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Interview

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

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SCAN ME

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. 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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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.

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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https://www.mendoza.conicet.gov.ar/ihem/investigacion/investigaciones-andrologicas-de-mendoza/

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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, spermatic 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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