

*Editorial Article***Omega-3 fatty acids, insulin resistance and type 2 diabetes***Leila Azadbakht<sup>1</sup>, Mohammad Hossein Rouhani<sup>2</sup>, Pamela Jean Surkan<sup>3</sup>**J Res Med Sci 2011; 16(10): 1259-1260*

In a manuscript published in July of 2011, Saidpour et al.<sup>1</sup> reported beneficial effects of fish oil and olive oil on insulin resistance after an eight-week intervention in rats. Fish oil is a rich source of n-3 fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).<sup>2</sup> There is evidence for the role of n-3 fatty acids in insulin resistance and diabetes, as other studies have shown similar effects of fish oil on insulin resistance in obese rats<sup>2</sup> as well as in humans.<sup>3</sup> Furthermore, according to a recent study, omega-3 supplementation in diabetic patients results in increased visfatin levels,<sup>4</sup> although evidence is controversial regarding visfatin and its function. While visfatin is an inflammatory factor and higher levels may have adverse effects,<sup>4</sup> omega-3 fatty acids help prevent glucose intolerance and have anti-inflammatory properties.<sup>5</sup> Another question that is still open to debate relates to the dietary source of omega-3 fatty acids. EPA and DHA are long chain polyunsaturated fatty acids (LCPUFA) found in fish and other animal sources whereas  $\alpha$ -linolenic acid (ALA) comes from vegetable sources. Although there is no indication of a significant association between the marine source of omega-3 fatty acids and diabetes risk, an inverse significant relationship has been observed between non-marine omega-3 fatty acid intake and diabetes incidence in an Asian cohort that studied high marine foods consumption.<sup>6</sup> Nonetheless, a beneficial association between

fish intake and diabetes risk was found in another cohort study of men.<sup>7</sup> In contrast, a 12.4-year cohort study indicated a positive association between marine omega-3 fatty acid and type 2 diabetes incidence in women.<sup>8</sup> These conflicting results are not restricted to only diabetes. A cohort study with 23-year follow-up found a significant inverse association between LCPUFA (not ALA) intake and risk of ischemic heart disease.<sup>9</sup> Conversely, a recent study reported a favorable association between dietary intake of total omega-3 fatty acids and risk of inflammatory disease mortality.<sup>10</sup> However, further analyses suggested nuts had preventive properties against inflammatory disease mortality, but fish did not.<sup>10</sup> When attempting to understand inconsistencies across studies, some points should be noted. First, contaminants of marine foods may play a role.<sup>11</sup> Second, the amount of fish consumption in the population studied is important. For intervention studies, the dose of supplementation and the intake of dietary fish oil or other dietary sources of omega-3 fatty acids must be considered. Finally, the susceptibility of omega-3 to oxidation may also play a role, such that the antioxidant intake may affect the association between omega-3 fatty acids and diabetes or other chronic diseases.<sup>12</sup>

On the other hand, an improved postprandial insulin response has been reported due to olive oil consumption in insulin resistant women.<sup>13</sup> However, the components of all

1- Associate Professor, Food Security Research Center, Department of Community Nutrition, School of Nutrition and Food Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.

2- Department of Community Nutrition, School of Nutrition and Food Science, Isfahan University of Medical Sciences, Isfahan, Iran.

3- Department of International Health, Johns Hopkins Bloomberg, School of Public Health, Baltimore, USA.

Corresponding Author: Leila Azadbakht

E-mail: azadbakht@hlth.mui.ac.ir

olive oils are not the same which could partially account for different effects.<sup>14</sup> Dietary approaches to stop hypertension (DASH), a source of good dietary fat -limited in saturated fatty acids- and full of fiber, has been shown to have anti-diabetic, anti-hyperlipidemic and

anti-inflammation properties in recent studies.<sup>15, 16</sup>

Further research is needed to understand the role of omega-3 fatty acids on insulin resistance and risk of diabetes. However, olive oil consumption may exert beneficial effects on the diets of diabetic patients.

## Conflict of Interests

Authors have no conflict of interests.

## Authors' Contributions

LA, MHR, and PJS wrote this letter.

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