

0.01% butylated hydroxytoluene ( $p < 0.001$ ). The mechanism of antioxidant activity of the peptide was by carbon centred radical scavenging, hydroxyl radical scavenging ( $IC_{50}$  value 1.60 mg/ml), metal chelating and reducing ability. The peptides were absorbed by and were not toxic to caco-2 colon cancer cells. In the presence of a prooxidant tert butyl hydroperoxide (tBHP) (2.5 mM) cell viability was 79.3 % and increased to 94.7% in the presence of peptides. Similarly, caspases-3 and -7 activity reflecting apoptosis (cell death) was higher in caco-2 cells treated with tBHP only ( $157.5 \pm 7.99$  %) compared with those treated with tBHP and peptide ( $25.7 \pm 3.92$  %). Reactive oxygen species were reduced by 26 - 39 % in endothelial cells treated with the peptide. Conclusions. Peptides isolated from mackerel flesh exhibited ACE inhibitory activity and antioxidant and ROS scavenging properties and have the potential for reducing hypertension and cardiovascular risk.

**SCHEME FOR THE STUDY OF VOLATILE COMPOUNDS FORMED BY CAROTENOID OXIDATION.** Cintia N. Kobori<sup>1</sup>, Marisa Padula<sup>2</sup>, Roger Wagner<sup>3</sup>, Delia B. Rodriguez-Amaya<sup>1</sup>. <sup>1</sup>School of Food Engineering, University of Campinas, <sup>2</sup>Institute of Food Technology, <sup>3</sup>Department of Food Science and Technology, Federal University of Santa Maria, Brazil.

Carotenoids are highly unsaturated natural pigments susceptible to degradation during food processing and storage. Despite the recognized negative consequences of this degradation, the mechanisms involved are not well elucidated. The objective of this study was to develop a scheme for the study of oxidative degradation of carotenoids in a low-moisture model system, simulating dehydrated foods, using the technique of solid phase microextraction (SPME) for the capture of the volatile compounds produced. The scheme was applied to lycopene isolated from watermelon and impregnated on microcrystalline cellulose, the volatiles being identified by GC/MS and the Kovats indices. Three types of coating fibers with different polarities were tested for SPME. The mixed fiber DVB/CAR/PDMS yielded the highest number of peaks in the chromatogram and with greater intensity. The seven main compounds corresponded to approximately 78.6% of the total peak area, the main volatile being 2-methyl-2-hepten-6-one. Three of the compounds identified had been reported in the literature as products of the degradation of lycopene, responsible for the flavor of some foods: 2-methyl-2-hepten-6-one, citral or geranial-(trans-3,7-dimethyl-2,6-octadienal) and neral (cis-3,7-dimethyl-2,6-octadienal).

**CURRENT ISSUES IN FOOD BIOCHEMISTRY AND BIOTECHNOLOGY.** Ralf Greiner, Max Rubner-Institut, Department of Food Technology and Bioprocess Engineering, Germany.

Food biotechnology is defined as the application of biological techniques to food crops, animals and microorganisms with the aim of improving the attributes, quantity, safety, ease of processing and production economics of food. Recent progress in genetic manipulation techniques enables the improvement of enzymes and whole organisms. Implementation of functional genomics programs will further help to reach the various industrial goals. Rational protein design and directed evolution approaches have made it possible to provide enzymes with improved properties for established technical applications as well as to produce enzymes tailor-made for entirely new areas of application. Furthermore, isolation of metagenomes enables considerable progress in obtaining enzymes for specific applications.

**FOOD BIOCHEMISTRY AND FOOD PROCESSING.** Gabriela Macedo, Department of Food Science, University of Campinas, Brazil.

In the last 20 years the role of food biochemistry has assumed increasing significance in all major disciplines within the categories of food science, technology, engineering, processing and biotechnology. As is well known, food biochemistry and processing are intimately related. Understanding of food biochemistry followed by developments in food biotechnology in the past decades resulted in, besides better raw materials and products, improved human nutrition and food safety, and these developments are applied in the food industry. In the near future, we should not be surprised when researchers report new developments that are food biochemistry related. This is expected in fact, due to the better trained researchers and more advanced research tools in biochemistry, processing and biotechnology.

**THE DISTRIBUTION AND CONTENT OF ANTHOCYANINS IN NEW BRS VIOLETA (BRS RÚBEA X IAC 1398-21) YOUNG WINES USING HPLC-DAD-ESI-MS/MS.** Ellen S. Lago-Vanzela<sup>1</sup>, Afonso M. Ramos<sup>1</sup>, Paulo C. Stringheta<sup>1</sup>, Esteban García-Romero<sup>2</sup>, Isidro Hermosín-Gutiérrez<sup>2</sup>, Eleni Gomes<sup>3</sup>, Roberto Da-Silva<sup>3</sup>, <sup>1</sup>Federal University of Viçosa, Brazil, <sup>2</sup>Escuela Universitaria de Ingeniería Técnica Agrícola, Universidad de Castilla-La Mancha, Spain, <sup>3</sup>São Paulo State University (UNESP), Brazil.

The distribution and content of anthocyanins in young wines made in three successive years (2009–2011) of the new 'BRS Violeta' grape has been studied using HPLC-DAD-ESI-MS/MS and it was possible to detect a total of 30 anthocyanins, with the presence of five different anthocyanidin aglycons (delphinidin, dp; cyanidin, cy; petunidin, pt; peonidin, pn; and malvidin, mv). In summary, the anthocyanin profile (molar percentage in which each anthocyanin appears) was dominated by the group of 3,5-diglucoside derivatives (96.02% of total), with high concentrations of dp (22.16%) followed by mv (16.88%) and pt (16.21%), and, in a lesser extent, cy (9.72%) and pn (9.28%). In this study, five 3-(p-coumaroyl)-glucoside-5-glucosides were detected, all together accounting for 19.93%. Only a very small amount of the acetylated derivatives (dp, cy, pt, pn and mv-3-acglc-5-glc) was detected (1.83%). Anthocyanidin 3-glucosides were also found as minor compounds (3.98%). Total anthocyanin content of wine was 694.21 mg of malvidin 3,5-diglucoside equivalents per liter of wine. 3,5-Diglucoside-type anthocyanins of BRS Violeta wine can very likely not react in order to give rise to pyranoanthocyanins (more stable pigments than their precursor anthocyanins). On the other hand, the high proportion of p-coumaroylated anthocyanins may promote the formation of copigmentation complexes in wine, thus resulting in an increase in the intensity of the red color. These results reinforce the suggestion of using grape of the BRS Violeta variety in assemblages of young wines made with other varieties of grapes that present color deficiencies.

**PREPARATION AND ISOLATION OF ANTIFREEZE PEPTIDES FROM SHARK GELATIN WITH HYPOTHERMIA PROTECTION ACTIVITY.** Shaoyun Wang, Jun Zhao, Pingfan Rao, Institute of Biotechnology, Fuzhou University, No.2 Xueyuan Road, Minhou District, China.

Antifreeze protein has been becoming a popular research point because it could inhibit ice crystal growth, reduce damage of cell membranes and maintain products' quality





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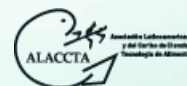


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