The Peroxisome Proliferator–activated Receptors and their Ligands – their Role in Lipid and Glucose Metabolism

Bogna Grygiel-Gorniak
Chair and Department of Bromatology and Human Nutrition, University of Medical Sciences
Poznan, Poland

PPARs are ligand-activated transcription factors that regulate genes important in cell differentiation and various metabolic processes, especially lipid and glucose homeostasis. Molecularly PPARs are nuclear hormone receptors, targets for the compounds inducing peroxisome proliferation. The family of these receptors comprises of three isoforms, PPARα, PPARβ/δ (in some studies called PPARδ) and PPARγ. These three isotypes differ between each other and the main differences concern tissue distributions, their ligand specificities and physiological roles. PPARα is implicated in fatty acid metabolism and its activation lowers lipid levels. PPARγ is important in lipoprotein metabolism, adipogenesis, and insulin sensitivity. It plays a key role in the regulation of the energy balance, adipocyte differentiation and lipid biosynthesis. The least known is PPARδ that probably regulates blood cholesterol concentration and glucose level.

The ligand binding cavity of PPARs is 3–4 times larger than the other nuclear receptors. Thus, PPARs gave capability to accommodate and bind variety of natural and synthetic lipophilic acids that are used in prevention and treatment of cardiovascular and metabolic diseases. The natural (essential fatty acids e.g. docosahexaenoic acid and eicosapentaenoic acid) and synthetic agonists of PPARs (e.g. fibrates or synthetic insulin sensitisers - thiazolidinediones) are used in treatment of dyslipidaemia and diabetes mellitus. Therefore, natural compounds and their close synthetic derivatives are focused as future promising medications against metabolic diseases. The clinical and nutritional role of PPARγ is preseneted in this article.