INTRODUCTION

Recent attention has focused on a number of non-vitamin antioxidants, such as phenolic compounds, that could contribute to antioxidant defense. These phenolic compounds are found in many plant species and are present at very high concentrations in many components of the Mediterranean diet, including olive oil (Manna et al., 1997). Dietary antioxidants would likely exert their protective action by counteracting the oxidative damaging effects on cellular components (Pompella, 1997). The Mediterranean diet is characterized by a predominance of olive oil among seasoning fats, and it is associated with low rates of colorectal carcinoma (Braga et al., 1998). According to Raj and Katz (1984), fatty acids and their constituents are able to act as free radical scavengers. Olive oil is very high in monounsaturated fats and has antioxidant properties (Hill and Glacosa, 1992; Trichopoulou, 1995).

Doxorubicin (DXR) is an important chemotherapeutic agent, that also induces chromosome aberrations. Rat bone marrow cells treated simultaneously with olive oil (10 ml/kg body weight) and DXR (90 mg/kg body weight) developed significantly fewer chromosomal aberrations and abnormal metaphases than those treated with DXR alone.

MATERIAL AND METHODS

Doxorubicin (Adriblastina®) was donated by Farmitalia Carlo Erba (Brazil). Olive oil (Carbonell®) was purchased in the local market. Experiments were carried out on six-week-old rats (Rattus norvegicus) weighing approximately 100 g. Animals were supplied by the animal facilities of the Faculty of Medicine of Ribeirão Preto, University of São Paulo. Food and water were available ad libitum. Rats were divided into experimental groups of six animals each (three males and three females). The DXR (90 mg/kg body weight) was injected intraperitoneally (0.5 ml/100 g body weight) simultaneously with a single dose of olive oil (1 ml/100 g body weight) by gavage. Control groups were similarly treated. All animals were injected intraperitoneally with 2 mM colchicine 90 min before sacrifice, that occurred 24 h after treatment. Bone marrow preparations for analysis of chromosomal aberrations in metaphase cells were obtained by the technique of Ford and Hamerton (1956). One hundred metaphases per animal were analyzed in order to determine the frequencies of chromosomal aberrations in a blind test. The mitotic index was obtained by counting the number of mitotic cells in 2000 cells analyzed per animal. Statistical analyses were done by the Tukey test (α = 0.05).

RESULTS AND DISCUSSION

As expected, animals treated with DXR had a significantly higher frequency of chromosomal aberrations and abnormal metaphases when compared with olive oil alone (Table I). In groups treated with DXR alone or olive oil plus DXR, the most frequent chromosomal aberrations observed were chromatid breaks, followed by complex exchanges (P < 0.05). Animals treated with DXR alone, or a combination of olive oil plus DXR, had a significantly lower mitotic index compared to olive oil alone (Table I). There were no significant differences between sexes (P = 0.48).
Olive oil, administered simultaneously with DXR, resulted in a significant reduction in both the total number of chromosomal aberrations and abnormal metaphases induced by DXR (48.6 and 29.0%, respectively). Raj and Katz (1984) observed a reduction in 7,12-dimethylbenz[a]anthracene-induced chromosomal breaks in mouse bone marrow cells pretreated with corn oil. Irradiated animals pretreated for six months with olive oil also have significantly fewer chromosomal aberrations than those pretreated with water or vitamin E (El-Nahas et al., 1993).

Mimnaugh et al. (1979) observed that olive oil did not interfere in the metabolism of DXR in lung, liver and heart in mouse. One possible explanation for the protection against chromosomal damage is that simultaneous treatment with olive oil would allow interception of free radicals generated by clastogenic agents before they reach DNA and induce alterations.

Olive oil-fed rats are remarkably resistant to oxidative modifications induced by copper (Scaccini et al., 1992). Manna et al. (1997) demonstrated that (3,4-dihydroxyphenyl) ethanol, present in olive oil, acts as a biological antioxidant in Caco-2 epithelial intestinal cells and protects against oxidative injury. Experimental animal model studies of high dietary fat and cancer have also indicated that olive oil can help prevent a number of chemically induced tumors (Weijl et al., 1997). It has been proposed that squalene, found in olive oil, has a protective effect (Newmark, 1997). A favorable effect of olive oil has also been proposed, on the basis of other animal experiments, to be due to the presence of oleic acid, a monounsaturated fatty acid, and specific micronutrients, such as vitamin E (Braga et al., 1998).

In this investigation, the bone marrow cells from animals treated with olive oil had significantly fewer chromosomal aberrations and abnormal metaphases induced by DXR. Indeed more research is needed to assess the impact of olive oil as an antioxidant agent, since it is suggested as an organic solvent in mutagenesis tests (Logan and Salamone, 1988) and could therefore modify the results obtained with compounds of mutagenic potential.

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RESUMO

Existe considerável interesse na identificação de componentes da dieta que têm a capacidade de proteger contra as aberrações cromossômicas induzidas pelos agentes...
Protection by olive oil

antitumoral. Os ácidos graxos e seus constituintes são capazes de atuar como sequestradores de radicais livres. Na presente investigação, as células da medula óssea dos animais tratados simultaneamente com o óleo de oliva (10 ml/kg de peso corporal) e doxorubicina (DXR; 90 mg/kg de peso corporal) apresentaram uma significativa redução no total de aberrações cromossômicas e metáfases alteradas induzidas pela DXR.

REFERENCES


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