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Intravenous Lipid Emulsions

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Preface

Intravenous (parenteral) nutrition can be lifesaving and is an essential intervention for those without a functional gastrointestinal tract. Lipids have been in clinical use as components of intravenous nutrition for over 50 years. They were introduced as a source of energy and essential fatty acids, undoubtedly two important roles. Initially, a number of plant seed oils were explored as sources of lipids for use in intravenous nutrition. Soybean oil was favoured over other candidate oils and, since the 1960s, emulsions of soybean oil with egg lecithin have been the most widely used. A better understanding of the metabolic and functional roles of the fatty acid components of intravenous lipid emulsions has led to a re-consideration of what lipid emulsions should bring to intravenous nutrition beyond the basic nutritional attributes of energy and essential fatty acids. There is a view that pure soybean oil may not present an optimal fatty acid composition, being very rich in one fatty acid, i.e. the essential omega-6 fatty acid linoleic acid. Hence, progressively more complex lipid formulations have been introduced that typically combine soybean oil with one or more other oils. These formulations include mixtures of soybean oil with the so-called 'medium-chain triglycerides' or MCTs, which are usually derived from coconut oil or palm kernel oil, mixtures of soybean oil with olive oil, mixtures of soybean oil, MCTs and fish oil, and mixtures of soybean oil, MCTs, olive oil and fish oil. A pure fish oil emulsion is also available, as are the so-called 'structured lipids', in which the fatty acids from soybean oil and MCTs have been randomly inter-esterified. These emulsions are all considered safe and well tolerated, although they may be cleared from the circulation at different rates. The most exciting characteristics of this range of lipid emulsions for intravenous use is that they offer the opportunity to deliver high amounts of specific fatty acids and that they are likely to possess different functional properties; in particular, they can influence inflammatory processes, immune responses and hepatic metabolism. The uptake of the different new lipid emulsions into routine clinical care has been varied according to patient type and geography, but these emulsions have been subject to considerable research. Relevant applications include children and adults who require intravenous nutrition because of short bowel syndrome, premature infants, those destined to undergo elective surgery, post-surgical patients, and the critically ill. These varied patient groups may benefit in different ways from the

new lipid emulsions, for example, some could benefit from a better balanced supply of fatty acids for maintenance of organ function and others could benefit from the ability of some fatty acids, such as the long-chain omega-3 fatty acids found in fish oil, to modulate inflammation and immune responses. The new lipid emulsions may also offer the opportunity to deliver high amounts of specific functional fatty acids in acute settings such as after severe head injury or myocardial infarction. This book brings together expert authors to provide state-of-the-art reviews of different nutritional, technological, and clinical aspects of the lipid emulsions designed for intravenous nutrition. It is our belief that the articles herein will provide the reader with a broad range of relevant and up-to-date information on the covered topics. In our view, these articles will appeal equally to basic scientists, clinical researchers and clinical practitioners and will serve to provide significant advances in the knowledge and understanding of this field. Of course, this is a moving field, with new studies being published regularly; nevertheless, these articles will remain a valuable resource to understand the background on newly emergent research in this exciting field.

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