PharmaNutrition 4 (2016) 139–142

Contents lists available at ScienceDirect

PharmaNutrition

journal homepage: www.elsevier.com/locate/phanu

Research article

Hydroxytyrosol augments the redox status of high fat diet-fed rats

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ARTICLE INFO

Article history:
Available online 29 September 2016

Keywords:
Hydroxytyrosol
High-fat diet
Obesity
Antioxidants
Cardiometabolism
Metabolic syndrome

ABSTRACT

Hydroxytyrosol (HT) is being investigated for its manifold biological activities. In this study, we assessed whether HT could lessen the metabolic and redox imbalance caused by high-fat diet, in a rat model. Male Wistar rats were divided into four groups (n = 4 each), homogeneous for age and weight. Group 1: control diet; Group 2: control diet + 20 μg HT/d by oral gavage; Group 3: high fat, high carbohydrate diet; Group 4: high fat, high carbohydrate diet +20 μg HT/d by oral gavage. The experiment lasted four weeks. The addition of HT to the high fat diet did not slow down weight gain as compared to the unsupplemented diet. No significant differences in glycemia were observed among the four experimental groups. Ascorbic acid plasma concentrations at the end of the experimental period were non-significantly lower in high fat diet rats than in control animals. Plasma, but not erythrocytes hydroperoxide concentrations were significantly lower in group 4 animals as compared with the other ones. The high-fat diet induced protein carbonyl formation. Even though supplementation with HT lowered carbonyls' concentrations, the effect did not reach statistical significance. Conversely, the action of HT became significant when plasma MDA was measured.HT also increased serum antioxidant capacity, assessed as ORAC of total serum and as conjugated diene formation of copper-oxidized isolated LDL/HDL.

Public heath bodies should actively discourage the adoption of obesogenic high-fat diets, but HT as supplement modulates some of their harmful effects.

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1. Introduction

Mediterranean countries enjoy lower rates of mortality from cardiovascular disease and cancer than Northern European or other Western countries [1]. This has been attributed, at least in part, to the Mediterranean diet [1], which is composed of specific local foods [2], of which olives and olive oil are foremost components [3]. Traditionally, many beneficial properties associated with this diet were attributed to the high content of bioactive compounds, most of them phenolic in nature [4,5]. One notable example is that of hydroxytyrosol (HT), the leading phenolic component of olive, olive mill waste water, and extra virgin olive oil [3].

Alas, the traditional Mediterranean diet is slowly fading away, giving way to more fat- and sugar-laden Western dietary habits. Even though public health initiatives and educational programs should be readily implemented to reverse this trend, one parallel proposal is to add bioactive ingredients to foods in order to lessen the noxious effects of improper diets.

In this investigation, we studied the effects of HT on the redox code [6] of rats exposed to high fat diets.

2. Materials and methods

2.1. Animals and treatments

Adult male Wistar rats, weighing 200 ± 50 g, were used in this study. The animals were kept in an environmentally controlled breeding room (20 °C; 60% humidity; 12 h dark/light cycle). Before the experiment started, rats were fed a standard diet (Office National Des Aliments Du Bétail, spa, Remchi, Tlemcen, Algeria) composed of corn, soybean meal, wheat bran, limestone, calcium bi phosphate, DL-methionine, sodium chloride, vitamin and mineral complex [7]. Tap water was provided ad libitum.

These rats were then divided into four groups (n = 4 each), homogeneous for age and weight. Group 1: control diet; Group 2: control diet + 20 μg HT/d by oral gavage; Group 3: high fat, high

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http://dx.doi.org/10.1016/j.phanu.2016.09.001
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carbohydrate diet; Group 4: high fat, high carbohydrate diet + 20 μg HT/d by oral gavage. The composition of such diets was as follows: control diet: casein 20%, starch 15%, sucrose 50.2%, cellulose 5%, sunflower oil 5%, animal fat 0%, mineral salt 3.5%, vitamins 1%, cholesterol 0%, methionine 0.3%; high fat diet: casein 20%, starch 11.3%, sucrose 37%, cellulose 5%, sunflower oil 3%, animal fat 17%, mineral salt 4.2%, vitamins 1.2%, cholesterol 1%, methionine 0.3%.

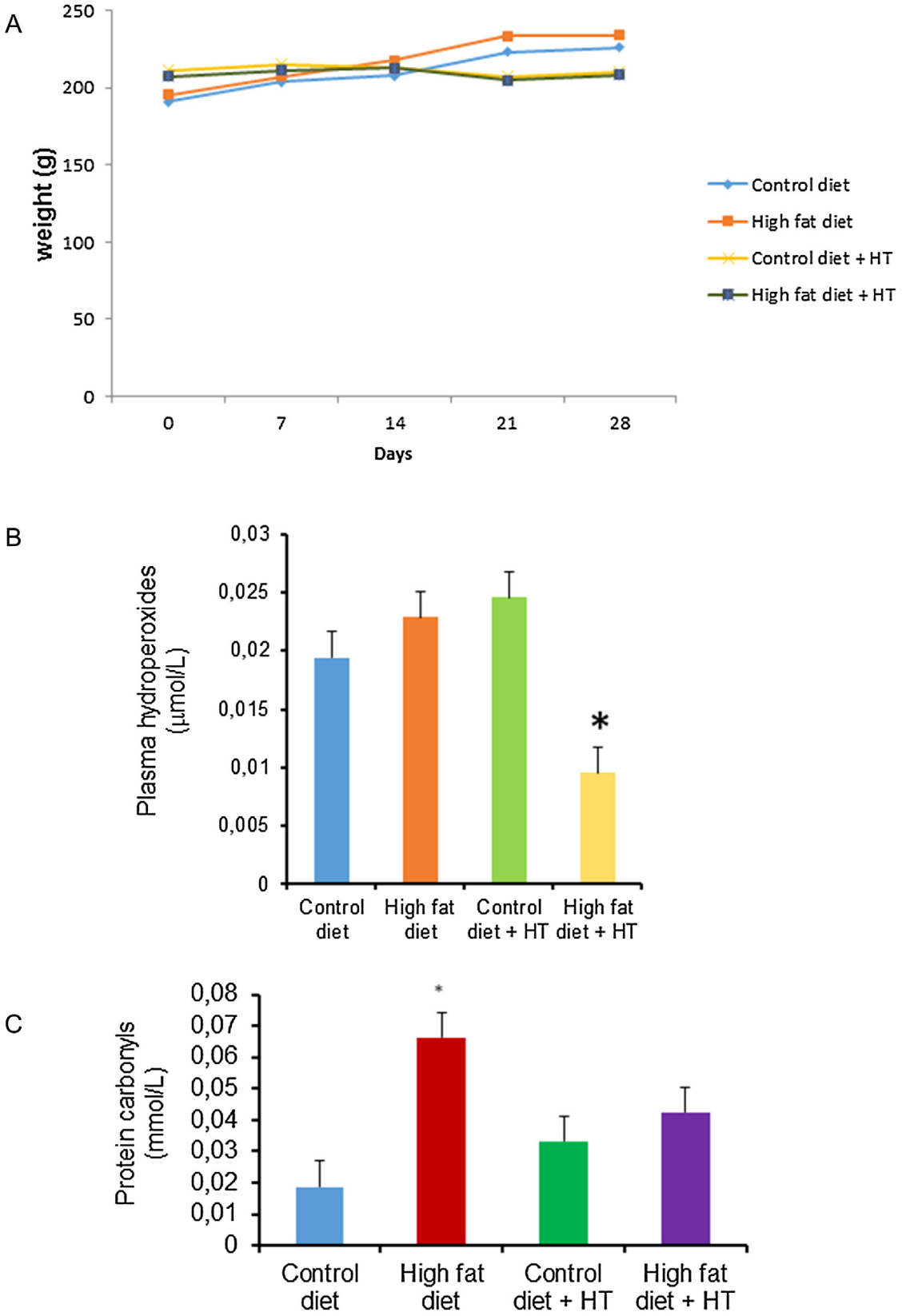

Fig. 1. A) Animal weights throughout the experiment; B) Plasma hydroperoxides concentrations; *$p < 0.05$ as compared to the other groups; C) Plasma protein carbonyls.

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