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Mixed vs. Pure Soybean Oil Lipid Emulsions: How to Select and Monitor Patients

Announcer:
You're listening to *GI Insights* on ReachMD, and this episode is an educational grant provided by Fresenius Kabi. Here's your host, Dr. Charles Turck.

Dr. Turck:
This is *GI Insights* on ReachMD, and I'm Dr. Charles Turck. Joining me to share strategies for incorporating mixed lipid emulsions into clinical practice is Dr. Phil Ayers. Dr. Ayers is a Clinical Associate Professor with the School of Pharmacy at the University of Mississippi and the Chief of Clinical Pharmacy Services in the Department of Pharmacy at Baptist Medical Center in Jackson. Dr. Ayers, welcome to the program.

Dr. Ayers:
Thank you, Dr. Turck. It's great to be with you today.

Dr. Turck:
Well, to start us off, would you tell us how lipid emulsions in parenteral nutrition have evolved over the years, including any factors that influenced those changes?

Dr. Ayers:
Yes, I'd be glad to. I've been doing nutrition support for 30 years, so I've seen some significant changes, especially recently in the lipid emulsion arena. When we think back to when we first started using lipid emulsions in the mid-70s, in the U.S. at least, we primarily used them initially to prevent essential fatty acid deficiency, and later as a caloric source. And so what we had available in the 1970s was 100 percent soybean oil. Again, it was a great addition to parenteral nutrition because we could use less dextrose, hopefully reducing the amount of hyperglycemia one might see.

But in recent years, starting in around 2015 to 2016, we saw the introduction of more mixed oil lipid emulsions. We started seeing a four-oil and then a two-oil lipid emulsion introduced into the United States. And so with that, we saw the introduction of things like less phytosterol, which is the plant sterol, which is known to be hepatotoxic, so these mixed oil lipid emulsions have less of that. We even had a mixed oil lipid emulsion with fish oil. So it's very interesting to have another option available, because it had been quite some time since we'd had anything new in the parenteral nutrition arena. Being one of the older clinicians, I was excited to see some newer products come to the U.S. market. We had been seeing these used worldwide in a number of countries, but we had not had those options in the United States.

Dr. Turck:
So with that evolution in mind, what role do lipid emulsions have in modulating immune function and inflammation?

Dr. Ayers:
If we go back and look at what we originally used in the 70s, 100 percent soybean oil was an omega-6. If you look down those fatty acid pathways, we know that arachidonic acid is part of that pathway. You have your parent here is going to be linoleic acid, but further down that pathway is arachidonic acid. We know arachidonic acid is inflammatory in nature. When you look at the leukotrienes and thromboxanes associated with that pathway, they tend to be more inflammatory in nature. So there was always a concern, especially in those patients that had inflammation—those critically ill patients for instance—with giving 100 percent soybean oil. But we gave it because we also knew that glycemic control was really important in those patients as well.

With the evolution of some of the newer ILEs, we've seen the introduction of omega-3s. We know omega-3—think fish oil, DHA, EPA—those are less inflammatory or anti-inflammatory in nature. So it's given us another option, especially in those patients that are critically ill. We can consider how using a different lipid emulsion in those patients could be beneficial in terms of reducing the amount of inflammation that may occur with the introduction or the administration of parenteral nutrition.

Dr. Turck:
Now, if we zero in on current ASPEN guidelines for just a few moments, they recommend mixed lipid emulsions over pure soybean oil emulsions for stable patients. And for critically ill patients, they also recommend mixed lipid emulsions, especially ones that contain fish oil. So what are your thoughts about those recommendations? And how do they impact your approach to clinical practice?

Dr. Ayers:
Sure. Well, as I said earlier, I was excited to have some other options. And I will say that there's a little bit of confusion when we look at the latest ASPEN Critical Care Guidelines—it mentions either 100 percent soybean oil or a mixed oil lipid emulsion. Those were done in 2020. We've had some additional trials and meta-analyses that have since been published that do show some benefit with using a mixed oil lipid emulsion containing fish oil, for instance, in those patients who are critically ill. And if you look back at the consensus recommendations—I was a part of that paper—we mentioned that potentially, there could be some benefit from reducing the omega-6 load from 100 percent soybean oil and using more of a mixed oil lipid emulsion containing fish oil. And so that consensus recommendation, and most recently, a PN International Summit, occurred. It was clinicians not only in the U.S., but Europe as well. And again, the European clinicians have had these options for much longer and have seen benefit from using these. We're starting to see more and more trials, larger trials, that are showing benefit from using the mixed oil lipid emulsions over 100 percent soybean oil, especially in those patients that are critically ill or those that have some inflammation occurring in the process in their hospital stay, or even their home stay as well.

Dr. Turck:
For those just tuning in, you're listening to *GI Insights* on ReachMD. I'm Dr. Charles Turck, and I'm speaking with Dr. Phil Ayers about the use of mixed lipid emulsions in parenteral nutrition.

So Dr. Ayers, if we switch gears a bit and focus on how we should use mixed lipid emulsions in clinical practice, what factors should we consider when evaluating and selecting appropriate patients?

Dr. Ayers:
First of all, you look at your patient population. Is your patient population primarily critically ill? Is it surgical patients? Things like that, we need to take into consideration. The length of therapy—for instance, if we have patients who we know are going to be on parenteral nutrition for a significant amount of time, we may want to look at more than mixed oil. What we do know is the older lipid emulsion, 100 percent soybean oil, has a high phytosterol content as I mentioned earlier. Phytosterol is a plant sterol that's known to be hepatotoxic, so we have seen some issues in patients on long-term parenteral nutrition, where it may increase their liver function test or their transaminases, or their bilirubins can be elevated. So that may be a patient where you might want to consider using more of a mixed oil lipid emulsion with less phytosterol. There are other mixed oil lipid emulsions that contain fish oil. So for those patients where inflammation is occurring, in a critically ill patient for instance, they certainly could benefit as well.

You really have to look at your patient mix. Maybe in a short-term patient, you would be okay with using 100 percent soybean oil for a short period of time, less than two weeks for instance. But once we get out a little bit longer, we need to be thinking in terms of that more of a mixed oil lipid emulsion. Or if that patient is with some inflammatory process, like a critically ill patient for instance, or maybe a Crohn's patient, then we might consider using more of a mixed oil with potentially fish oil where they may benefit from using that type product over an older 100 percent soybean oil.

Dr. Turck:
And how do we effectively monitor the use of mixed lipid emulsions and make necessary adjustments based on patient response and lab markers?

Dr. Ayers:
Primarily with lipid emulsions, we're always going to look at triglycerides, right? And so we definitely need to be sure we're monitoring those. In those patients who are critically ill, we know oftentimes they will have a high triglyceride level, maybe because inhibition of lipoprotein lipase. I would start there. And then if their triglycerides are elevated, then I have to reduce it—it doesn't matter what lipid emulsion I'm using, whether 100 percent or mixed—I'm going to reduce the dose or maybe even remove that.

Now, we also have to look for other lipid-containing products, for instance, like propofol, which is used in the ICU in critically ill patients. So if a patient's receiving propofol, we may want to hold on using a lipid emulsion, whether it's 100 percent or mixed oil. So those type of

things are factors as well. We want to look at overall infection process itself, so looking at the CBC and seeing if there's some benefit there as well.

We want to try to maximize the dose of lipid emulsion. So that's what's nice about some of the newer products. We can give higher doses of lipid emulsions in our older lipid emulsions. So that's when we give those higher doses that would allow us to use less dextrose, which might decrease the instance of hyperglycemia. That's one of those things we're monitoring as well. The glucose control in these patients—especially those in the ICU—we know when the glucoses are greater than 200, and we see generally inhibition of chemotaxis and phagocytosis, so those patients may not do as well from an infectious standpoint.

Dr. Turck:
And lastly, Dr. Ayers, do you have any final thoughts or recommendations on how we can best incorporate mixed lipid emulsions into practice?

Dr. Ayers:
Yeah, again, look at the acuity level of your patients and the patient mix that you have. Again, if you have a lot of patients that are critically ill who you're using parenteral nutrition in, they may benefit from some of these mixed oil lipid emulsions. If you have those patients who are going to be long-term PN patients or those patients who have elevated liver function tests, they, too, might benefit from the mixed oil lipid emulsions more so than the older 100 percent soybean oil. We probably still need to keep 100 percent soybean lipid emulsion on formulary because of drug toxicities, for instance. There's really not a lot of data in terms of using the newer mixed oil lipid emulsions in those patient populations. So keep that in mind as well. But in general, if we're looking at getting out past two weeks, then we may want to look at using more of the newer lipid emulsions that are available now in the U.S. That's how I would approach that.

Dr. Turck:
Well, with those final thoughts in mind, I want to thank my guest, Dr. Phil Ayers, for joining me to discuss how we can integrate mixed lipid emulsions into clinical practice. Dr. Ayers, it was great having you on the program.

Dr. Ayers:
Thank you, Dr. Turck. I appreciate it.

Announcer:
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