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## Analysis of fatty acids in human plasma

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### Abstract

*In this issue of the Journal of Hematology and Hemotherapy, a study by Morais et al. evaluated four classical methodologies of lipid extraction (Folch, Bligh-Dyer, Rose-Gottlieb and Gerber) and an alternative technique, in order to evaluate the efficiency of extraction and fatty acid composition of human plasma. The alternative method proposed by the authors uses a microwave oven, and is considered efficient to extract lipids and identify fatty acids, but not for their quantification. The most suitable extraction method to measure fatty acids in human plasma is the Folch method.*

**Keywords:** *Fatty acids/blood; Lipids/analysis; Lipids/chemistry; Biochemistry/methods*

In humans, omega-6 (n-6) and omega-3 (n-3) series fatty acids are important to maintain cell membranes, brain function and nerve impulse transmission.<sup>(1)</sup>

Linoleic (LA, 18:2 n-6) and alpha-linolenic (LNA, 18:3 n-3) acids are strictly essential fatty acids, which must be obtained through the diet. The other n-6 and n-3 fatty acids can be synthesized from LA and LNA or be obtained through the diet.

Of the n-6 and n-3 series fatty acids of nutritional value, arachidonic (AA, 20:4 n-6), eicosapentaenoic (EPA, 20:5 n-3) and docosahexaenoic (DHA, 22:6 n-3) acids are the most important.

As in the human body, LA, an n-6 fatty acid, must be converted into AA, and LNA, an n-3 fatty acid, into EPA and DHA in order for them to exercise their functions, many kinetic studies are performed to measure these conversions from diets with different n-6/n-3 ratios.<sup>(1)</sup>

The first step in the process to assess the fatty acid composition of different foods and biological materials is to extract the lipids. Extraction methods are crucial to accurately measure fatty acid concentrations, as methods may degrade some fatty acids, especially polyunsaturated fatty acids and thus overestimate the true values.

Accordingly, in this issue of the Journal of Hematology and Hemotherapy, a study by Morais et al.<sup>(2)</sup> evaluated four classical methods of lipid extraction (the methods of Folch, Lees and Stanley,<sup>(3)</sup> Bligh and Dyer,<sup>(4)</sup> Rose-Gottlieb,<sup>(5)</sup> and Gerber<sup>(6)</sup>) and an alternative technique, proposed by the authors, with the objective of comparing the efficiency of lipid extraction and to evaluate the fatty acid composition in total lipids from human plasma.

The Gerber method is not suitable for lipid extraction from human plasma, while the Rose-Gottlieb method, despite efficient lipid extraction, was not good to assess the fatty acid composition. The method of Bligh and Dyer was not very efficient in the extraction of lipids, but was adequate to evaluate the fatty acid composition in general.

The alternative method proposed by the authors using a microwave oven to extract the lipids from human plasma is considered a rapid technique. The application of this technique was suitable to identify fatty acids, but not for the measurement of fatty acid concentrations in human plasma. The most suitable technique to quantify fatty acids is the Folch, Lees and Stanley method.

Overall, the total lipids extracted from plasma ranged from 0.19% to 0.41%, with the highest values being obtained by the Folch, Lees and Stanley (0.41%), alternative (0.37%) and Rose-Gottlieb (0.36%) methods.

With these extraction methods, the authors identified a total of twenty-four fatty acids in plasma by gas chromatography. The main fatty acids in human plasma were the linoleic, palmitic, oleic, stearic and arachidonic acids. Linoleic acid was the fatty acid with the highest concentration ranging from 150.94 to 223.87 mg/g total lipids as measured by the different methodologies.

After a critical analysis of the work of Morais et al., we conclude that the Folch method, despite being one of the oldest used, is the most suitable method to extract lipids and determine the qualitative and quantitative composition of fatty acids. Therefore, this method can be used to determine fatty acids in human plasma. However, any methodology used should be carefully assessed by the researcher.

Thus, this study has great importance as it may be considered by different healthcare professionals when there is a need to analyze fatty acids and lipids in human plasma.

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### Resumo

Nesse fascículo da revista, o estudo de Morais et al. (2010) avaliou quatro metodologias clássicas de extração de lipídeos (métodos de Folch, Bligh-Dyer, Rose-Gottlieb e Gerber) e uma técnica alternativa, com o objetivo de avaliar a eficiência da extração e a composição em ácidos graxos de plasma humano. O método alternativo proposto pelos autores usou o forno de micro-ondas como ferramenta e foi considerado muito rápido na extração lipídica e adequado na identificação de ácidos graxos, mas não em sua quantificação. O método de extração mais indicado para quantificação de ácidos graxos em plasma humano foi o método de Folch.

**Descritores:** Ácidos graxos/sangue; Lipídeos/análise; Lipídeos/química; Bioquímica/métodos

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