In recent years lipid, oxidation has focused the attention of many research-workers and practitioners. Lipids are sensitive to oxidation, which in turn reduces the flavour and the nutritive value of fats, oils and lipid-containing products and may increase the rate of cardiovascular diseases. Free radical oxidation in foods and in living organisms may be divided into four distinctive interfacial groups: bulk lipid foods (oils), dispersed lipid foods (membranes and emulsions such as salad dressing), dispersed lipids in living organisms (membranes and organelles), and free-radical reactions in watery fluids in organisms (cytoplasm, plasma). The free radical oxidation of the lipid components in foods by the lipid peroxidation chain reaction is a major problem for food manufactures. An antioxidant may be defined as a substance that, when present at low concentrations compared with those of an oxidizable substrate such as fats, proteins, carbohydrates or DNA, significantly delays or prevents oxidation of the substrate. Suggestions that oxidative stress plays a role in human diseases have led to the proposal that health might be improved by increased dietary intake of antioxidants.

Plant-derived antioxidants are increasingly proposed as important dietary antioxidant factors, and foods rich in antioxidants are receive attention. It is widely accepted that fruits and vegetables have many antioxidant components. Among them flavonoids play a special role. They have applications in food stabilization owing to their ability to protect sensitive foods against peroxidation of oxygen. Recent work has highlighted the effect of evening primrose as a source of antioxidant nutrients. We used a rat brain homogenate and erythrocytes oxidized with 1 mM 2,2'-azobis(2-amidinopropane) dihydrochlodide (AAPH) as a model to study the antioxidative properties of the evening primrose extract. Lipid oxidation is deternined by thiobarbituric acid reactive substances (TBARS) and conjugated dienes (CD). Samples of brain homogenate and erythrocytes were collected for the analysis of oxidation 1, 2, 4, 24 and 48 h after oxidation induction. Two different concentrations of the plant extract were used: 30 and 150 mg/mL.

Our data clearly indicate that the abovementioned concentrations significantly inhibited TBARS and CD formation both in brain homogenates and in erythrocytes.

In conclusion, our results show that the extract from evening primrose seeds inhibits the oxidation of polyunsaturated fatty acids. Therefore, it may be of interest for the food industry as a preservative.

Communication no. 11

Protective activity of rutin against lipid peroxidation in the rat. J. Wilczak, B. Balasinska, M. Jank, P. Ostaszewski (Department of Animal Physiology, Veterinary Faculty, Warsaw Agricultural University, Nowoursynowska 166, 02-787 Warsaw, Poland)

The effect of flavonoid-rutin (quercetin-3-rutinoside) (RUT) during dexamethasone (DEX)-induced oxidative stress was investigated in lipid peroxidation and some antioxidant systems in rat brains. DEX administration induced a greater susceptibility to reactive oxygen species (ROS) resulting in an increase in lipid peroxidation, expressed as thiobarbituric acid reactive substance (TBARS) and conjugated diene (CD) production, and an increase in reduced gluthatione (GSH) transformation in oxidised gluthatione (GSSG). Recently, a lot of attention has been focused on the use of natural antioxidants isolated from vegetables to protect living organisms against damaging effects of ROS. Among them the most effective compounds found in natural antioxidants are flavonoids – a large group of vegetable polyphenols. All experiments were performed using 6-week-old male Sprague-Dawley rats, with an initial body weight of 180 ± 15 g. Animals were fed a regular laboratory diet. DEX (2 mg·kg^{-1} b.m./day) and

rutin (2 mg/day/animal) were administered directly into the stomach by an intragastric tube. Rats were divided into seven groups (n = 12): C – control; Drec – 5 days DEX followed by 5 days of post-DEX recovery; D – 5 days DEX alone; DR – 5 days DEX followed by 10 days RUT; RD – 10 days RUT followed by 5 days DEX; R+D – RUT and DEX together for 10 days; and R – 10 days RUT. After that time, rats were killed and brains were isolated. Reduced glutathione (GSH) was assayed by the reaction with 5,5'-dithio-bis (2-nitrobenzoic acid). TBARS were expressed as a sum of the substances reacting with tiobarbituric acid, CD were expressed as the amount of doubled bonds which had a maximum absorbance at 234 nm. The TBARS and CD were also assayed in brain homogenates during lipid peroxidation induced by AAPH. Administration of dexamethasone caused the highest increase in TBARS and CD concentration which was accompanied by the highest decrease in GSH level in brain homogenates in the D-group. In contrast, TBARS and CD concentrations were the lowest and the level of GSH was highest in the R-group. Administration of rutin and dexamethasone (regardless of the treatment) resulted in TBARS and CD concentrations which were lower than in the C-group and a GSH level higher than in the C-group. Changes in TBARS and CD concentrations in experimental groups during 48 h of AAPH-induced lipid peroxidation were consistent with the results obtained from non-AAPH-peroxidated brain homogenates. The TBARS and CD concentrations both at 0 and at 48 h of peroxidation were lowest in the R-group. In conclusion, rutin appears to be a potent inhibitor of lipid peroxidation during dexamethasone-induced oxidative stress.

Communication no. 12

Effect of various phytoestrogens on lipid metabolism of isolated rat adipocytes.

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There are over 300 species of plants containing substances performing estrogenic-like action (soy, alfalfa). They are called phytoestrogens because of their origin. Some of them are also produced by Fusaria, which develop on plant seeds during poor storage conditions. Phytoestrogens ingested by animals may cause hyperestrogenic effects. They may also play a significant role in the etiology of some cancers or may reduce rates of some cancers and cardiovascular diseases. It is known that they can influence many biochemical events, e.g. lead to disorders of the oxidative chain or disturb corticosteroid synthesis. It is quite possible that phytoestrogens can also affect lipid metabolism in the same way that estrogens do. We used two phytoestrogens (genistein, zearalenone) to investigate their direct effect on lipid metabolism in isolated fat cells. Isolation of adipocytes was performed according to Rodbell (Rodbell, J. Biol. Chem. 239 (1964) 375–380). Cells from epididymal fat tissue of male Wistar rats (160 ± 5 g) were incubated for 90 min in a buffer containing phytoestrogens in the absence or presence of epinephrine (10^{-6} mol·L^{-1}) and then lipolysis was determined as the amount of glycerol released. The effect of phytoestrogens on lipogenesis was ascertained as [U-^{14}C] glucose conversion to lipids in adipocytes in the absence and presence of insulin (10^{-9} mol·L^{-1}). Differences between groups were statistically evaluated using one-way analysis of variance. We found that phytoestrogens exert a significant effect on lipid metabolism. Generally,

* Values with different letters were significantly different at $P \leq 0.05$.