The Queen of Fats

An Author's Quest to Restore Omega-3 to the Western Diet

Some of the most seismic events in human history are hidden in plain sight while they're occurring. Susan Allport's The Queen of Fats: Why Omega-3s Were Removed from the Western Diet and What We Can Do to Replace Them *is a slender book that tells the story of one such event. The removal of omega-3s from the diets of the industrialized nations — Japan and Mediterranean Europe are notable exceptions — may turn out to be the major factor behind the onslaught of chronic diseases afflicting the citizens of those countries, especially the United States. This essential element was removed from our diet thanks to ignorance and industrial expediency, yet replacing it is not a simple matter of taking a supplement, as Allport explains in the interview that follows.*

Susan Allport

ACRES U.S.A. What made you realize that this topic deserved a whole book? What was the catalyst that really got you going?

SUSAN ALLPORT. It was very specific. It was when I realized that the chloroplasts of green leaves were full of omega-3s, as are the eyes and the brains of animals — different omega-3s, but the same family — and I thought there may be something very special about this family of fats, since chloroplast is where photosynthesis, the fastest activity of plants, takes place. Likewise, the brains and the eyes, visual transmission and nerve transmission, are the fastest activities in animals. I kept brushing up against the whole body of research on the omega-3s when I was writing *The Primal Feast: Food, Sex, Foraging and Love,* but because that book was really about how differences between the sexes work in terms of foraging and omega-3s didn't have a different sex basis, I put it aside. I took a look at it again when I finished my book and found it to be an unbelievable topic. When I first called Dr. Ralph Holman of the University of Minnesota, a major researcher of essential fatty acids, it turned out to be the morning of his wife's funeral. I told him that I wanted to write this book and he sounded incredibly irritated and upset, then he told me about the funeral, and I was extremely apologetic. But he stopped and there was silence and then he said, "I've been waiting for this call for a long time." I knew then that there was something in this story that had not yet been told. So it was doubly exciting.

ACRES U.S.A. One of the striking things about the subject is that omega-3s have been a factor in our knowledge for quite a while, at least several decades. What are the popular misconceptions about omega-3s? What are the gaps in our knowledge of these fats?

ALLPORT. So many of our essential nutrients are straightforward — we simply need to consume them in order for us to live. But with *these* essential nutrients, the omega-6s and the omega-3s, it's crucial to consume them in the right balance for optimal health. That's been a confusing thing for researchers — it's only come out over a period of years how that really works. The omega fats are different than most nutrients where you just need to consume adequate amounts, and it doesn't hurt terribly much if you consume a little more — it's not a problem. But with these, there really is an important issue about the relative quantities. The relationships between the fatty acids in the different families has also made it very confusing. It wasn't until 2000 that a kind of framework was developed that accounted for the effects of the two families and actually pulled the whole thing together.

ACRES U.S.A. What happened in 2000?

ALLPORT. That was when Tony Hulbert, an Australian researcher, realized that metabolism in different species is keyed to the amount of omega-3 in the membranes of those different species. We finally began to understand that the omega-3s are predominantly concentrated in the *green leaves* of plants and the omega-6s are concentrated in the *seeds* of plants, and that basically what we're talking about here is two families of fats that allow us animals to prepare for the changing seasons, to either speed up, get ready for times of activity and reproduction when green leaves are available and abundant — or to slow down, hunker down, get ready for times of survival — when the fats of seeds are more prevalent. It's really a cool system. Plants use the changing light as the Earth makes its orbit around the sun — they adapt to the changing light, and then we adapt to the change in plant food. It really is an amazing thing, but it's not generally understood. We just think, oh, we'll eat this food, if we eat enough fish we'll be healthy. There is a much bigger story than just how much fish we need to eat, or which seed oils to eat.

ACRES U.S.A. It's an evolutionary question, isn't it? Did the omega-3s appear in plants first and then in seafood?

ALLPORT. All the omega-3s in seafood come originally from plants. Fish are so important to us because they're one of the last animals in our food supply that still eat greens. That is one of the reasons why fish have become so important. Another is that because they live in water, they require more of those omega-3s in their tissues in order to move around in that much colder environment, under pressure. So they require omega-3s in their diet, and because we now feed the majority of our animals grains instead of grasses, they're one of the last animals we're eating in any kind of quantity that eats greens.

ACRES U.S.A. Isn't there a caveat anytime you talk about seafood? Everybody knows that seafood is dicey nowadays. There are varying amounts of mercury and other pollutants in seafood, depending on the animal. At the same time, the presence of omega-3s in seafood has been getting more and more play and is being talked up a lot, so if you're the fish industry, what do you do? Encourage people to eat polluted fish? They can't really get up on a soapbox and just yell about the omega-3s, because at the same time the government is telling people, especially pregnant women, not to eat so much of this or that seafood. The seafood industry probably doesn't want to tell people to just forget about their product and take little gelcaps full of omega-3 oil.

ALLPORT. From the vegetable oils that have replaced butter and lard, from other fats in our diet, from the processed and packaged foods that use vegetable oils as a convenient and inexpensive fat, from the process of partial hydrogenation, which specifically eliminates omega-3s, turning them into 6s as well as trans-fats, from the fact that our livestock are no longer fed grass and other greens but are fed grains, which are much richer in the omega-6s. . . . I don't know how many ways! We wouldn't need to eat as much fish if we'd stop eating those high omega-6 vegetable oils. We don't have to be between that rock and hard place in terms of fish. We can protect those resources and save them. If everybody ate twice-weekly meals of fish as the government now recommends, there would soon be no fish left in the ocean, and we wouldn't be having this conversation.

"We're talking about *every cell in the body* — and we're talking about these fatty acids first winding up in the cell membrane, every cell, which is why every day you see a new disease that's being linked to this imbalance."

ALLPORT. Right. It's terribly confusing. Eating fish is *one* way to correct this imbalance of 6s and 3s in our food supply. But it's not the only way, and it is not the *best* way. We have to eat 10 times as much fish to get a really healthy balance of those two families of essential fats as we would if we were eating healthy amounts of the omega-6s. If our omega-6s were at healthy levels, we would need just tiny amounts of fish or omega-3 enriched eggs or cattle that have been raised on grass. These two families of fats compete for enzymes, for positions in our cell membranes, which don't care whether they get loaded up with omega-6s or omega-3s. They don't care for a reason — because they're built that way so that they can change with the changing seasons and the changing food supply. They're meant to go through these seasonal changes, slight seasonal changes. The reason we've run into problems is because we eat this high omega-6 diet year-round.

ACRES U.S.A. Where does the excessive omega-6 come from?

ACRES U.S.A. Except as an exercise in nostalgia.

ALLPORT. Right.

ACRES U.S.A. What products are responsible for the excessive amount of omega-6 in the American diet?

ALLPORT. Safflower oil, sunflower oil, peanut oil, corn oil and soybean oil. Soybean oil can be part of a healthy diet if it's not a huge part of your food supply and if it's not modified or processed.

ACRES U.S.A. Palm oil?

ALLPORT. Palm oil is not so bad, butter is not so bad, olive oil — all of those are useful oils. Canola oil has a very good ratio, a very healthy ratio — not the

modified canola oils that they're coming up with now that are reducing the Omega-3s, but the original ratio was about one to five. All of the oils are constantly being modified.

ACRES U.S.A. Why are they being modified, to manufacture them?

ALLPORT. Yes, for manufacturing purposes and to meet the current demand for oils that are healthier. Currently people are looking for monounsaturated oils, which are monounsaturated fats like olive oil, so they're modifying these other oils to make them closer to that profile, and in the process they can be increasing the omega-6s or decreasing the omega-3s. They can do a variety of different things.

ACRES U.S.A. What does an excess of omega-6 or an out-of-balance ratio 6 to 3 do to the human body?

ALLPORT. Remember, we're talking about *every cell in the body* — and we're talking about these fatty acids first winding up in the cell membrane, every cell, which is why every day you see a new disease that's being linked to this imbalance. The last one I saw was Parkinson's disease. I've seen recent reports on autism, obesity, Type 2 diabetes, macular degeneration, all of those. OK, so you're picturing every cell, and every cell likes a certain amount of polyunsaturate in it, and that's what keeps it moving optimally, right? But that amount can be made up either of omega-3 or omega-6 fats, so it's got that discretion, which is meant to work with the changing seasons. The rest of the fats in those cell membranes will be fats of the saturated and the monounsaturated families. Those are fats that we make ourselves, depending on what we need. So, given anything that we eat, we can make whatever saturated and monounsaturated fats those membranes need, but the polyunsaturated fats have to come from the diet, and each different cell type is going to want a slightly different ratio of polyunsaturated than the others, but the family that it comes from depends upon what you're eating. We know from Tony Hulbert's work and the work of many others that the different families have different numbers of double bonds in them, and that produces a different flexibility of the membrane.

ACRES U.S.A. How are they different?

ALLPORT. Let's say that omega-6s are a little stiffer, and omega-3s are a little looser. That looseness enables all those enzymes in the membrane — and that's where most enzymes live, in cell membranes — it enables them to go about their business that much faster. You can imagine it is kind of a WD-40 for the entire body, or you can think about doing jumping jacks in the air versus doing them in a thicker medium like water — that's what the difference is. You have this slowing-down effect when the omega-6s have replaced the omega-3s, and that fits in with that hunkering down for times of leanness and survival. You're putting on weight, and you're slowing down. These two families have different overarching effects. They are also snipped out of the membrane and used to make important cell messengers called prostaglandins. The first thing that we knew about these two families of fats was the fact that they made very different cell messengers. The ones made from the omega-6s are highly inflammatory, highly likely to promote blood clotting or increased blood pressure — they affect all kinds of bodily processes linked to diseases such as heart disease, obesity and diabetes. The omega-3 messengers are far less likely to promote inflammation. I talk about the omega-6 messengers as being a kind of SWAT team coming in to fight infection. They're actually necessary for a healthy immune response, but too many SWAT teams coming in, or SWAT teams bursting in at a family dinner, so to speak, aren't going to do you any good. There's hardly a chronic disease that Western nations suffer from that is not linked in very specific ways to the double effects of these two families of fatty acids.

ACRES U.S.A. Have these linkages been established recently, or have they been known for a long time?

ALLPORT. For a long time — in fact, they keep being established. For instance, now people know that the two different families of essential fats have *profoundly* different effects on the growth and migration of cancer cells — and cell death, too. There's a great deal of evidence that the omega-6 rich diet predisposes us to certain forms of cancers, including breast and colon and prostate cancer. It's a very large topic. It's easy to dismiss it because there are so many diseases involved, you might think, oh, this can't possibly be, but when you're talking about every cell in the body, there are reasons for the fact that there are so many diseases involved.

ACRES U.S.A. Are the public health authorities fully aware of these things, or is it still just catching on?

ALLPORT. I think it is still catching on, *slowly* catching on. There is a new study every day on this, so I think my book was probably helpful in giving them this historical overview that puts the research in context. Also, the overview of Tony Hulbert's work probably helped. There is a lot of biological research you have to understand and apply to this. You can't get to these connections one epidemiological study at a time.

ACRES U.S.A. What are the pitfalls of researching these fats?

ALLPORT. In order to see clear and consistent findings of the differing effects of the omega-3s and the omega-6s in any subject group, you really have to carefully control for omega-6 consumption as well as looking at omega-3 consumption. In studies that have looked, for example, only at fish consumption and trying to link fish consumption to a decrease in cancer risk or a decrease in heart disease, some say yes, there is such a thing, and then you see the next one and it says no. That's probably because they haven't controlled for the omega-6 consumption, because, as we were discussing earlier, those two families compete with each other for those same spots in the cell membranes. Unless you understand that a person's diet is extremely rich in omega-6s, it doesn't really matter how much fish they're eating. Unless they're *really* eating a lot of fish, they're not going to show the positive effects of the high omega-3 diet. They need to reduce that omega-6, or at least the investigator needs to understand that in this

population it is really about what's happening in your tissues. Our tissues will show whether we've had a consistently high omega-3 intake or consistently high omega-6 intake. If we just look at what they're consuming in terms of fish, we're not necessarily going to see that.

ACRES U.S.A. Is our thinking about these things affected by an emphasis on singular causes, while we need to look at the interrelationship of several things, like looking at one actor in the drama instead of the whole ensemble?

ALLPORT. The balance thing is a hard one for many people to accept. It's a lot easier to say this food wears the white hat and that one wears the black hat and stay away from that one, so that probably plays a role in it.

ACRES U.S.A. You mean it plays a role in the popular mind?

ALLPORT. Yes — but it's a complicated story. It's even complicated for scientists to wrap their head around this and the fact that we've known about these essential fats since the 1930s, so why are we still struggling with them? But we really didn't know that omega-3s were *essential* until the 1980s. So in that time that we knew about essential fats and we really knew that omega-6s were essential, but not omega-3s, we promoted the consumption of those omega-6s and you know the 1960s and 1970s were rife with promotion of margarines and all those high omega-6 butter substitutes. Now we've really got egg on our face, and we have to turn back all that. It's a little embarrassing that we made such a big deal about switching from butter to those high omega-6 fats.

ACRES U.S.A. Did the long gap in the understanding occur because scientists were structuring their studies around single factors?

ALLPORT. No — for one thing, we only need tiny amounts of these fats in our diets, so it's incredibly hard to deplete research animals of these fats that are everywhere in the food supply. It's 0.5 percent of our diet that needs to be omega-3s and one percent of our diet that needs to be omega-6s. We store the omega-6s in our body fats. We don't store many omega-3s in body fats, we store them in our cell membranes, but somebody has to be on these fat-free diets for months and years to actually observe the deficiencies, so it's a hard deficiency to observe. And what are we even calling this imbalance? The imbalance itself is hard to observe, too — it comes out in these chronic diseases.

ACRES U.S.A. How long does it take to emerge that way?

ALLPORT. It doesn't come out immediately. If we could see the impact immediately we would have understood this a long time ago. But the first little girl who was observed with an omega-3 deficiency, she had a gunshot wound in her stomach, so a lot of her intestines had to be replaced, and she had to be on intravenous feeding for the rest of her life. At first she was fed food based on safflower oil, and she was a little girl, so it wasn't long — it was months not years — before she developed the omega-3 deficiency and bizarre symptoms that the doctors had never seen before began to appear.

ACRES U.S.A. When did this occur?

ALLPORT. That was in 1981 or 1982.

ACRES U.S.A. So the little girl's misfortune removed the need for a multi-year study and gave researchers a shortcut?

ALLPORT. Right, and they knew how to use it. They just changed the fats in those intravenous feedings — she was just on that single food. Nobody else is on a single food, except for rats in the lab, and that's why they're showing us many of these problems. I can't remember how many months it took her to develop the deficiency, but it was maybe six months or so, and that's with a little girl. You can imagine. The part to remember is that it's not so much a question of a deficiency of omega-3s as it is an *imbalance* of omega-3s and omega-6s.

ACRES U.S.A. Has there ever been a population or a cluster of people with an extreme excess of omega-3s, an imbalance in the other direction?

ALLPORT. You might say that the Inuit had that. When researchers went up to Greenland to study them they realized these people had a very, very low rate of heart disease and no diabetes, no obesity. Even though they might look fat, it's just the cheeks, they actually are quite lean people and they lived on a very high-fat diet. But they had chronic nosebleeds, and they also had a higher rate of hemorrhagic stroke, some bleeding strokes. So they *might* have had too much omega-3 in their diet. We tend to die of clotting, but they had much more tendency towards bleeding, heavy bleeding. There were battle accounts in which the Inuit would talk about how, when they were pierced, if they were wounded, they just didn't stop bleeding. Their diet has changed now, so they don't have that same high bleeding tendency.

ACRES U.S.A. What kind of ratio is ideal?

ALLPORT. The Japanese have about a 50:50 ratio of the omega-3s and the omega-6s in their membranes, maybe even a little higher towards the omega-3s but let's say it's a 50:50 ratio, while our

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ratio is about 80 percent omega-6s and 20 percent omega-3s. We need to get it down. In the Mediterranean it's about 60 percent omega-6s and 40 percent omega-3s. We need to get down to at least that level, and a lot of these diseases will just disappear.

ACRES U.S.A. Does the health profile of Mediterranean populations reflect that?

ALLPORT. Yes! The heart disease rate definitely reflects it, and the cancers, too.

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I don't think people have looked at every one of the diseases linked to these fats, because there's no point in looking — they're not there! We need to look at the question of why are they here for us?

ACRES U.S.A. On the Amazon page for your book, one of the citizen reviewers takes issue with your mocking the Atkins diet, although it seems that unless you eat an Atkins diet with grass-fed meat, you're on solid ground there.

ALLPORT. Yes, and the Atkins diet in the Arctic is a perfectly healthy diet.

ACRES U.S.A. Leaving that to one side, another reader took issue with you on the question of linolenic acid breaking down into EPA and DHA. Could you address that and explain along the way what EPA and DHA have to do with all this?

ALLPORT. Remember that these two essential fats come in families. Let's call them the parent fatty acids — they each have a parent because they're two different families. The omega-3 parent is *alpha-linolenic* acid. The omega-6 parent is *linoleic* acid. The way I can keep them straight is that the linolenic has the extra "n" in it, and it also has one more double-bond in the molecule. That's what gives the omega-3s their kinkier nature and allows them to loosen up those membranes. All the omega-3s, the parent and then the offspring, all have an extra double bond. In the omega-6s the parent is the linoleic, and through enzymatic elongation and desaturation that adds double bonds and elongates the molecule, it turns into arachidonic acid. Likewise, the parent omega-3, linolenic acid, through enzymatic desaturation and elongation turns into DHA and EPA — docosahexaenoic acid and eicosapentaenoic acid. DHA is particularly concentrated in the brain and the eyes, and EPA has been linked to all kinds of mood disorders. What's also interesting is that EPA and arachidonic acid are the two members of the two families that are snipped out and turned into those cell messengers — just those two. They're both 20-carbon molecules, but one has one more double bond than the other.

ACRES U.S.A. They're obviously important — where does the controversy come in?

ALLPORT. People will tell you that it's no good basing our omega-3 intake on greens and flax seed, which are full of this alpha-linolenic acid, the parent, because the body is so inefficient at turning it into EPA and DHA. They say that what we need to do is eat more fish, more foods that already have the EPA and DHA. Now, the enzymes that turn the parent acid into the longer-chain fatty-acids are the same for the two families. The parents compete with each other for those enzymes that add the double bonds and add length — so much so that if your diet is very rich in linoleic acid, you're not going to get that conversion of alpha-linolenic acid to EPA and DHA. But if your diet is balanced between the two and is not too rich in the linoleic acid, your body is going to be fine. You still need to eat small quantities of the pre-elongated fats. You don't need to base your omega-3 intake on the long-chain fats — what's most important is that by reducing your omega-6 intake and keeping those two parents in balance, you're preventing the linoleic acid from being turned into arachidonic acid. If you are consuming lots of fish oil and don't understand that you also need to eat greens and the flax seed and all those other plant sources of omega-3s, your body is just going to take its linoleic, which it is getting from the vegetable oils, and turn it into tons of arachidonic acid — because there's no competition for it. Then you're going to have those highly inflammatory, slightly stiffer fats in your membranes.

ACRES U.S.A. It makes perfect sense, although it's difficult to hold in mind all at once.

ALLPORT. It's a difficult and complex story. But there's proof in the pudding when you look at the intake of vegetable oils in the United States and then at the estimates for how much EPA and DHA and how much arachidonic acid we're consuming. Our intake of both is about the same, but our tissues are already full of the arachidonic acid. There's only one way that can happen — it's from the excess parent, the excess linoleic acid.

ACRES U.S.A. An excess of the omega-6?

ALLPORT. There's no other way for that to happen, so looking at the conversion rate in an animal that has a high omega-6 intake is not the same as looking at it under healthy conditions. You have to look at it under balanced conditions. It's healthy to consume a little long-chain, but not anything like what we need without that high omega-6 intake. People have done numerous studies on this. There was a very recent one showing how little fish we needed to consume if we would just reduce the omega-6 intake, thereby getting us beyond that

point of advising people to consume more and more fish when so much of that fish is either not caught sustainably or is possibly polluted.

ACRES U.S.A. How did the omega-3s come to be removed from our diet, the Western industrial diet?

ALLPORT. They are more highly oxidizable than omega-6s, which is one of the reasons why we got sent along this path. The other one is that we didn't realize they were essential, so why not eliminate them? They were so oxidizable, why not remove them from our foods?

ACRES U.S.A. And *oxidizable* translates into shorter shelf life.

ALLPORT. Right, they are not consistent with a long shelf life in the way that we have them now. I think there are new technologies for putting omega-3s into packaged foods that prevent them from being oxidized, but they're not common in the United States at this point — although I have been seeing it on some new packaging, so they're moving in that direction. People took them to task for the partial hydrogenation because of the trans-fat, so they're going to have to move away from that technology anyway. As long as the public is not demanding it, the food companies are not necessarily going to go to the next step of implementing those technologies. Once the public *does* demand it, however, the food supply can turn on a dime. It did with the Atkins diet. Once somebody puts this in a way that the public understands, there won't be any problem for them. It's probably good for us to stay away from packaged foods, anyway, but I think that they will have a technology for putting them in packaged foods.

ACRES U.S.A. Would you agree that the thing they'll dig in their heels the hardest on is changing beef to grass-fed? The price of beef would go up, people would eat less of it, which is probably a good thing for the planet, but the beef industry would shrink. And they don't want to shrink.

ALLPORT. A farmer said to me, "There isn't enough grass to raise our beef on," but some of these farmers I've been talking to — just a few — really understand that there is a big chemical change in the animals with grain feeding versus grass feeding. Once you understand that, then there is a big incentive for making that change, that transition back to the grass feeding.

ACRES U.S.A. Was the rise of grain-fed beef the tipping point for the wholesale disappearance of the omega-3s?

ALLPORT. No, it was the vegetable oils replacing the other fats after World War II, basically. That played the bigger role, because in most people's diets that's a larger percentage of their diet.

ACRES U.S.A. You've described your book as a detective story. Could you elaborate on that aspect of it?

ALLPORT. It's a detective story in that this is an important biological truth connecting plants and animals. It's just a beautiful thing on its own terms. It doesn't seem so beautiful to us now because we have all these diseases, but we're not seeing it for what it is, which is that these fats are messengers from plants to tell us how to get ready for the future! The seasonal shifts in the availability of these fats have given animals this wonderful way of predicting the future. We've disrupted that process by giving ourselves this high omega-6 diet year-round. The detective story is that every aspect of this tale has been so complicated and difficult to unwind. Once you get to the end of it and see this picture about the seeds and the leaves, it becomes simple, but you have to get all the way to the end to see the simple part.

ACRES U.S.A. And getting there involved many people on many continents.

ALLPORT. And many chance findings between them. People who really understood that there's something profoundly different between an essential fat, something that you *have* to eat in your diet, and all this fat that all of us consume everyday. They're not the same things at all. Because of this competitive interaction between the two families of fats, the story has taken that much longer to put together. The involvement of the food industry promoting the one and eliminating the other is confusing too. All these different threads have made this a difficult story to put together. I feel very fortunate to have come along at a time when that theoretical framework was available from Tony Hulbert. I'm a forager by nature, so I appreciate the role of greens in the human diet. I came to it with that, and I loved chemistry in graduate school, so I came to it with that too! Those affinities put me in position to be able to really look into this story and not shy away from the chemistry. If you shy away from it, you're not going to get to the end of the story. You have to appreciate that there are these two fats with only small differences in chemical structure, but very large differences in function.

For more information on Susan Allport, visit her website, *susanallport.com*. *The Queen Of Fats* (ISBN 0-520242-82-3) is available from retail and online booksellers.