and insights in a detailed and personal manner. The interview was recorded, transcribed, and is available in both text and video formats. **Results:** Professor Ribamar detailed his academic and professional journey, including his undergraduate and graduate studies in chemistry, his contributions as a professor at the Federal University of Maranhão (UFMA), and his initiatives as a course coordinator and department head. He also discussed the impact of his research and his vision for the future of chemistry, emphasizing the importance of artificial intelligence and algorithms in predicting chemical models. **Discussion:** The interview provided a comprehensive overview of Professor Ribamar's contributions to chemistry in Brazil. He emphasized the importance of education and ongoing research for scientific advancement, as well as the need to adapt to new technologies. The discussion also addressed the challenges the scientific community faces and the importance of interdisciplinary collaboration. **Conclusion:** Professor José Ribamar has significantly promoted and developed chemistry in Brazil in academia and public administration. His career illustrates the importance of dedication to education and research, and his reflections offer valuable lessons for future generations of scientists and educators. The interview serves as a testament to his lasting impact on the scientific community.

**Keywords:** José de Ribamar Oliveira Filho, Chemistry Education, Federal Chemistry Council (CFQ), Interdisciplinary Collaboration, Sustainability.



**Luis:** Good afternoon, Professor Ribamar. How are you?

**Dr. Ribamar:** Very good, even more so now, in your presence, sharing with you all the best. Before starting, I want to show my solidarity with the gaúcho brothers and that the system, CFQ, CRQ, we have capillarity in the 27 units of the Brazilian federation. We are represented by 21 Regional Councils that are located in each state, covering all our federation units. There is a council, for example, that represents four states, as is the case of Amazonas. So, we have representation in all Brazilian federation units, reiterating.



**Photo:** Dr. José de Ribamar Oliveira Filho. 2024.

**Luis:** I appreciate it, and, as a gaúcho, I am grateful for all the support we are receiving from our brothers. From our perspective, as we live in the extreme South, we call them brothers from the North, but for us it is North from Santa Catarina onwards. And all help is very welcome. Our state was hit hard. But let's go back...

**Dr. Ribamar:** Luiz, I just want to complement you, if you don't mind.

**Luis:** Of course, please.

**Dr. Ribamar:** Regarding our concern, we are mobilized. The 21 councils representing the 27 units of our federation are together, emanating in everything. We are all mobilized to do as much as possible for our brothers and sisters, and we have already started donating, doing everything within our reach.

In a few days, we will have our plenary meeting, and they will bring news from each of their states. There are 22 advisors who will bring

news and provide some new ideas so that we can be more effective in providing this assistance and move on to more practical, visible things.

This is what I want to clarify to our brothers there in Rio Grande do Sul. I was there recently inaugurating the headquarters of the fifth region, the headquarters of the Regional Chemistry Council, through Dr. Fallavena (Paulo Roberto Bello Fallavena).

And we, through this Council and through the banks, will provide maximum solidarity to you. That's what I say from the heart.

**Luis:** Thank you very much, professor. I hope our brothers in Porto Alegre are well. Porto Alegre is a huge city affected by rain and floods. The city I am in, thank God, was minimally affected, but others went the other way.

And if you allow me...

Shall we go back to our interview?

**Dr. Ribamar:** Let's go.

**Luis:** Because I'm not able to talk much about it. At least not now. In a year or two...

**Dr. Ribamar:** Porto Alegre will be Porto Alegre again and much happier than before.

**Luis:** Definitely. It will be a better city after this. It was already a very good city.

Today we have the excellent opportunity to interview Professor José Ribamar. Thank you very much for having us.

On this special date and...

Let me concentrate here. I told you I'm not a reporter, man, but let's do our best. Initially, I'm just going to read a statement regarding our interview.

Our interview will be published in Portuguese by Periódico Tchê Química and in English by Southern Journal of Sciences. We will share the interview with a local television, Conecta Mais TV. Our interview content is distributed under a Creative Commons license. So, it is public.

Today, we have the pleasure of interviewing Professor Ribamar, who is president of the Federal Chemistry Council. And if you allow

me, I'll start by asking questions.

**Dr. Ribamar:** Okay.

**Luis:** Professor, you have a degree from UFPA. Degree in Chemistry. Full Degree in Chemistry from UFMA. Specialization in Chemistry from UPE. Master's degree in Analytical Chemistry from UFMA and PhD in Analytical Chemistry from USP. How did this diversity of training influence your career?

**Dr. Ribamar:** Look... chemistry was a wonderful breakthrough in my life because until then, I didn't really like studying, but my mother, thank God, with that very strong pulse, mother of 8 children, 6 boys... I studied to pass the year because I was afraid of her. After all, she hit those who didn't study very hard (laughs). It was at 6 am that things started. And I studied to pass the grade because of her since it was a horror not to pass the grade with my mother.

Thank God I have never failed in anything in my life. I mean 'nothing' concerning studies in the area of chemistry. Then, I got into chemistry, which was an interesting thing. In the past, it was first grade, second grade, junior high, and scientific.

When I went on to my first scientific year, I learned chemistry through the teacher, and I will never forget this teacher, Reis from Maranhão. He was my chemistry teacher in the first scientific year, and we were making our debut. Those young people and I arrived at the first class drunk (laughter).

We drank a few shots of cachaça — I'm saying this with open heart —, a shot of cachaça (laughs), and we got there, in class, full of cachaça. Then Mr. José R. arrived and noticed that we were drunk; he was a chemistry teacher — a pharmacist, and a chemistry teacher. Then he arrived and said... he looked at our class, looked at our faces, and put the formula  $C_2H_5OH$ . I said, "What the hell is this?" He put structure in place and said, "Do you know what this is?"

Then, people looked at each other, and no one responded. The teacher said: "I'm asking precisely the group that is at the back." We were at the back. "Do you know what this is?"

"No," everyone said. He said: "This is the chemical formula of alcohol, of ethyl alcohol. You are all ethylized" (laughs). He said this word,

'ethylized.' Whether the word is right or wrong, ethyl alcohol... "You are full of ethyl alcohol, and you don't even know it does a lot of harm. It does a lot of harm. I'm your chemistry teacher." In our first class, this was the question he asked. "Don't do that in my class anymore. I'm Mr. José Reis; from now on, I'm your chemistry teacher."

After that first class, I arrived home, and for the first time, I said to my mother, "Mom, Dona Carmem"... "Mom," I say, "look... I discovered something interesting today called chemistry. And I liked that." She was excited, but at the same time, she said, "My God!" "What is it, mom?" "You take after your grandfather. He was a chemistry technician." He came from another place... He did so many experiments on the farm, bottles would explode... "My son, I was terrified of that. And you are just taking after him... but it was okay." That was in the morning.

When she arrived late in the afternoon, she had bought a chemistry book collection, Victor A. Nehmi — General Chemistry, which I never forgot. From then on, I began to study chemistry on my own, and, evidently, I became the best student in the chemistry class.

And I was already earning money, teaching privately, private chemistry classes. Those who paid me were the wealthier, middle class, or a little below. Then, I started making money with chemistry in the first year of my studies, and then I turned to chemistry and I got to the entrance exam. That whole thing. I passed the first time right away, and...

There was only chemistry in Belém do Pará. In Maranhão, there wasn't any. I traveled to Belém do Pará, and took chemistry, thank God... I passed, and made this... this career, thank God, without any failings in my life, in the academic part.

**Luis:** Allow me to ask a question. I was looking at your CV, and I think you just answered. What led you to graduate from two different universities, the industrial training at one and the graduation at another? Weren't there both courses at the same?

**Dr. Ribamar:** Exactly. There was no chemistry at the Federal University of Maranhão. The closest one was in Belém do Pará, which is about 40, more or less 45 minutes away by plane.

**Luis:** Oh, by plane!

**Dr. Ribamar:** And I went there by bus. I went by bus to do chemistry. Then, the failure rate was so high that there were two entrance exams. I passed the first exam straight away. In the second, it was even more crowded because everyone who didn't pass in other areas wanted to take chemistry, but it didn't work out well because of the remaining vacancies. But that was it.

I lived in a republic for four years. I lived in Belém do Pará, in a republic, with 16 colleagues who were taking various courses.

Most of the ex-Maranhão students took chemistry and agronomy, since there was neither of them there (in Maranhão). Some studied chemistry and agronomy, and others studied medicine.

Mr. Zé Reis was the one who clarified my ideas and made me love chemistry. When his son went there to study medicine, Reis asked me to help him with chemistry.

My first job was precisely at São Luís School, where he was a teacher. Recommended by whom? By Mr. José Reis. He nominated me. It was my first job, in April 1974, at São Luís School. I graduated in 1974, but my graduation was completed at the end of 1973. It was made official in 1974. In April 1974, I was already a chemistry teacher at São Luís School.

And a detail: I am the only stuttering teacher I have ever met in my life. In chemistry, was only me. I was very stuttering.

And I went to teach a special class, which didn't have a high school education. They had the scientific, and only people of mature age, and some even more... less young. Just to avoid calling them old, we call them less young. And they helped me a lot when I had difficulties. And there was a radio host, Herbert Fontinelli, and the students said, "Teacher, if you speak slower, you can do it." And I was 'unstucking,' as they say in the countryside, I never had treatment for stuttering. It was a shock treatment (laughs). Because I needed to earn something, and my first job was as a teacher. I liked being a teacher... because I was prepared to be an industrial chemist and work in a closed factory, I thought I was very shy — I still am, very shy — and with that, I had to find a solution. Everything I was afraid of in my life, I was compelled to do. That's that.

**Luis:** It's a really cool path.

**Dr. Ribamar:** I'm almost cured of my stutter.

**Luis:** Professor, my next question. Since 1977, you have been an assistant professor at UFMA, correct?

**Dr. Ribamar:** I'm already a member. I already jumped a grade.

**Luis:** Exactly.

**Dr. Ribamar:** But I'm an associate. Associate is a higher degree.

**Luis:** Yes.

**Dr. Ribamar:** Maybe you want to do something else because otherwise, I'll go ahead and talk and tell some huge stories (laughs)...

**Luis:** But stay, that's great, that's great because it's good to be able to talk.

**Dr. Ribamar:** I feel comfortable with you. You are a good journalist. I love communication. Thanks to communication, we ascend to a higher level, and we will talk more about it later.

**Luis:** Yes, thank you, professor.

Returning to the previous question. Since 1977, you have been an associate professor at UFMA. What are the main contributions that you believe you have made to chemistry teaching over these decades, which has already been a long time?

**Dr. Ribamar:** Very much.

I was the course coordinator for the undergraduate chemistry course. I'm an industrial chemist, and I graduated with a degree in chemistry, too.

And at the request of the students, I was a teacher... and I like being a teacher. I adore. I love chemistry. Just mention chemistry, and I spend the whole day on it. I love it, and I love chemistry.

But okay. As a legacy, I left mainly... When I was an undergraduate chemistry teacher coordinator, I was already a general chemistry teacher, and I taught almost all the basic chemistry in the department. I also replaced several colleagues who were going to complete their

master's degree and doctorate at the time. I wasn't interested in any of that. Master's, doctorate... I wanted to teach. Do you understand? Which I liked.

I started in second grade. São Luís School, then Liceu Maranhense and then university. The Liceu Maranhense was a reference.



**Image:** Liceu Maranhense.

Source:[https://pt.wikipedia.org/wiki/Liceu\\_Maranhense#/media/Ficheiro:Liceu\\_Maranhense.jpg](https://pt.wikipedia.org/wiki/Liceu_Maranhense#/media/Ficheiro:Liceu_Maranhense.jpg)

Some old ones — making a digression to inform you —, today politicians, and even state governors, were high school students. They really lay it on thick about having studied in public school. Just one detail. The public school, at the time the Liceu, was the best state school, it was the best school that existed in Maranhão. It was called Liceu Maranhense.

Only those who had an IQ were accepted. But not an intelligence IQ, the IQ of “who indicates” (pun in Portuguese). That’s how it worked, do you understand? I do this to correct things because, “oh, because today, private schools”... In the past, private schools were much inferior to the Liceu. And I studied at a private school, which was São Luís. Much inferior to the Liceu. “But why didn’t you go to the Liceu?” Because I knew you had to be the son of a senator or a politician to climb the ladder. Only a few people got in there, and there wasn’t even a selection. Now, for the teacher, there was.

And thank God, I never went through the window anywhere. I entered through competition, and I’ve been doing exams since I was a kid. I did exams with the sectional so my mother wouldn’t

pay for São Luís High School. I’ve been doing exams since I was a kid. I took my first public exam when I was still a boy. And it was always through public competitions that I achieved everything. At the Liceu, for teachers... The governor at the time was Victorino Freire. He stipulated a selection to be a teacher at the Liceu, and I passed the selection, thank God. I liked Liceu so much that I refused when I was invited to UEMA, the State University of Maranhão. I preferred to stay at the Liceu. High school. Why? Because there were all the conditions. It had chemistry laboratories. I was one of the heads of these laboratories. I loved teaching at the high school, and I only left the Liceu because I took the federal exam and went to the federal level in Maranhão. Not to the state level, to the federal level. Then I left because I spent too much time teaching. I taught in the morning, in the afternoon, at UFMA, and at night at the Liceu. Then I couldn’t handle it. Even though I was young and had a lot of resistance, I couldn’t handle teaching like that. Then, I asked for exclusive dedication at UFMA and left high school. You know, the state spent two years... I resigned, and the state took two years to fire me.

I have always tried to raise my children like this with ethics and respect. Found is not stolen? I don’t accept this, and the find has an owner. Look for the owner. That’s how my mother raised us. If you don’t find the owner, put it in its place and let someone else take it. That’s how I taught my children.

**Luis:** Professor, moving on to the next question.

In addition to teaching, you also served in several administrative positions at UFMA, as course coordinator, head of the department, and member of the Center Council. How did this experience in university management contribute to your preparation to assume the presidency of CFQ?

**Dr. Ribamar:** So, there was one activity missing. I was the director of the Extension Department.

And I loved it. Look, I loved working in the extension. Because extension is knowledge taken to populations.

In the interior of Maranhão, there was a very high level of infant mortality. Why? Because of the water. All because of the contaminated water that people drank. And I went to give the

extension course and left them doing it... Doing it. I hate it when things remain just in theory. And I did it there, and it worked. Simple things: you can treat water and do the test, you can see the treatment level in small tests, as, for example, free residual chlorine. But if we go there, we will never end. Please repeat your question.

**Luis:** Of course, Professor. How did this management experience contributed to preparing you for the presidency of CFQ?

**Dr. Ribamar:** First, when I was coordinator of the chemistry course, there was a student, a chemistry technician, who took the entrance exam for chemistry to graduate so he could increase his responsibilities at a higher level. He did it because the assignments in the secondary course were limited by law.

In other words, a chemistry technician may even be technically responsible for a factory. However, it must be of small size. For medium-sized and large factories, he must have a higher education degree. He came in to increase his professional responsibilities, to increase his professional scope through higher education, and be technically responsible for medium-sized and large factories. Then I heard his story. Until then, I was registered with the Council of Pará because we were a delegacy, the state of Maranhão was a delegacy. I was registered with the Council of the sixth region, which is Pará, because I graduated from the federal university of Pará.

Then I went to find out about it. I discovered that a chemistry graduate could not practice the chemical profession. He was limited to high school education at most. He couldn't be a practitioner. I found this incongruous. Why? How can a chemistry technician practice as a chemist and a graduate with a higher education degree cannot? He could only teach. Look, guys, those who teach chemistry know chemistry. So, why were chemistry teachers underestimated at the high school level? The thing was so serious that, in those days, the private schools — that are the best today — preferred medical or pharmacy students to teach chemistry rather than a person with a degree in chemistry.

So I say, "Guys, why is this?"

This woke me up, and I sent, at the time, a letter to the president of the Federal Council, who, at the time, was Dr. Hebe Martelli, asking why the graduates were prohibited from practicing the

profession of chemist by the Federal Chemistry Council itself. We establish the standards, establish these parameters, and examine the curriculum.

Then she responded, by letter, that chemistry graduates did not meet the minimum required by the Federal Chemistry Council to be a chemist. She sent me this extraordinary resolution, 1,511, which is still in force today. And I discovered that our chemistry curriculum was very weak. We taught three chemistry classes halfway, and the rest were just subjects in the pedagogical area. Then I say, "My God, oh no!" It was then that I communicated with the president. It was no longer Hebe Martelli. It was Professor Adade, Jesus Adade.

I also communicated with him by letter, and he replied what I had to do. I say, "Professor, why can't a licensed chemist in Brazil work as a chemist?"

He replied, "Because the curriculum is very weak." "And what can we do to climb the ladder and claim that a chemistry graduate is also a chemistry professional?" He replied, "You have to reform the curriculum and establish the minimum contained in resolution 1,511."

Then he sent the resolution to me, and I started the fight. After two years — because people in the education area already had another interest, which was is very well known —, I started to reduce the workload on pedagogy and even eliminate subjects from the pedagogical area to introduce chemistry. Then there was a series of debates, people in the education area would say, "It's difficult. Oh, you're changing the professional profile," among other things. I would come and say what my understanding was at the time.

I say, "Look, pay attention, those in the field of education." They were using those difficult terms. "I confess that I didn't understand 50% of what you said." I said that right away. "I am ignorant of your terminology, but I tell you, education teachers. No matter how many public speaking courses one takes, no one in the world gives a speech without knowing the content. What will the chemistry graduate teach? He'll teach chemistry! How am I going to teach chemistry without knowing the subject?"

Therefore, the market is full of pharmacy and medical professionals and students. I became a teacher at São Luís School only with training as

an industrial chemist. I passed the high school selection, just with this training. And if I passed the selection, it's because I showed that I have knowledge of teaching.

I taught a pre-university exam course in the 24th Hunter Battalion in the army here for people to take an officer course. People liked it, and I didn't have any discipline in their area.

Then I'm going to take a look at my curriculum to see if it has inorganic chemistry — 60 hours —, it doesn't have experimental chemistry... Physical chemistry 1, and organic. What the hell is that?

Guys, this can't happen!

Oh boy... The coordinator of the chemistry course in the experimental practical part was a math teacher. For the love of God, right?

Then I say, "Look, professor, I'm going to replace you because I'm going to hire someone from the area." He replied, "No, I'm a doctor..." I argued: "Listen, you don't know chemistry in depth. You know some basics, you know nomenclature, that decorative thing... You have to study reaction mechanisms and more advanced organic chemical reaction mechanisms."

"The properties... You don't even know how to prepare a solution, professor. Imagine standardizing a chemical solution... You don't know! You have no basis in chemistry at all." It is difficult. He started fighting, and I replaced him. Man, it was a struggle.

Then, I managed to approve the curriculum. So I told the new dean: "I have a problem with the area of education. I can't approve of this curriculum or this reform because they don't want it. It's a market issue. They will lose their jobs, I don't know what's going on." Then the professor, who joined us during the rector's time, arrived and said, "He who knows the plus knows the minus. I agree with you."

That's it. Then it went to the Council. At the time, the curriculum reform had to go through the Department, the Center Council, and the State Council.

It passed all three, I approved it, and that was the first Council to approve this in Brazil.

I arrived and sent it to Professor Adade. I

was invited, for the first time, to step into the Federal Council, which was there in Rio de Janeiro. I was invited because he set up a committee to approve this course, and wanted me to be present. They paid for everything, so I went.

Then, I met Professor Jesus Adade, and I saw this system thing and I got excited.

It was approved. I came carrying the approval, arrived and broke the news to the students, and to that student. "Now, yes, a chemistry graduate is a chemistry professional!"

"The new resolution is here: it changes the one that has the prohibition, and more, it can even increase your competencies through the additional curriculum."

"If you want to have assignments of 1 out of 12, which is industrial chemistry, you only take the technological subjects. If you want to have the competencies of a chemical engineer, just do the part relevant to the area of chemical engineering. Your title will remain the same, with a degree in chemistry, but with competencies from 1 to 16."

I achieved all of this, and the rest of Brazil copied me. It copied Maranhão, but about it they said nothing.

**Luis:** Allow me to add something, Professor. I reaped the fruits of your work. I already graduated with this concept. I did PUCRS.

**Dr. Ribamar:** That's great, boy.

**Luis:** Thank you very much.

You know, we hear about it... The Council did it... But you know, I never imagined I would talk to the person who did this. Thank you very much, Professor.

**Dr. Ribamar:** Don't mention it, I did what was my obligation.

From then on, I got carried away with the Council and started a fight with Pará because we were a delegacy, and I created the Maranhão Chemistry Council. "I'm going to create the Council because I don't agree with the state of Maranhão being a delegacy of Pará."

I graduated there, right? I love Pará. The state of Pará was my second home, in my youth. I spent four years there. Four years in the republic

there. And many friendships. I love the Federal of Pará. My teachers and my colleagues. Thank God that is over, and today we are a very big brotherhood. We are very united. I love the Federal University of Pará because it is my story, the most brilliant page of my life was written at the Federal University of Pará and in the republic there in Belém do Pará. And we will be there, God willing, in this new meeting, which will be about the environment. It will be global, and we will be there because we have practically been invited by the staff, by the entities that are in charge there, to participate in this meeting in Belém do Pará, which will be COP number 30.

The 29th will be in Azerbaijan, right?

The 30th will be in Pará, when the whole world will see the state of Pará and know about it. They will meet indigenous people, who they no longer know. They will see forests, on site, and they destroyed theirs. And they will also see the importance of Amazon for the environment and the sustainability of the planet.

**Luis:** Thank you, Professor.

Taking advantage of your suggestion about COP 30, we are organizing a small conference in November. I know you have a busy schedule... Anyway, I'll invite you, if you're available. It's virtual and in person, so you can give us a little talk. Keep the invitation in your heart.



**Image:** Logo of the [SSCON 2024](https://www.sjofsciences.com).

**Dr. Ribamar:** Okay, I could never reject it, especially coming from you. You're the second journalist I like. The first is here.

**Luis:** Thank you, thank you.

**Dr. Ribamar:** Look, guys, I love you. Without you, this divulgation does not exist.

Chacrinha already said that those who don't communicate get into trouble, and that's true (laughs).

There's no point in doing something without communicating what you're doing. Being ostracized, what is that? You have to show up, and people have to show their faces. And you have to get along well with the press. The press is a great thing because it publicizes things for us. Without the press, you know nothing.

**Luis:** It's true.

**Dr. Ribamar:** The press is essential.

**Luis:** It's true. I'm going to send an invitation letter to Jordana later to make the invitation official.

Moving on to our next one. Now it's a group of questions about the role of the chemist in society. How important is the chemistry professional for Brazil's scientific, technological, and economic development?

**Dr. Ribamar:** It's so important, but so important... We have a series of fantastic things that chemistry can — chemistry wants, can, and will accomplish.

Because God, the great architect of the universe, created chemistry. Without chemistry, we wouldn't be alive because chemistry preceded biology.

So much so that the concept of life that is the most accepted worldwide, from NASA, defined it as a highly sustained chemical system capable of undergoing Darwinian evolution.

So, if chemistry didn't exist, life wouldn't exist. Because chemistry preceded life. God created us to be able to create life.

Life, even scientifically, as I said, underwent an evolution because, in the explosion (Big Bang), the elements were formed, they came together to form organic compounds, and they came together to form DNA and RNA.

And then life pulsed through chemical evolution. So, biology is living chemistry. Living chemistry is biology, and we are a perfect chemical system. Any gesture you make triggers hundreds of reactions in you.

So, you see, the importance of the chemical is essential, on a global level, at the level of national sovereignty of any country. Because without chemistry, there is nothing. Everything you are using right now has chemicals in it. You use chemicals in your mouth, and your body produces chemicals. What makes bones and teeth? What are teeth? It's hydroxyapatite.

The teeth formula is calcium dihydroxyhexaphosphate  $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ . This is the teeth formula. Cavities are a chemical reaction.

Why is fluoride used in toothpaste? Fluoride replaces the hydroxide in the tooth, forming a film that is more resistant to cavities, which is nothing more than acidity caused by the lactic acid that we are using in the body. All that is needed is a pH acidity below 5.5, which favors the attack on teeth.



**Image:** Representation of the fluoride used in toothpaste.

Image Source: Generated by IA · May 2024. Ideogram.

So, see, chemistry is in everything. It is present in everything; we live it right now when we breathe  $\text{O}_2$ . And water. When we breathe, we only think about oxygen, but no. There has to be water. In space, there has to be water, and if there wasn't water, you would dry out. You would implode.

If the water, if the relative humidity of the air was zero, you would implode. The lung deflates, and you would implode.

Water is a divine thing, but it has side effects. You have proof of this, which is drowning and excess. Everything that is excess is surplus. And Paracelsus already said, I don't know how many years ago, that "what kills is not the poison, it's the dosage, it's the concentration." We have more than 50% of the chemical elements in the body. You have radium, you have a radioactive

element inside your body. Mercury. Just look at the water we drink, the amount of things there are. The mineral water. So, we're also going to have more information to say that, below certain limits, nothing is toxic. What is toxic is something outside the limits, as we have more than 50 chemical elements and products. We have organogenic elements: oxygen, carbon, nitrogen, and hydrogen. The most present elements in all life, in all life there are these elements.



**Image:** The representation of chemical elements is being studied.

Image Source: Generated by IA · May 2024. Ideogram.

So, it's a lack of information. We have to demystify chemistry, and we will achieve it.

Well, what does the chemist do? The chemical is important in industrial development. We have the least polluting chemical industry in the world. Brazil is at the forefront in this area. We are at the forefront of sustainability.

We have the least polluting chemical industry in the world. We have everything it takes to be at the forefront of global sustainability. We have to teach and not be subject to unfounded criticism, especially from more developed countries.

I think there could even be a tax on pollution. Some politicians have even suggested this.

Or invest more in countries that produce cleaner. Why don't they invest in the Amazon? The Amazon is responsible for water, including the fight against pollution. It absorbs excesses. Whoever destroys the Amazon destroys Planet Earth. People still haven't gotten it into their heads that we live in the same house. The evil that is done here has repercussions there and vice versa. And theirs are having more impact here. Oh, sometimes it's local. Yes, but look at the warning



from Rio Grande do Sul. It's there. This tragedy that is happening. This is a climate response. It's a response to climate change. In the face of excessive human pollution, we are the most polluting agents. It's us. We pollute the air. We pollute in liquids, in waste, all these things. We are the most polluting. If you calculate the number of things we produce, then you'll see. Damn! No one has yet realized that what we produce when we breathe is carbon dioxide. We contribute to the greenhouse effect. What the world population breathes?

So, the chemical is in everything. The important thing is to transform CO<sub>2</sub> — in addition to reducing... We have a solution for everything. For everything. Here comes artificial intelligence. Today, we have algorithms. I'm not going to talk about it because it's an extremely complex topic.



**Image:** Representation of AI being used in chemistry.

Image Source: Generated by IA · May 2024. Ideogram.

**Luis:** Comprehensive.

**Dr. Ribamar:** There are several things. But we have algorithms today that predict. Through the study of the physical, biological and chemical footprints of chemicals, products can be synthesized, before laboratory experiments, through artificial intelligence and algorithms applied to artificial intelligence. This model prediction, without carrying out laboratory tests, is fantastic. I will say more, the future language of chemistry is artificial intelligence. It is already being greatly successful. And for us, it is essential.

Of course, we'll study the side effects on the companies, regarding the statutes. But we have to prepare ourselves, including curricular changes. That's why I intend to hold a meeting as soon as I have more information.

We have high-level scientists in chemistry who are not appearing. I'm going to create a Bank of Notables here to help people who are studying this area and are already doing things in this area. Let's understand all the good things that chemistry does. This will demystify chemistry. Through this, the teaching of chemistry will change at the cellphone level. The person on the cellphone will be able to predict things that would otherwise cost a lot of money on rehearsals, which will cut the path to many achievements. Fantastic. The potential is a tremendous, unimaginable thing. We are just at the beginning.

**Luis:** True.

Professor, I know I have to ask the questions. I apologize profusely.

**Dr. Ribamar:** That's why I tell you.

**Luis:** It's great. I want to make the most of our first meeting. And that many others appear along the way.

So, Professor, allow me to move on to the next block of questions about CFQ's activities.

What are the main actions and projects that CFQ has implemented to enforce the legislation regulating Brazil's chemical profession?

**Dr. Ribamar:** We have done a lot. Really a lot. But the main point, the most important for what is happening, and so that it can happen even more — and that I want more, I worry a lot —, is that tomorrow is a lesson for today, and for the future.

So, I wanted to implement the digital process for the entire system, back in 2018.

I'm anxious. You must have noticed. I'm anxious indeed. I say this in public, there's no problem at all.

I haven't managed it yet, but we are developing a lot of things in this sector. Did you mention standardization?

**Luis:** Yes. Actions to enforce legislation that regulates the profession.

**Dr. Ribamar:** The first keyword is integration. When I took over in 2018, the first thing I did... And for the first time in my life, I did it — our law is the Law No. 2,800, of 1956. The first time I

heard about it was now in 2018. You'll even think it's funny. For the first time in the system's history, I managed to bring together all the regional presidents.

**Luis:** May it be the first time of many.

**Dr. Ribamar:** Yes. I managed to get them together and create a plan, a 10-year strategic plan, with all the presidents and advisors. We spent a week together, focusing solely on this, and a 10-year plan came out, so I did a multi-year plan.

What a clear shot that was. Can you believe no one knew each other? Neither do the regional presidents. One of the presidents had never stepped foot on the Regional Chemistry Council. Then, they started to trust. The proposals came from them. COPRESI (College of Presidents, Ordinance No. 168 of September 13, 2022) is an example. We strengthened it, strengthened the base. They gained confidence in the system. Today, things are different, and we have monthly meetings. We are integrated.

I speak in a chemical language — we fight for the concentration of convergences and the dilution of divergences.

**Luis:** Perfect language.

**Dr. Ribamar:** So that's it.

We are creating standards, and the staff is complying, but these standards are made with broad base consultation. Some colleagues see it as a defect that I am excessively democratic. My answer is, "I would rather sin by excess than by lack."

Well then.

And this democracy, and this dilution of powers, which used to rest entirely with the president — I created 12, 6 commissions, and 6 committees. I created the ombudsman's office, which didn't exist; I created internal and external controllership, which didn't exist; a chief of staff, which we didn't have; and a job and salary plan, which didn't exist. I created everything. All of it. I do not have a single labor action against the Federal Chemistry Council. Thank God, thank God we made it.

I never say "I." I say "we." I always speak in the plural. We managed to be united and integrated and have the trust of all employees.

Everyone has their rights guaranteed here. Good salaries. This is what we do, and everyone has motivation. There is no point in wanting to do something if your base and those under your command are not satisfied. I never took a course in anything. The only thing I've studied in life that I like is chemistry.

I'm talking in terms of — I didn't take an MBA course, anything like that. I just do what I think. Fortunately, it's working. I am in my third term. And look, having the vote of Brazil's 22 delegates, unanimously, in the third term...

Because they feel represented and they feel that this administration is ours, it is diluted with them. They are part of this administration. So, when criticism comes, I take that criticism on board. But they know it's for them, too.

We have everything here today, everything in terms of infrastructure. And the infrastructure is improving. And I want to improve more and more. In this sense, the staff complies with the legislation. We are enlisting the support of chemistry associations such as ABQ, SBQ, and ABQUIM, the Brazilian Chemical Industry Association. Here, people were at odds with ABQUIM. They saw us as an enemy. "They are inspectors." No, we are not inspectors. We want to work together. I fight for the development of the chemical industry because it is our job market. Today, we work together. Do you understand?

**Luis:** Yes.

**Dr. Ribamar:** One supports the other, and the converse is true. We have a parliamentary front in defense of chemistry. There in the National Congress. Chemist's Day will be celebrated in the Chamber. Look, there is a committee called CRIG (Institutional Relations Committee). I created. As I created COPRESI (College of Presidents). We have this interconnection with all of them, everything we do is open. You enter the transparency portal, everything is clear. Even my income tax is done here at CFQ by the auditor. He is an employee here. He always was, and he always prepared my income tax declaration. When I became president, I asked, "Is it legal?" I consulted legal counsel. They said, "It is, and it's even better because your income statement is open here."

Anything I do wrong, I want to be punished for this. People who make mistakes, intentionally or even innocently, must be punished.

That's why I have too many auditors, internal and external. If anything goes wrong here, it goes through all sectors. I'm the last one to see the document. Other sectors have already approved it. I have a legal sector, with six or seven lawyers.

Because there is a lot of demand here, and we provide assistance to the regional authorities — who previously did nothing —, with everything they want. We assist them.

Partisan politics is prohibited here. I know that people have their preferences, but for God's sake, partisan politics has no place even in my house. So please, let's not mix things up. Our party is the party of the CFQ, CRQ system. It's converging more and more. With a single objective, which is the growth of chemistry in Brazil, with visibility in Brazil and abroad. I don't just think at the local level. I think at the exterior level, and we are achieving that. Of course, I am nonconformist. I criticize everything. "This whole thing is slow!" But public matters, man — we have to follow the rules and the laws. So, we do and try to do everything that is legal. Within legality. Obeying the rules. The current rules. The laws and regulations that are in force in our country.

**Luis:** Perfect.

**Dr. Ribamar:** I respect and love this country.

**Luis:** Allow me to move on to the next question. In drugstores — which is another branch, another activity —, having a pharmacist while the store is operating is necessary.

It is not a single pharmacist serving a drugstore chain. Each store has its own pharmacist. If it is open 24 hours, there are three pharmacists. In a similar way, based on Decree No. 85,877 of 1981 — the second article describes the activities that are exclusive to chemists. What would a company be like, hypothetically speaking, if it operates in 300 municipalities? Can it have just one chemist or half a dozen chemists to serve the 300? Or should it have at least one professional per place of work?

This is the first part of the question. What would it be? One is enough for everything, or is it required at least one professional per place of work?

**Dr. Ribamar:** This is regularized by our resolutions that establish that the technical responsibility is a function of time, it's a function of distance. For example, if you are the president of a board that has three small stores — not a big company, right —, and the chemist can prove that there is time compatibility, and that the distance is feasible — i.e., it's a small distance — to have the responsibility over those three, it is the responsibility of the regional president. Each case is different. In this case, it is impossible. How come? There you are even taking... This is not ethical.

Technical responsibility considers time, distance, and, especially, the ethical aspect. This is not ethical because you are harming professionals, do you understand?

So, this has to be... Now, this is done individually by the presidents of Regional Councils. If you know of any case, please report it to the ombudsman.

Look, not you (Luis), but any chemist who is listening to me. If you know of cases of this nature, inform the ombudsman of the Federal Chemistry Council, and we will take action.

**Luis:** Continuing with the same question. This concerns our chemical training, technical training, our fellow engineers, any professionals in the field of chemistry. The legislation speaks of physical-chemical tests and dosage of chemical products. That is, these are the responsibilities of the chemistry professional.

**Dr. Ribamar:** That's right.

**Luis:** In a factory — it could be anyone —, could the analytical part be delegated to anyone else without the necessary training, or does the chemist have to be there to do it?

**Dr. Ribamar:** It could even be under the supervision of a mid-level or higher-level chemist or technician, depending on the factory's complexity level. If it is small, it can be supervised by a technician. A technician can be the responsible chemist.

**Luis:** Yes.

**Dr. Ribamar:** So, he can say, "It's under my supervision." Now there are types of things that are really complex. This depends on the degree of complexity and on each Council. They have the

independence for that. For more complex things.

For example, making buffer solution. It's not a simple thing, especially when it has ionic strength. When it is tabulated, in Tokio Morita, that manual book for preparing reagents and solutions... everything is fine. And when it's not there? I did my doctorate, and there were people there, doing their doctorates, and anything beyond Tokio Morita they didn't know how to do. And I had to teach. But everyone needs everyone. Knowledge is complementary. I'm learning from my neighbors, you can learn from anyone, and then you say, "Man, I never thought about that." No one can do more than anyone else. Knowing is complementary. Everyone can help each other. Talking and learning from each other.

When I went there, I didn't know how to use Orange, that mathematical program. Then, damn, I had to learn. But... I spent almost a day learning. But... I spent almost a day learning, slow as hell. And there was a boy there who was like a snake (very agile in using Orange). It was this boy who helped me, he was already doing his doctorate. He passed the Petrobras competition, he was the only one who passed there, of those who participated.

I told him I wanted to learn. Soon, I became so good that I started teaching those who arrived to use Orange. I made graphs and such, interpolations, put graphs one on top of the other and so on. You could even do it with a program there to see the spectrum part, right? I did everything there to find out if there was only one specie or two, through this program. So, it was a fantastic thing.

That was it. I didn't take anything else after my doctorate (laughs). The Council didn't let me do anything else.

And so, I was promoted here to be first secretary, and my advisor knew. I said, "Okay, I'll do a doctorate as long as you accept that I won't leave the federal university." In fact, I missed a chance to do a postdoc because of the Federal Chemistry Department.

Then I said, "I won't go." I preferred the federal position because I was already very committed. I wanted the Council of Maranhão. Same president. Then, I came here as a substitute. I spent a lot of time as a substitute.

It took me a long time to become a permanent staff member, and it was a struggle.

Winning in the boardroom. I worked my way up — substitute, permanent secretary, second secretary, first secretary. Then, due to illness, I became second vice. And so I went.

**Luis:** Very cool.

Professor, due to time, I will ask one or two more questions.

**Dr. Ribamar:** I will be more objective (laughter).

**Luis:** No, not at all.

It's great talking to you, sir. It's great to talk to people who talk. A difficult interview is when you ask a question, and the person answers "yes" or "no." So, it's great.

Professor, about the future of the chemical industry in Brazil, what trends and opportunities do you see for the development of the Brazilian chemical industry in the coming decades?

**Dr. Ribamar:** Wow, it's fantastic. Because we are already a reference, we are already a vanguard. We are the sixth-largest chemical industry in the world. Who do we lose to?

China, the United States, Germany, Japan, and South Korea.

I said this to a colleague from another area, right? And he said, "Wow, so you're complaining with a full stomach." I said, "No, we're not."

He said, "What is this phenomenon where you are sixth but keep crying and such?"

And we will improve because now the king has returned, not as we wanted, but he has returned with the support of the vice-president, Dr. Alckmin.

I'm going to expose a secret. Professor Alckmin, the vice-president of the Republic, Professor Dr. Alckmin, he said he was a professor of organic chemistry.

I went to ask him because he was a doctor, but at the time, as I told you, they preferred that the professor of these courses be a medicine or pharmacy graduate because the chemistry graduate had nothing in chemistry.

He said this, and he remembers that things

like C1, C2, until C4 are gases. And from then on... (laughs). I thought that was cool about our vice president.

**Luis:** Yes, what do you see in the future? Which areas will be a priority?

**Dr. Ribamar:** Brazil as the world's powerhouse in the chemical industry. We are the least polluting industries; we are already at the forefront of this, and we will grow with the rehabilitation of the king. We will grow and gain more space. And we can, and we have the potential for this.

When I told this story and my colleague criticized it, I said, "Our big problem is that we import more than 40% of raw materials." Why?

Because some countries, mainly... I won't name them because...

**Luis:** That's beside the point.

**Dr. Ribamar:** That's beside the point.

They practice the following, they sell raw materials cheaper than they have there.

**Luis:** Dumping!

**Dr. Ribamar:** Yes! It's so cheap that they sell it below the asking price there.

**Luis:** To kill our industry?

**Dr. Ribamar:** Exactly.

So that we don't...

For example, we have enormous potential in these raw materials, but investing in it is so expensive that we prefer to import it, which is much cheaper. And they practice that there. High subsidies. It's something highly harmful to our development.

So much so that we import 40-45% of raw materials, both in the chemical and pharmaceutical chemistry areas. Why?

We have all this here, and we have plenty, but we don't want to invest and produce. That's bad in the future. We could greatly reduce the price of these products. We are unable to invest here, which would create more jobs. We have an import deficit of almost 35 billion dollars. If we

invested this money here, we would create more jobs for our chemists, you know? And we would stop being dependent. This affects our sovereignty because if a country suddenly cuts the supply, what will we do? Are we going to extract this from the ground right away? No! It's all there. I think this should be seen, and it is being seen...

**Luis:** Priority, with attention.

**Dr. Ribamar:** This protection is a priority because it really is very harmful. Now we have enormous potential. We are already sixth, the one that pollutes the least, and in the future we will be among the very first. Reaching third place and much more. We have the potential to be even the first. Now, I think that this political vision has been well regarded by the government. This vision is that there has to be some solution so that we can explore our riches.

**Luis:** I agree, perfect.

Professor, there were several questions. I will choose the last one, but it will not be our last interview, God willing (laughter).

**Dr. Ribamar:** I think I didn't let you speak because I talk too much.

**Luis:** But I don't need to talk (laughs).

Professor, what are the main environmental and sustainability challenges the chemical industry must face, and how can CFQ contribute to this agenda?

Do we have a guide? Let's go that way, do it this way, do it differently. How can we integrate?

**Dr. Ribamar:** Look, we are going to integrate a lot with green chemistry. We are integrated with green chemistry. The energy solution, for example, the energy transition, is nothing more than sustainable hydrogen, which comes from a clean source. Then hydrogen is there, and we have all this potential. And we can get ahead in this too. But the Amazon and, for example, green chemistry, the artificial intelligence in green chemistry, what does this contribute to? Some countries are already using chemical catalysts, and they are transforming CO<sub>2</sub> into methane, a raw material that goes into almost everything. And we sell methane. Our methane is five times more expensive when sold than imported methane. And we have a lot of methane. Now, they are already producing it through

chemical catalysts, where artificial intelligence comes into play. So there's something fantastic there. Excessive CO<sub>2</sub> causes the greenhouse effect, and sometimes people criminalize it. For God's sake, the greenhouse has to be there, it cannot be exacerbated as it is. Because if there is no greenhouse effect, there is no temperature regulation. However, CO<sub>2</sub> can be extremely reduced through these catalysts, and we have to be concerned about that too. Sometimes, people think about energy transition as if it were a magic trick, but it's not like that. We have wealth, and oil has petrochemicals.

**Luis:** Exactly.

**Dr. Ribamar:** This transition has to be slow and enter in a way that does not harm the exploitation of our riches. In other words, we have been trying to find more efficient ways of capturing CO<sub>2</sub> and transforming it into useful things, such as CO<sub>2</sub> transformed into methane.

Because it is a very expensive raw material to exploit concerning imports, which come with a price six times lower, a price outside the price charged here in Brazil. So this is not magic. CH<sub>4</sub> is highly strategic for the chemical industry. What's more, considering a way to capture more CO<sub>2</sub>. So that we can make it compatible with the extraction of our wealth. Because you see that the countries that do this the most, they have already explored almost everything, and we cannot leave this wealth buried. Those colleagues who are more exacerbated, "You have to do it soon" — that's not magic. This has to be an energy transition. Okay, great. Because otherwise, the planet dies. But we can reconcile. It's possible. And even replace it completely in the future. But it's not magic. This has to be done gradually and slowly.

I'm showing my personal vision. Not all counselors think like this.

**Luis:** No, not at all.

**Dr. Ribamar:** I have this view. We're going to have a great show at COP 30. I saw comments from colleagues here saying "Because man, we won't have the structure we had in Dubai..." I say, "Man, better than this? They've never seen it in their lives." They will meet the Indians, and they will miss their Indians. They will see forest, excess forest, and will see it on site. There will be ships, according to what I heard from the city minister himself, there will be ships docked there for people to arrive and return to give guarantees. To give

more guarantees to these people from abroad who will arrive. They will be amazed, they will come and say, "My God." They will have an awareness that perhaps they never had. The eyes of the world will be here. And we will do very well, God willing. This is what I say to colleagues who criticize that we have no structure. Better structure than on-site? And know that this exists? So that's a fantastic thing. And, God willing, I will be there.

**Luis:** I hope so and that we are well represented there. Thank you very much.

**Dr. Ribamar:** I will do my best. This position is a position of honor, of great honor for me. Look, for the third time, I have the honor of presiding over the Federal Council. It's a fantastic thing. Because it's not the Federal Council, it's the system — Federal Council, Regional Councils. It is the chemists who support us and who are increasingly supporting us. In the past, we had a lot of regrets about what happened, which was an isolated thing. The diagnosis that I had at the beginning was a very bad thing. I made a diagnosis in 2018, and I was like: "My God, where are our investments?" Zero. "Where's the communication?" It wasn't even there. How come? So that's what I did. I hope I got more right than wrong. Thank God. And this demonstrates the support I have from COPRESI, the presidents, our directors, our effective advisors, and our substitute advisors. These are people of the highest levels here. So look, we have everything and a whole bunch of scientists who are hidden, but I'm going to bring them and show them, because they are fantastic. I saw an interview with a professor at Unicamp in the field of artificial intelligence, and I was impressed. He is already doing this at Unicamp. I forgot his name. I didn't record his name. But I was amazed to see that he is already working on it and understands so much of it. He gave an interview to CFQ about artificial intelligence in chemistry.

**Luis:** Professor, on behalf of the newspapers that I represent today, *Periódico Tchê Química*, *Southern Journal of Sciences*, I would like to thank you for your willingness to welcome us. Thank you for the opportunity to talk to you, to present the Chemistry Council a little more to other colleagues, and to say that it was a pleasure to talk to you. I hope you can welcome us again.

Thank you very much.

**Dr. Ribamar:** I guarantee that I am really happy to meet you and have this opportunity to

show a little of the Federal Chemistry Council system and the Regional Chemistry Councils.

I am proud and honored to represent them.

**Luis:** Thank you very much, Professor. Have a good week, and I see you next time.

**Dr. Ribamar:** All the best.

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## DECLARATIONS

**1. Limitations:** The interview is limited to its content.

**2. Funding source:** The host funded this interview.

**3. Competing Interests:** The host has worked for the journal for many years, and this may have influenced the interview.

**4. Open Access:** This article is licensed under a

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- CFQ. <https://cfq.org.br/>
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### Conference invitation. (now related to the interview)

Visite o site da *Second Southern Science Conference* que será realizada nas belas cidades de Mendoza, na Argentina, e Vassouras no Brasil, de **7 a 9 de novembro de 2024**. <https://www.sscon.org/>



## EVALUATION OF TNF-A CONCENTRATION LEVEL IN PATIENTS INFECTED WITH HYDATID CYSTS IN AL-NAJAF HOSPITALS

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### ABSTRACT

**Background:** Human echinococcosis is a zoonotic disease caused by *Echinococcus granulosus*, the etiological agent of cystic echinococcosis (CE). **Aim:** This study aims to determine the epidemiological prevalence of *Echinococcus granulosus* in patients with hydatid cysts and evaluate serum TNF- $\alpha$  levels associated with echinococcosis, as well as the correlation between these levels and disease progression. **Methods:** Radiological examinations were performed to diagnose *Echinococcus granulosus* by identifying echinococcal cysts. The study included patients of all ages and both sexes from Al-Sader Medical City, Al-Hakeem General Hospital, Al-Haidarya General Hospital, and Al-Hayat Hospital. The study period was from October 2023 to the end of January 2024. **Results:** The mean TNF- $\alpha$  level in patients was 163.27 pg/ml, significantly higher than the mean level of 38.58 pg/ml in controls ( $p$ -value < 0.001). **Conclusion:** The prevalence of hydatid disease in Al-Najaf Al-Ashraf was found to be 33%. TNF- $\alpha$  levels are notably higher in patients with *Echinococcus granulosus* who are under 40 years of age compared to those over 40 years of age.

**Keywords:** *Echinococcus*, *Tumor Necrosis Factor Alpha*, and *Hydatid Cyst*.

### 1. INTRODUCTION

In humans, this causes a disease called echinococcosis. The three types of echinococcosis are cystic echinococcosis caused by *e. granulosus*, and alveolar echinococcosis caused by *e. Multilocularis* and polycystic echinococcosis are caused by *e. Vogeli* or *e. oligarchs*. A worm's incubation period is usually up to 50 years (Marija and Pramodhini, 2022).

A Hydatid cyst caused by *echinococcus granulosus*, also called the hydatid worm, hyper tapeworm, or dog tapeworm, is a cyclophyllid cestode that dwells in the small intestine of canids as an adult but which has important intermediate hosts such as livestock and humans, where it causes cystic echinococcosis, also known as hydatid disease (Alvi *et al.*, 2021).

TNF- $\alpha$  is a pro-inflammatory cytokine that is produced most by macrophages through several mechanisms (Wang and he, 2018). immunologically, TNF- $\alpha$  is produced through macrophage presentation to the antigen-presenting cell (APC), which then APC will order t-helper 1 to proliferate into IFN- $\gamma$  where IFN- $\gamma$  will produce TNF- $\alpha$  as an anti-microbe (Fasano *et al.*, 2022). therefore in hydatid cyst, the parasite stimulates IL-10 and TGF- $\beta$  to down-regulate TNF- $\alpha$  during the late phase of the disease (Liu *et al.*, 2020). IL-10 produces a lower degree of immunosuppression in unilocular disease that is more localized (Fasano *et al.*, 2022).

The study aims to determine the epidemiological prevalence of *Echinococcus granulosus* in patients infected with hydatid cysts, evaluate serum TNF- $\alpha$  associated with echinococcosis, and assess the correlation between them and the development of the disease.



## 2. MATERIALS AND METHODS

### 2.1 Patients Group

A case-control study design was chosen for patients infected with hydatid cysts (33 participants).

A radiological examination will be performed for these patients to diagnose the *Echinococcus granulosus* parasite by finding echinococcal cysts. All of these patients were involved in this study and during the period starting from October 2023 to the end of January 2024, from all ages of patients from both sexes (males and females). Every patient was reported through a specifically prepared questionnaire, which included name, gender, age, living, site of cysts, and duration of disease. at al-Sader medical city, al-Hakeem general hospital, al-haidarya general hospital, and al-hayat Hospital.

### 2.2 Control group

The control group was 50 people not suffering from echinococcosis disease. The control group was used only for comparing parameters. The control samples were approximately similar to the sample patients in terms of number, ratio of age, and place of living in the countryside and city. Also, ask a special question sheet for the control samples where blood was drawn from a vein to measure immunological parameters TNF- $\alpha$ .

### 2.3 Serum collections

Five ml of venous blood was withdrawn from each subject by vein puncture using a sterile syringe with needle gauge 23, then the blood sample was transferred into coagulate gel tubes, then centrifuged for 5 minutes at 4000 (rpm) to separate serum were transferred to another sterile eppendorf tubes, labeled with a serial number together with the patient name, and frozen at (-20°C) until used.

The ELISA technique used the quantitative sandwich enzyme immunoassay technique to measure interleukin 6 in the patient's serum. The test was performed according to the company's instructions/ MyBioSource USA.

Serum specimen. Allow serum to clot for 10-20 minutes at room temperature. Centrifuge at 2000-3000 rpm for 20 minutes. Collect the supernatant without sediment.

### 2.3. Statistical analysis:

All data were statistically analyzed by IBM SPSS 26 (SPSS Inc., Chicago, IL). Frequencies and percentages with the use of the chi-square test reported nominal data. The normal distribution used the Kolmogorov-Smirnov test. Numerical data were expressed as mean  $\pm$  standard deviation (SD), an independent t-test between two groups, an ANOVA test, and post hoc for comparison among groups. Pearson correlation was used. The receiver operation curve (ROC) is used to determine the area under the curve (AUC) with a confidence interval (95% CI) of TNF- $\alpha$  for discriminating between patients and controls by obtaining the cut-off point. Differences with p values < 0.05 were considered to be statistically significant. The significant level was a p-value <0.05 Sullivan, 2022; Al Khafaji and Sharba, 2022).

## 3. RESULTS AND DISCUSSION:

### 3.1. Results

#### 3.1.1. Demographic characteristics of study groups

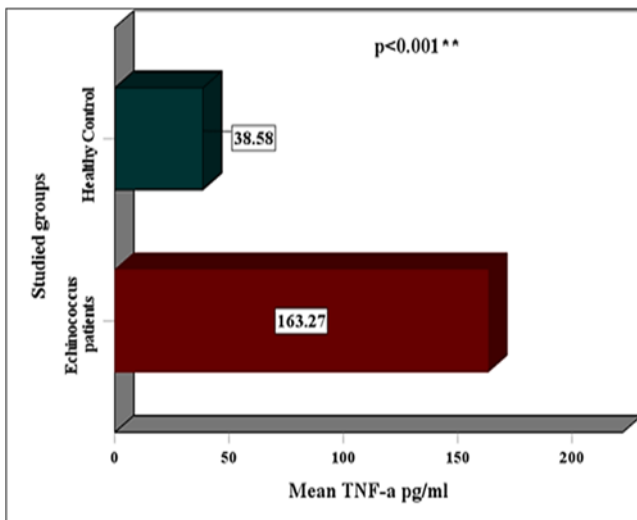
Table 1 presents the demographic characteristics of two groups: echinococcosis patients and control, with 100 individuals. The chi-squared test results indicate no significant differences between the patient and control groups in any of the demographic categories, as indicated by the p-values ranging from 0.128 to 0.907. Thus, this table shows no significant differences between the two groups regarding age, sex, education level, or job.

#### 3.1.2. Cytokine level about study groups Echinococcosis patients and controls

Table 2 appears to be a comparison of cytokines levels between two groups: patients (diagnosed with echinococcosis disease) and controls. the cytokines measured are: interleukin-6, tumor necrosis factor-alpha.

The results suggest that all four cytokines have significantly different levels between the patients and control groups.

Regarding TNF- $\alpha$ , the mean level of TNF- $\alpha$  in patients is 163.27 pg/ml, significantly higher than the Mean level of 38.58 pg/ml in controls (p-value < 0.001).



**Figure 1:** TNF- $\alpha$  levels in study groups of echinococcosis patients and controls.

Significant differences at p-value  $^{**} < 0.01$

### 3.1.3. Levels of cytokines depending on sex among study groups

Table 3 explains the results of a study comparing the levels of certain inflammatory cytokines (TNF- $\alpha$ ) in echinococcus patients and controls, depending on sex. The mean age of the male echinococcus patients is 32.4, with a standard deviation of 13.9. The error in the mean is 3.2 years. This value significantly differs from that of the control group.

### 3.1.4. Levels of cytokines depending on age among study groups

Table (4) explains the levels of certain cytokines (tnf- $\alpha$ ) in the serum of patients with echinococcus infection and control individuals depending on age (< 40 years and > 40 years). The results were as follows:

Among echinococcus patients, TNF- $\alpha$  levels are significantly higher in patients < 40 years old compared to those > 40 years old ( $p = 0.001$ ,  $p = 0.002$ ,  $p = 0.001$  and  $p = 0.001$ ), respectively. Thus, the results suggest these cytokines may be associated with echinococcosis infection. The study also found no significant differences in cytokine levels among control individuals between individuals < 40 years old and those > 40 years old.

### 3.1.5. The comparison between the levels of cytokines according to the number of cysts.

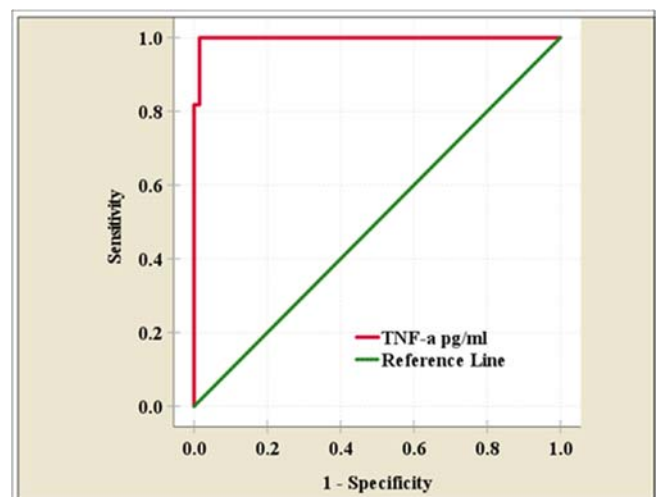
Table (5) shows that the levels of all cytokines included in the current study TNF- $\alpha$  did give light difference between patients with one, two, or three or more cysts. This is indicated by the non-significant p-values ( $p > 0.05$ ) for each cytokine.

### 3.1.6. Correlation analysis between TNF- $\alpha$ and Age in the serum of Echinococcosis patients

Table 6 presents the results of a correlation analysis (Pearson correlation coefficient) (R) between TNF- $\alpha$  cytokine. The correlations range from -1 (perfect negative correlation) to 1 (perfect positive correlation). A strong positive significant correlation between TNF- $\alpha$  and age ( $r=0.812$ ,  $p < 0.001$ ). The p-value indicates the probability that the observed correlation is due to chance.

### 3.1.7. ROC analysis of TNF- $\alpha$ to predict risk cytokine in Echinococcosis patients

Table 7 and Figure 7 display the results of AUC and ROC curve analysis of cytokine (TNF- $\alpha$ ), statistically significant relationships of TNF- $\alpha$  with Echinococcosis patients by obtained of AUC:0.997, 95%CI: 90.56-1.003,  $P < 0.001$ .



**Figure 7:** ROC Analysis of TNF- $\alpha$  cytokine

## 3.2. Discussion

As for the age, the mean age of the patients is 37.24 years, the standard error (SE) is 2.35, and the mean age of the control group is

39.78 years and SE 1.81. As shown in the table, the age is also presented in separate columns as < 40 and greater than 40 years; the age distribution demonstrates that both groups' age distribution is almost similar. Meanwhile, a study in Iraq also took place from 2018 to 2019, indicating the prevalence of echinococcosis among the population of different ages; the most affected group is 20-40 years old (Al-khazraji *et al.*, 2019). The mean age of the current study is also supported by a study conducted in Iraq in 2015-2018, and it depicted a mean age of 36.4 years (Al-Talib *et al.*, 2019).

From the above similarities, the mean age for the same duration of patients treated and control group patients was 40.2 years. In this study, the current one, fewer 40-year-old people were identified as compared to the control group of 54.5% and 50.7%. Abdul-Rahman *et al.*, 2018, note that from 2016 to 2017, echinococcosis infections were significantly higher in Iraq than those reported in younger individuals. Similarly, the patient and control groups have slightly higher percentages of male patients than the control groups. The current findings are consistent with earlier studies in Iraq from 2015 to 2024 (Abdul-Rahman *et al.*, 2018; Hassan *et al.*, 2019; Al-Abadi *et al.*, 2021).

Although the percentage of university graduates is higher among patients, there is no significant difference. This finding is analogous to several studies conducted in Iraq between 2015 and 2024. the researchers also found no statistically significant association between patient education level and Echinococcus. Zhang *et al.*, 2017 study found that TNF- $\alpha$  levels were significantly higher in patients with chronic inflammatory diseases than healthy controls. Kim *et al.* 2022 study reported that TNF- $\alpha$  levels were elevated in patients with psoriasis, an autoimmune disease characterized by skin inflammation. This study also found that TNF- $\alpha$  levels were associated with disease severity and response to treatment. Chen *et al.*, 2018 study found that TNF- $\alpha$  levels were associated with disease activity and severity in patients with rheumatoid arthritis. It was indicated by Wang *et al.* (2020) and Li *et al.* (2022) that TNF- $\alpha$  levels do not significantly change among individuals who are infected with Echinococcus.

The lack of alterations is thus similar to what we have found presently. A study by Salem and El-ghareeb (2019) showed that TNF- $\alpha$  levels were significantly higher in patients with Echinococcus multilocularis infection compared to controls ( $p < 0.01$ ). Another study introduced by

Wang and Zhang (2022) found that TNF- $\alpha$  levels were elevated in patients with Echinococcus granulosus infection compared to controls ( $p < 0.05$ ). This agrees with our current results. On a similar note, Kumar *et al.* (2015) found that TNF- $\alpha$  levels differ greatly between those afflicted with echinococcosis and healthy individuals; they did not mention whether this discrepancy could be tied back to the number of cysts present.

Hussain *et al.* (2020) established that the levels of TNF- $\alpha$  are directly proportional to the severity of echinococcosis symptoms but did not present the mean and standard deviation values for TNF- $\alpha$  levels.

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Kumar *et al.* (2015) found that TNF- $\alpha$  levels differ greatly between those afflicted with Echinococcosis and healthy individuals; however, they did not mention whether this discrepancy could be tied back to the quantity of cysts present.

Hussain *et al.* (2020) established that the levels of TNF- $\alpha$  are directly proportional to the severity of Echinococcosis symptoms but did not present the mean and standard deviation values for TNF- $\alpha$  levels. Another study introduced by Wang and Zhang (2022), found that TNF- $\alpha$  levels were elevated in patients with Echinococcus granulosus infection compared to controls ( $p < 0.05$ ). This agrees with our current results.

Similarly, the mean TNF- $\alpha$  level in these male patients is 157.3 pg/ml (sd=37.6 pg/ml; sem=8.6 pg/ml;  $p=0.243$ ), showing no statistical significance with controls. The average TNF- $\alpha$  level in these patients is 171.3 pg/ml with a standard deviation of 26.7 pg/ml, and its standard error is 7.1 pg/ml. It was indicated by Wang *et al.* (2020) and Li *et al.* (2022) that TNF- $\alpha$  levels do not significantly change among individuals who are infected with Echinococcus. The lack of alterations is thus similar to what we have found presently.

A study by Salem and el-Ghareeb (2019) showed that TNF- $\alpha$  levels were significantly higher in patients with Echinococcus multilocularis infection compared to controls ( $p < 0.01$ ). On a similar note, Kumar *et al.* (2015) found that TNF- $\alpha$  levels differ greatly between those afflicted with echinococcosis and healthy individuals; they did not mention whether this discrepancy could be tied back to the quantity of cysts present. Hussain *et al.* (2020) established that the levels of TNF- $\alpha$  are

directly proportional to the severity of echinococcosis symptoms but did not present the mean and standard deviation values for TNF- $\alpha$  levels.

An *et al.* (2017) and Yao *et al.* (2017) reported elevated TNF- $\alpha$  levels in cystic echinococcosis patients compared to healthy controls; however, Yao's study found a more pronounced correlation. The research conducted by Zhang *et al.* in 2020 demonstrated that the levels of TNF- $\alpha$  were related to the severity of the disease and how patients respond to treatment in cases of alveolar echinococcosis.

#### 4. CONCLUSIONS:

The study found that the prevalence of hydatid disease in al-Najaf al-Ashraf was 33%. It was observed that levels of the cytokine TNF- $\alpha$  are more significant in patients with *Echinococcus granulosus* who are under 40 years old than in those over 40 years old. There is evidence that individual differences in cytokine levels may impact the development or susceptibility to the disease. Furthermore, TNF- $\alpha$  levels showed significant variances between patients with 1, 2, 3, or more cysts.

#### 5. Declarations

##### 5.1. Study Limitations

The relatively small sample size, the lack of long-term follow-up, and the single-center nature of the study are some of the limitations of this study.

##### 5.2. Acknowledgements

The authors thank all the patients who participated in this study.

##### 5.3. Funding Source

The authors funded this research.

##### 5.4. Competing Interests

The authors declare that they don't have any potential conflict of interest.

##### 5.5. Open Access

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#### 6. Human and Animal-related studies

##### 6.1. Ethical Approval

Ethical Approval was obtained from the Council of Al-Furat Al-Awsat University, College of Health and Medical Technology, following the Helsinki Declaration (Number 36170, dated 12/09/2023)

##### 6.5. Informed Consent

The patients were informed about the study, and their permission was obtained to use the anonymized information.

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**Table 1:** Demographic characteristics of study groups.

demographic categories		patients		control		total		chi-square p-value
		n	%	n	%	n	%	
<b>studied groups</b>		33	33.0%	67	67.0%			
<b>age year</b>	<b>mean (se)</b>	37.24 (2.35)			39.78 (1.81)			
<b>age groups</b>	<b>&lt; 40 years</b>	18	54.5%	34	50.7%	52	52.0%	<b>0.128</b> <b>0.721 ns</b>
	<b>&gt; 40 years</b>	15	45.5%	33	49.3%	48	48.0%	
<b>sex</b>	<b>males</b>	19	57.6%	30	44.8%	49	49.0%	<b>1.449</b> <b>0.229 ns</b>
	<b>females</b>	14	42.4%	37	55.2%	51	51.0%	
<b>education level</b>	<b>illiterate</b>	8	24.2%	14	20.9%	22	22.0%	<b>3.441</b> <b>0.329 ns</b>
	<b>primary school</b>	9	27.3%	15	22.4%	24	24.0%	
	<b>secondary school</b>	6	18.2%	24	35.8%	30	30.0%	
	<b>university degree</b>	10	30.3%	14	20.9%	24	24.0%	
<b>job</b>	<b>employee</b>	6	18.2%	14	20.9%	20	20.0%	<b>0.196</b> <b>0.907 ns</b>
	<b>freelancer</b>	19	57.6%	39	58.2%	58	58.0%	
	<b>student</b>	8	24.2%	14	20.9%	22	22.0%	
<b>total</b>		<b>33</b>	<b>100.0%</b>	<b>67</b>	<b>100.0%</b>	<b>100</b>	<b>100.0%</b>	

ns: non- significant differences

**Table 2:** cytokines levels in study groups of echinococcosis patients and controls

Groups		Mean	SD	SE	p-value
TNF- $\alpha$ pg/ml	Patients	163.27	33.65	5.86	<0.001**
	Control	38.58	20.39	2.49	

**Table 3:** Levels of cytokines depending on sex among study groups

studied groups		sex	n	mean	SD	SE	p-value
Echinococcus Patients	age (year)	males	19	32.4	13.9	3.2	0.013
		females	14	43.9	10.0	2.7	
	TNF- $\alpha$ pg/ml	males	19	157.3	37.6	8.6	0.243 ns
		Females	14	171.3	26.7	7.1	
Healthy control	Age (year)	Males	30	38.1	16.8	3.1	0.427
		Females	37	41.1	14.3	2.4	
	TNF- $\alpha$ pg/ml	Males	30	37.6	17.3	3.2	0.733 ns
		Females	37	39.3	22.8	3.7	

Significant differences at p-value  $* < 0.05$ . SD: standard deviation. SE: standard error. ns: non-significant

**Table 4:** levels of cytokines depending on age < 40 years and > 40 years among study groups

Studied groups	Age group	N	Mean	SD	SE	p-value	
Echinococcus patients	Age (year)	< 40 year	18	27.8	9.5	2.2	0.001**
		> 40 year	15	48.5	7.5		
	TNF-a pg/ml	< 40 year	18	147.3	36.4	8.6	0.002*
		> 40 year	15	182.5	16.1		
Healthy Control	Age (year)	< 40 year	34	27.6	10.7	1.8	0.001**
		> 40 year	33	52.3	7.3		
	TNF-a pg/ml	< 40 year	34	38.0	18.7	3.2	0.822
		> 40 year	33	39.2	22.3		

Significant differences at p-value  $* < 0.05$ ,  $p^{**} < 0.01$ .

**Table 5:** The comparison between the levels of cytokines according to the number of cysts

		Mean	SD	SE	p-value
TNF- $\alpha$ pg/ml	One Cyst	152.50	38.87	9.43	0.237 ns
	Two Cysts	164.65	20.72	10.36	
	Three or More	178.06	23.70	6.84	

significant differences at p-value  $* < 0.05$ ,  $p^{**} < 0.01$

**Table 6:** Correlation analysis between TNF-a and Age in the serum of Echinococcosis patients

		Age (year)
TNF-a pg/ml	R	0.812**
	p-value	<0.001
	N	33

**Table 7:** AUC and ROC analysis of TNF-a to predict risk in Echinococcosis patients

Predictors	Area	SE	p-value	95%CI
TNF- $\alpha$ pg/ml	0.997	0.003	<0.001**	90.56-1.003

Significant at  $**p < 0.01$ . 95%CI: Confidence interval. SE: standard error. AUC: Area under the curve.

# SOUTHERN SCIENCE CONFERENCE

<https://www.sscon.org>

- Food Production
- Energy Production
- Environmental Sciences
- Valuation of Endogenous Resources
- Drug Production
- Production Without Waste
- One Health
- Science Education

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## MENDOZA

November, 2024  
07 - 09

## HYBRID MODE

CONFERENCE

CONFERENCE

REGISTRATIONS OPEN

DEADLINE: OCTOBER 12



ORGANIZING INSTITUTIONS:



PARTNER INSTITUTIONS:





## Invitation to the Second South Sciences Conference (SSCON)

The Organizing Committee is pleased to invite you to participate in the Second South Sciences Conference (SSCON - <https://www.sskon.org>) to be held in the **Universidad de Mendoza**, Argentina, from November 7th to 9th, 2024. The Conference will focus on important advances in various scientific and technological fields, offering another opportunity for high-level discussions, as occurred in the successful inaugural edition in 2022.

Please note that **the conference will not charge any fees for participation, including the submission of presentations and publications of papers.** The organizers aim to provide an inclusive platform for researchers and professionals to share their work and engage in fruitful discussions without financial barriers.

The Conference will feature keynote speeches, parallel sessions, poster presentations, and networking opportunities, allowing participants to exchange ideas, establish collaborations, and stay updated on the latest developments in their respective fields. We encourage researchers, academics, industry professionals, and students to submit their abstracts and contribute to the diverse range of topics covered during the event.

The official website announces further details regarding the conference program, submission guidelines, and registration process (<https://www.sskon.org>). We look forward to your participation and contributions, which will undoubtedly enrich the scientific discourse and foster progress in the South Sciences region.

### Main Theme: Working on the Global Crisis

Aligned with its main theme, "Working on the Global Crisis", SSCON 2024 will bring together experts, researchers, students, and professionals from different areas to explore innovative solutions to our current urgent global challenges. The main topics to be addressed include:

- Food Production
- Energy Production
- Environmental Sciences
- Valuation of Endogenous Resources
- Drug Production
- Production Without Waste
- One health
- Science Education

## Call for Papers

We invite the submission of abstracts for original research papers, case studies, and oral/poster presentations related to the conference topics. Submission guidelines will be available soon on the website. Join us at this important scientific event and contribute to shaping a more sustainable future for all. Register today!

<https://www.sscon.org/instructions.php>

## Scientific Program

The Conference will include plenary lectures, invited lectures, and contributed paper presentations. The meeting will be multidisciplinary in nature. A virtual session for poster presentations will be organized, similar to the first edition.

## General Information

### Conference Venue

Mendoza is the enchanting city at the heart of Argentina's famed wine country, serving as the setting for the Second South Sciences Conference. This event is scheduled for November 7-9, 2024, and promises to be a memorable gathering. Surrounded by the breathtaking Andes Mountains, Mendoza's beauty is amplified by its vast vineyards and vibrant cultural scene. The city is accessible via the Governor Francisco Gabrielli International Airport, ensuring convenience for international attendees.

The conference will take place at the prestigious **Universidad de Mendoza**, celebrating over 64 years of academic excellence. This venue offers state-of-the-art facilities and a rich historical backdrop that enhances the academic environment. In collaboration with Brazil's **University of Vassouras**, this conference is set to foster a cross-cultural exchange of knowledge and ideas, further enriching the experience for all participants.

To accommodate Brazilian students who cannot travel to Mendoza, the University of Vassouras will provide a unique classroom. In this virtual environment, students can attend the event's lectures and sessions remotely. At the end, they will receive a certificate of participation for the presentations they follow online, provided by the University of Vassouras. This initiative ensures that even those who cannot be present in person will have the opportunity to benefit from the valuable content and enriching discussions that will take place during the Second South Sciences Conference.

**Since it is a free event, there will be no payment per diem, with each student being responsible for covering their own costs and expenses.**

## Conference committees.

### Organizing Committee

- Dr. Cristián Andrés Quintero, Ph.D., Argentina, Universidad de Mendoza/Universidad Juan Agustín Maza. Chair of the conference.
- Dr. Cristiane de Souza Siqueira Pereira, PhD. Brazil, University of Vassouras. Chair of the conference.
- Dr. Walter José Peláez, PhD, Argentina, INFIQC-CONICET-FCQ-UNC | Southern Journal of Sciences Editor-in-Chief. Co-chair of the conference.
- Dr. Ketevan Kupatadze, Ph.D., Georgia, ISU | Editor-in-Chief of the Periódico Tchê Química.
- M. Sc. Shaima R. Banoon, MSc., Iraq, University of Misan | Editor-in-Chief of the Periódico Tchê Química.
- Dr. Paulo Roberto Barros Gomes, Ph.D. Brazil, Federal Institute of Technical Education of Pará.
- Dr. Olubunmi Atolani, Ph.D., Nigeria, University of Ilorin. Facilitator.
- Dr. Joan Josep Solaz-Portolés, Spain, University of Valencia. Science Education.
- Dra. Yolanda Echegoyen-Sanz, University of Valencia, Spain. Science Education.
- Dr. Luis Alcides Brandini De Boni, Ph.D., Brazil, A.S.A. General Secretary. Event Treasurer.

### Scientific Committee

- Dr. Marco Antonio Soares de Souza, Rector, University of Vassouras, Brazil.
- Dr. Roseli Fernandes Gennari. Institute of Physics, University of São Paulo, Brazil.
- Dr. Aswan Al-Abboodi. Department of Biology, College of Science, University of Misan, Misan, Iraq.
- Dr. Rene Francisco Boschi Gonçalves, Technological Institute of Aeronautics - ITA, Brazil.
- Dr. Eduardo Goldani, UK., Springer.
- Dr. Élcio J. de Oliveira, Kvantum Technology & Innovation, São Paulo, Brazil.
- Dr. Intisar Razzaq Sharba, Faculty of Sciences - Dept. of Biology, University of Kufa, Kufa, Iraq.
- Dr. Tamari Edisherashvili, Ilia State University, Tbilisi, Georgia.
- Dr. Anton Timoshin, I. M. Sechenov First Moscow State Medical University, Russian Federation.
- Dr. Andrey Sevbitov, I. M. Sechenov First Moscow State Medical University, Russian Federation.
- Dr. Aleksei E. Dorofeev, I. M. Sechenov First Moscow State Medical University, Russian Federation.
- Dr. Maria Kuznetsova, I. M. Sechenov First Moscow State Medical University, Russian Federation.
- Dr. Bhavna Ambudkar, Symbiosis Institute of Technology, Pune, India.
- Dr. Giorgi Dalakishvili, School Of Natural Sciences And Medicine, Ilia State University, Georgia.
- Dr. Joan Josep Solaz-Portolés, Department of Didactics of Experimental and Social Sciences, University of Valencia, Spain.

- Dr. Roberto Fernández-Maestre, Chemistry Program, Zaragocilla Campus, University of Cartagena, Cartagena, Colombia.
- Dr. Greiciane França Bronzato de Almeida, Professional Master's Degree in Environmental Sciences, University of Vassouras, Brazil.
- Dr. Irenilda Reinalda Barreto de Rangel Moreira Cavalcanti, Professional Master's Degree in Environmental Sciences, University of Vassouras, Brazil.
- Dr. Carlos Vitor de Alencar Carvalho, Professional Master's Degree in Environmental Sciences, University of Vassouras and State University of Rio de Janeiro, Brazil.
- Dr. Erica Cristina Rocha Roier, Professional Master's in Veterinary Medicine Diagnosis, University of Vassouras, Brazil.
- Dr. Carlos Eduardo Cardoso, Provost for Research and Graduate Studies, University of Vassouras, Brazil.
- Dr. Elizabeth Laura Moyano, Department of Organic Chemistry, Faculty of Chemical Sciences, National University of Córdoba, Argentina.
- Dr. Denise Alves Fungaro, Center of Environmental Chemistry, Nuclear and Energy Research Institute, Brazil.
- Dr. Marcos Antonio Pereira Araújo, Professional Master's Degree in Environmental Sciences, University of Vassouras, Brazil.
- Dr. Cristiane Borborema Chaché, Professional Master's Degree in Environmental Sciences, University of Vassouras, Brazil.
- Dr. Paloma Martins Mendonça, Professional Master's Degree in Environmental Sciences, University of Vassouras, Brazil.
- Dr. Tássio Ferenzini Martins Sirqueira, Professional Master's Degree in Environmental Sciences, University of Vassouras, Brazil.
- Dr. Paulo Wilton da Luz Camara, General Coordinator of Lato Sensu Postgraduate Programs, University of Vassouras, Brazil.
- Dr. Edjane Rocha Dos Santos, Institute of Natural, Human, and Social Sciences. Federal University Of Mato Grosso, Brazil.
- Dr. Sandro Pereira Ribeiro, Professional Master's Degree in Environmental Sciences, University of Vassouras, Brazil.
- Dr. Sergio Bontti, Faculty of Medical Sciences, University of Mendoza, Argentina.
- Dr. Juan Pablo Mackern-Oberti, [IMBECU] Institute of Experimental Medicine and Biology of Cuyo | [CCT MENDOZA] Scientific and Technological Center, CONICET - Mendoza | [CONICET] National Council for Scientific and Technical Research, Argentina.
- Dr. Ahmed Al-Yasari, Faculty of Sciences - Dept. of Chemistry, University of Kerbala, Kerbala, Iraq.
- Dr. Hugo Chirinos, Faculty of Environmental Engineering, Director of the Research Institute. National University of Engineering, Peru.
- Dr. Aline Maria dos Santos Teixeira, Federal Institute of São Paulo, Cubatão Campus, São Paulo, Brazil.
- Dr. Felipe da Costa Brasil, Agronomist Engineer, DSc., Undersecretary of Agriculture for the State of Rio de Janeiro, Visiting Researcher at Pesagro-RJ, Brazil.
- M. Sc. Hamilton Moss de Souza, Professional Master's Degree in Environmental Sciences, University of Vassouras, Brazil.
- M. Sc. Enilson Salino Braga, Professional Master's Degree in Environmental Sciences, University of Vassouras, Brazil.
- M. Sc. Luiz Felipe Caramaz Berteges, Professional Master's Degree in Environmental Sciences, University of Vassouras, Brazil.

## Language

The official language of the Second South Sciences Conference (SSCON) will be **English**.

## Important Dates

- Early Bird Registration Deadline: July 1st, 2024
- Abstract Submission Deadline: October 12st, 2024
- Second Circular and Final Program Publication: July 2024
- Abstract Acceptance Notification: October 2024

Participants are encouraged to frequently check the conference website at <https://www.sskon.org> for the most up-to-date information and any updates regarding deadlines or other important details.

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## Questions about Mendoza

Conference Main Place

### Mendoza University

Address: [Boulogne Sur Mer 683. CP 5500. Mendoza, Argentina](#)

Conference main room:

Facultad de Ciencias Médicas-Aula Magna Dr. René Favaloro

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## Arriving in Mendoza

By plane:

Aeropuerto Internacional Gabrielli, also known as El Plumerillo [Map](#)

By bus:

Terminal de Mendoza [Map](#)

By car:

National routes No. 40 and 7 connect Mendoza with the entire country and Chile

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## Staying in Mendoza

Staying in Mendoza:

- 718 Rufino Petit Hotel [Website](#)
- Bohemia Hotel Boutique [Website](#)
- Soltigua Apart Hotel Mendoza [Website](#)
- Diplomatic Hotel [Website](#)
- Park Hyatt Mendoza Hotel, Casino & Spa [Website](#)

Eating during the conference:

The University is located at the well-known Arístides Villanueva Avenue, an important gastronomic pole in the city, with coffee shops and restaurants. The closest to the University are:

- Churrico Arístides Villanueva 744
- Essenza Arístides Villanueva 707
- Paloma Bakery Arístides Villanueva 641
- Cofi Arístides Villanueva 757
- Café 730 Arístides Villanueva 601

Dinner in Mendoza:

For fast food, several places are around the University. For gastronomic experiences, try these places on Arístides Villanueva and Sarmiento avenues:

- El Mercadito Arístides Villanueva 521 Instagram [@elmercaditoar](#)
- Chachingo Arístides Arístides Villanueva 383 Instagram [@chachingo.bares](#)
- República bistró Arístides Arístides Villanueva 373 Instagram [@republica.restaurant](#)
- El Patio de Jesús María Av. Boulogne Sur Mer 788 Instagram [@elpatiodejesusmaria](#)
- Almacén de Pizzas Arístides Villanueva 175 Instagram [@almacendepizzas](#)
- Carolino Cocina de Estación Av. Perú 775 Instagram [@carolinococina](#)

Where to go in your free time, local activities:

#### Museums:

- Museo de Ciencias Naturales y Antropológicas Juan Cornelio Moyano. Av. Las Tipas y Prado Español s/n. Parque General San Martín
- Museo del Área Fundacional. Beltrán and Videla Castillo square, Mendoza city
- Museo del Pasado Cuyano. Montevideo 544, Mendoza city
- Museo Nacional de Malvinas. Ituzaingó and 9 de Julio, Maipú, Mendoza
- Campo Histórico El Plumerillo. Villa Nueva, Guaymallén, Mendoza
- Cuartel general de San Martín. Remains of the House used by General San Martín during the organization of the Ejército de los Andes. Centro Cívico
- Museo Nacional del Vino y la Vendimia. Hipólito Yrigoyen 501, Maipú, Mendoza
- Museo Casa de Fader. San Martín 3651, Mayor Drummond, Luján de Cuyo, Mendoza

#### Parking your car:

- University parking: free, depending on availability. Huarpes 688
- Nearby parking: \$0.3-0.4/hour. Paso de Los Andes 935

#### Activities:

- Wine tours: different vineyards around the city offer visits and wine tastings.
- Outdoor activities: trekking, hiking, and sightseeing tours are available.
- Cultural events: theater plays, music concerts, and art exhibitions can be enjoyed.

