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REVISTA DA SOCIEDADE BRASILEIRA DE ALIMENTAÇÃO E NUTRIÇÃO



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# Abstracts - Oral Presentation

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**OR-01 - IN OVERWEIGHT WOMEN, ADIPOSITY-RELATED INFLAMMATION AND SERUM HEPCIDIN ARE INCREASED, DIETARY IRON BIOAVAILABILITY IS DECREASED AND ASCORBIC ACID HAS ONLY A LIMITED ENHANCING EFFECT ON IRON BIOAVAILABILITY****Authors:** ANA CARLA CEPEDA-LOPEZ; SOPHIA WUSSLER; ALIDA MELSE-BOONSTRA; MICHAEL BRUCE ZIMMERMANN; ISABELLE AEBERLI**Institution:** ETH ZURICH, ZURICH, SWITZERLAND**Country:** SWITZERLAND**Session:** SHORT COMMUNICATION - Date: 12/05/2014 - Room: ANTHURIUM - Time: 11:45-12:00:00**BACKGROUND**

Many transition countries are struggling with the double burden of malnutrition. Iron deficiency is more prevalent in overweight and obese (OW/OB) subjects compared to their normal weight counterparts. This association is likely a result of adiposity-related inflammation which increases hepcidin and decreases iron absorption. Because hepcidin reduces iron efflux from the basolateral enterocyte, whether luminal enhancers of iron absorption, like ascorbic acid (AA), would be effective in OW/OB subjects is uncertain.

**OBJECTIVES**

The aim of this study was to compare iron bioavailability (FeB) from non-inhibitory meals with and without AA in healthy, normal weight (NW), OW, and OB women.

**METHODS**

In a randomized crossover study in young women (NW=24, OW=19 and OB=19), FeB from a test meal without (A) and with (B) AA (molar ratio to iron, 2:1) was measured by using erythrocyte incorporation of Fe isotopic labels (Fe57 and Fe58) at 14 days. Iron status (serum ferritin, transferrin receptor), hepcidin and inflammatory markers (CRP, IL6) were determined in all subjects.

**RESULTS**

Inflammation was lower in the NW versus OW/OB (CRP:  $p=0.021$ , IL6:  $p=0.033$ ) and there was a trend towards lower serum hepcidin. FeB from meal A was 19.0 % in NW versus 12.2% in OW and 13.6% in OB (NW vs. OW/OB  $p=0.049$ ). FeB from meal B was 29.5% in NW versus 14.9% in OW and 18.4% in OB (NW vs. OW/OB  $p=0.004$ ). The %increase in FeB comparing A to B was greater in the NW (55%,  $P<0.001$ ) than in OW (22%,  $P=0.0178$ ) or OB (35%,  $P=0.008$ ). Higher hepcidin predicted lower FeB in both test meals (meal A:  $\beta=-0.458$ ,  $p<0.001$ ; meal B:  $\beta=-0.437$ ,  $p<0.001$ ).

**CONCLUSIONS**

In the present study we have for the first time been able to confirm that FeB is indeed reduced in OW and OB subjects compared to NW controls and that this seems to be associated with obesity induced subclinical inflammation and hepcidin. Moreover, the enhancing effect of AA on FeB in OW/OB subjects is blunted, consistent with the hypothesis that increased hepcidin is responsible for limited iron absorption in OW/OB subjects. Therefore, the widespread increase in obesity may limit current dietary strategies to improve FeB in iron deficient women.

**OR-02 - USING THE CACO-2/HEPG2 CELL MODEL FOR ZN TRANSPORTER STUDIES****Authors:** NATHALIE SCHEERS; ANN-SOFIE SANDBERG**Institution:** CHALMERS UNIVERSITY OF TECHNOLOGY**Country:** BRASIL**Session:** SHORT COMMUNICATION - Date: 12/05/2014 - Room: ANTHURIUM - Time: 12:00-12:15:00**BACKGROUND**

Zinc (Zn) is transported into the intestinal brush border cells mainly by ZIP4 and effluxed on the basolateral side by ZnT1. Zn is transported in the bloodstream bound to proteins and is absorbed into liver cells by means of ZIP14. During inflammation, the circulating cytokine IL-6 increases ZIP14 transporters in liver cells, which induces hypozincemia, at the same time as it increases hepcidin levels, inducing hypoferremia. Just as iron deficiency, Zinc (Zn) deficiency is commonly encountered in association with infection and inflammation. This is unfortunate since Zn is important for the immune system to fight these conditions.

**OBJECTIVES**

In this work we have investigated the effects of anti-inflammatory food-derived compounds on Zn transporter expression and hepcidin release in the Caco-2/HepG2 cell model.

**METHODS**

We have previously developed a cell model combining intestinal and hepatic epithelia in order to study mechanisms of iron absorption.

**RESULTS**

The results revealed the regulatory response of Zn and Fe transporters to the investigated food factors during IL-6 stimulation.

**CONCLUSIONS**

We conclude that the Caco-2/HepG2 cell system has potential to be used for Zn absorption studies.

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## **OR-03 - BRAZIL NUTS IMPROVE SELENIUM STATUS AND COGNITIVE PERFORMANCE IN MILD COGNITIVE IMPAIRMENT ELDERLY**

**Authors:** BÁRBARA RITA CARDOSO; VERÔNICA BANDEIRA; WILSON JACOB-FILHO; DANIEL APOLINÁRIO; ALEXANDRE LEOPOLD BUSSE; REGINA MAGALDI; SILVIA FRANCISCA COZZOLINO

**Institution:** UNIVERSITY OF SAO PAULO

**Country:** BRASIL

**Session:** SHORT COMMUNICATION - Date: 12/05/2014 - Room: ANTHURIUM - Time: 16:45-17:00:00

### **BACKGROUND**

Oxidative stress has a central role in the pathogenesis of neurodegeneration. Thus deficient status of antioxidants is associated with cognitive decline and risk of dementia.

### **OBJECTIVES**

We previously showed that Alzheimer's disease patients have deficient selenium (Se) status and low glutathione peroxidase (GPx) activity and thus we aimed to evaluate if daily consumption of Brazil nut would have a positive effect upon Se status, GPx activity and cognition in elderly with mild cognitive impairment (MCI).

### **METHODS**

31 elderly with MCI (78.0±5.3y old) were randomly divided in two groups: Brazil Nut group (BN, n=11) which received one nut (around 5 g, averaging 57.75 µg Se/g) a day for 6 mo, and Control group (CG, n=9) which did not receive anything. Se concentration in plasma and erythrocyte were determined by hydride generation flame atomic absorption spectrometry. GPx activity was assessed using a Ransel kit. Cognition was evaluated by sub-tests from Brazilian version of CERAD battery.

### **RESULTS**

Se status and GPx activity were not different between groups at baseline (Se plasma: BN=56.2±18.3µgSe/L, CG=50.0±15.5µgSe/L; Se erythrocyte: BN=59.5±20.6µgSe/L, CG=50.8±21.0µgSe/L; GPx activity: BN=40.73±15.20U/gHb, CG=44.01±17.24 U/gHb). However after 6mo treatment, Se level and GPx activity in BN were significantly higher than CG (Se plasma: BN=290.6±74.6µgSe/L, CG=47.8±11.7µgSe/L, p=0.000; Se erythrocyte: BN=574.6±181.4µgSe/L; CG=50.8±21.0µgSe/L, p=0.000; GPx activity: BN=59.55±20.79U/gHb, CG=42.54±13.05U/gHb, p=0.006). Performance on cognitive tests was not different between groups at baseline (CERAD score: BN=59.2±8.1, CG=66.71±8.2; verbal fluency: BN=12.8±3.3, CG=16.29±3.7; boston naming test: BN=11.7±2.3, CG=11.2±2.5; constructional praxis: BN=7.7±2.3, CG=8.7±2.6; word list learning test: BN=15.3±3.5, CG=15.4±3.2; word list recall: BN=3.7±2.2, CG=5.4±1.6). However, performance on verbal fluency and constructional praxis across time was significantly better on BN when compared with CG (verbal fluency: BN=14.1±3.9, change=1.3, 95% IC=0.6 - 2.6; CG=14.14±3.9, change=-2.1, 95%IC=-4.3-0.2; constructional praxis: BN=9.2±2.2, change=1.5, 95% IC=0.0-3.1; CG=8.3±2.4, change=-0.4, 95%IC=-1.6-0.7).

### **CONCLUSIONS**

Our data suggest that one Brazil nut daily may restore selenium deficiency, GPx activity and improve performance cognition and the inclusion of this nut on diet should be encouraged in selenium deficient population.

## **OR-04 - ASSESSMENT OF IRON BIOAVAILABILITY AND IRON BIOFORTIFICATION OF STAPLE FOOD CROPS: GUIDING THE BREEDING APPROACH WITH IN VITRO AND IN VIVO SCREENING TOOLS**

**Authors:** ELAD TAKO; RAYMOND GLAHN

**Institution:** USDA-ARS, ROBERT HOLLEY CENTER FOR AG&HEALTH

**Country:** UNITED STATES

**Session:** SHORT COMMUNICATION - Date: 13/05/2014 - Room: ANTHURIUM - Time: 11:45-12:00:00

### **BACKGROUND**

In recent years much has been learned about how to properly screen varieties of staple food crops to improve the Fe content and bioavailability. Research has shown that simply measuring Fe content and levels of known inhibitors such as phytic acid and total polyphenols is not adequate to guide crop breeding efforts, as this approach leads to misdirection because of inability to assess all of the genetic, environmental, and environment by genotype interactions that play a role in Fe bioavailability. Single or multiple meal human absorption studies with extrinsic labels are low throughput, expensive, and potentially problematic as extrinsic tags may not properly equilibrate with intrinsic Fe, thus leading to inaccurate estimate of absorption. Human studies with intrinsically labeled food crops yield better accuracy, however the hydroponic culture of the plant material is expensive and differences in Fe content and bioavailability may not match that of soil grown material; however, throughput is clearly an issue with this approach thus only limited studies are possible. There is therefore a defined need for screening tools that are relatively inexpensive, high throughput, and well correlated with human Fe absorption. Moreover, once Fe-biofortified crops are developed and released, there needs to be cost effective methodology in place to monitor and maintain the nutritional quality of successive harvests and revised lines.

### **OBJECTIVES**

The objective of this presentation will be to demonstrate how the combination of in vitro screening and an animal model can be extremely useful to develop and monitor Fe-biofortified crops

### **METHODS**

This presentation will report on key applications of the in vitro digestion/Caco-2 cell bioassay for Fe bioavailability, coupled with a poultry feeding model that have been developed and applied to a variety of staple food crops (eg. beans, lentils, maize, and pearl millet).

### **RESULTS**

Specific examples of high throughput applications for molecular marker assisted techniques related to maize, bean, and lentil breeding will be discussed.

### **CONCLUSIONS**

The overall conclusion to this approach is that in the in vitro digestion/Caco-2 bioassay for Fe bioavailability coupled with an animal (poultry) model of Fe bioavailability can be effective at developing and ultimately monitoring Fe biofortified foods.

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## OR-05 - IRON BIOAVAILABILITY OF CAROTENOIDS AND IRON ENHANCED CONTENT CROPS

**Authors:** HERCIA STAMPINI D MARTINO; DESIRRÊ MORAIS DIAS; MARIANA JUSTE C GOMES; NATÁLIA E GALDINO ALVES; MARIA ELIZA DE CASTRO MOREIRA; MARIA INÊS SOUZA DANTAS; SÔNIA MACHADO R RIBEIRO; MARILIA REGINI NUTTI

**Institution:** UNIVERSIDADE FEDERAL DE VIÇOSA

**Country:** BRASIL

**Session:** SHORT COMMUNICATION - Date: 13/05/2014 - Room: ANTHURIUM - Time: 12:00-12:15:00

### BACKGROUND

Iron deficiency is a nutritional problem that affects thousands of people in the worldwide. The correlation between vitamin A intake and iron status has been widely investigated. These facts have been induced researchers to develop biofortified foods with iron and carotenoids, which are of the low cost and included in the feeding habits of the Brazilian population.

### OBJECTIVES

The aim of the study was to evaluate the iron bioavailability of bean and a mix of bean and rice and/or sweet potatoes and/or pumpkin and analyzing the influence of carotenoids on iron bioavailability.

### METHODS

Foods (Pontal bean, rice, pumpkin and sweet potato) with iron, zinc and beta carotene were developed at Embrapa by the biofortification programs in Brazil: Breeding Crops for Better Nutrition (BioFORT and HarvestPlus). The iron bioavailability was assessed by bioassay by the method of depletion-repletion. Were tested seven experimental groups (n = 8): Pontal Bean (B); Rice + Pontal Bean (RB); Pontal Bean + Pumpkin (BP); Pontal Bean + Sweet Potato (BS); Rice + Pontal Bean + Pumpkin (RBP); Rice + Pontal Beans + Sweet Potato (RBS), Positive Control (ferrous sulfate). Hemoglobin was measured at the beginning and end of the repletion phase. We evaluated gain hemoglobin (GHb), Hb regeneration efficiency (HRE) and relative biological value of HRE (HRE of RBV).

### RESULTS

The experimental groups showed values of GHb similar to the control ( $6.9 \pm 1.95$ ; Dunnett,  $p > 0.05$ ), except for the groups B and RB ( $2.61 \pm 1.33$  and  $3.84 \pm 1.03$ , respectively). The test groups showed similar levels of HRE: RB ( $0.87 \pm 0.16$ ), BP ( $0.86 \pm 0.12$ ), BS ( $0.86 \pm 0.24$ ), RBP ( $0.81 \pm 0.11$ ), BRS ( $0.81 \pm 0.25$ ), which were higher than the control ( $0.76 \pm 0.14$ ), except for the group B ( $0.6 \pm 0.55$ ). The GHb values of all test-groups were similar, except of the group B. The RBVHRE indicated that BP ( $1.12 \pm 0.16$ ) and RB ( $1.13 \pm 0.21$ ), were higher than the control.

### CONCLUSIONS

The association of bean and pumpkin, or rice and bean are a good strategy to increase iron bioavailability and prevent iron deficiency.

ACKNOWLEDGMENT: EMBRAPA, HARVESTPLUS, FAPEMIG, CAPES, CNPQ and UFV

## OR-06 - DETERMINANTS OF CIRCULATING FOLIC ACID AMONG POPULATION WITH MANDATORY FORTIFICATION: POPULATION BASED SURVEY IN SAO PAULO - BRAZIL

**Authors:** JOSIANE STELUTI; REGINA MARA FISBERG; DIRCE MARIA LOBO MARCHIONI

**Institution:** SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF SAO PAULO

**Country:** BRASIL

**Session:** SHORT COMMUNICATION - Date: 13/05/2014 - Room: ANTHURIUM - Time: 16:45-17:00:00

### BACKGROUND

High oral doses of folic acid have been shown to bypass the normal folate absorption mechanism, resulting in circulating form of the vitamin. Several adverse health outcomes have been associated with exposure to high intakes of total folate and folic acid. Existing levels of circulating folic acid (FA) increased after fortification. In Brazil, the mandatory fortification of flour with FA has occurred since 2004.

### OBJECTIVES

The goal of this research is to determine the prevalence of detectable circulating FA and to assess the determinants of circulating FA.

### METHODS

This is a cross-sectional population-based survey that included 750 residents in Sao Paulo City-Brazil. The participants provided fasting blood samples. Samples were assayed for total plasma folate, circulating FA, homocysteine (hcy), vitamin B6 and B12. Affinity/HPLC with electrochemical detection method was used to measure circulating FA. DNA was isolated and the genotypes were determined by RT-PCR system. Generalized linear models (GLM) with Gaussian distribution and log link function were applied to model circulating FA according to sex, age, smoking, hcy, B12, B6, folate and polymorphism (C677T MTHFR: CC and T-carriers; A1298C MTHFR: AA and C-carriers; deletion in DHFR: non-del/del and del/del). The descriptive analyses were performed with STATA version 10.0 and GLM were run in R, version 3.0.2.

### RESULTS

The mean of age was 46.2 y (95% CI: 44.4-47.9), and women accounted for 58.1% of the study population. Only 2.2% of population had serum folate  $< 6.8$  pmol/ml (3ng/ml), cut-off of deficiency. Circulating FA was detected in 80% of the population with a mean concentration of 2.29 pmol/ml (95% CI: 1.92-2.65) in men and 2.19 pmol/ml (95% CI: 1.95-2.47) in women. Significant effects of female ( $p < 0.02$ ), age ( $p < 0.001$ ), total folate ( $p = 0.001$ ), homozygotes for the deletion in DHFR ( $p = 0.035$ ) and vitamin B6 ( $p = 0.001$ ) were found in GLM. An increase of one pmol/ml in folate was associated with increased of 1.46% in circulating FA considering fixed effects of all others variables in the GLM.

### CONCLUSIONS

Higher levels of folate are associated with higher levels of circulating FA. The finds point the mandatory fortification with folic acid has resulted in high exposure to circulating FA. There is growing experimental evidence that higher circulating folate levels can contribute to adverse effects. Further research is needed to elucidate these complex relationships, and to guarantee the safety of exposure to folic acid.

FAPESP - 2010/19899-5

## **OR-07 - A CHEAP, SAFE AND BIOAVAILABLE NOVEL IRON SUPPLEMENT BASED ON DESTABILISED FERRIHYDRITE NANOPARTICLES: A REVIEW OF FINDINGS**

**Authors:** DORA IA PEREIRA; MOHAMAD F ASLAM; JONATHAN J POWELL

**Institution:** MRC HUMAN NUTRITION RESEARCH

**Country:** UNITED KINGDOM

**Session:** SHORT COMMUNICATION - Date: 13/05/2014 - Room: ANTHURIUM - Time: 17:00-17:15:00

### **BACKGROUND**

Data from the 1970s and 1980s, as well as very recently from our laboratory, indicates that dietary non-haem ferric iron forms destabilised iron oxo-hydroxide nanoparticles during digestion in the intestinal lumen. Moreover, these particles resemble the iron core of ferritin (i.e. ferrihydrite). A nano route for the intestinal uptake of the intact iron core from ferritin has been recently described (1-4) which, we believe, is the normal route for digested dietary ferric iron that forms iron oxo-hydroxide nanoparticles in the lumen (5-7).

### **OBJECTIVES**

Our aim was to develop a cheap, safe and bioavailable novel iron supplement for the treatment of iron deficiency anaemia that was based on destabilised ferrihydrite nanoparticles that mimic the ferritin iron core, and the digestion product of dietary ferric iron.

### **METHODS**

We have synthesized tartrate-modified ferrihydrite nanoparticles and characterised their physico-chemical properties using TEM, XRD, FTIR and dynamic light scattering (6). We have used rodent models and human pilot studies to determine the bioavailability of this material. Furthermore, we have used animal and cellular models to evaluate gut-related toxicity.

### **RESULTS**

Tartrate-modified ferrihydrite nanoparticles with an hydrodynamic size of 10 nm showed ~80% relative absorption to ferrous sulphate in iron deficient female subjects and were equivalent to ferrous sulphate at repleting haemoglobin levels in rats (6). Furthermore, these nanoparticles are taken up endocytically by Caco-2 cells and broken down in the endosome/lysosome before joining the cellular labile iron pool (5). In gut cell models, the nanoparticulate ferrihydrite was more than 10-fold less toxic than Fe(II) ascorbate and in animal models it did not impact negatively on the most predominant bacteria genera of the faecal microbiota (unpublished data).

### **CONCLUSIONS**

Taken together our data show that nanoparticulate tartrate-modified ferrihydrite is similarly bioavailable to soluble ferrous sulphate but without its potential for gut toxicity.

Acknowledgments: This work was funded by the UK Medical Research Council (MRC) (U105960399). We acknowledge our scientific collaborators on this work: David Frazer, Mani Tagmount, Chris Vulpe, Gregory Anderson, Yemisi Latunde-Dada and Andy Brown.

References 1. *AJP Gastrointest Liver Physiol* 304, G655 (2013). 2. *J Nutr Biochem* 20, 304 (2009). 3. *J Nutr* 138, 659 (2008). 4. *J Nutr* 142, 478 (2012). 5. *PLoS One* 8, e81250 (2013). 6. *Nanomedicine Under Review*. 7. *Digestion* 8, 53 (1973). MEDICAL RESEARCH COUNCIL

## **OR-08 - ADDING VALUE TO THE BY-PRODUCTS FROM COMMERCIAL JUICE PROCESSING**

**Authors:** ESTHER MAYER-MIEBACH; KARLIS BRIVIBA; MARTA ADAMIUK; CORINNA GIENGER; MARION WINKLER; KERSTIN ZIETEMANN; RALF GREINER; DIANA BEHSNILIAN

**Institution:** MAX RUBNER-INSTITUT

**Country:** GERMANY

**Session:** SHORT COMMUNICATION - Date: 14/05/2014 - Room: ANTHURIUM - Time: 11:45-12:00:00

### **BACKGROUND**

A high consumption of fruit and vegetables is generally associated to a reduced risk of cardiovascular diseases, certain cancers and degenerative diseases. This is mainly due to high contents of several bioactive secondary plant metabolites (SPM). However, bioactive SPM are tightly associated with the plant tissue. During commercial production of fruit and vegetable juices SPM remain to a high extent within the pomace, a byproduct. Some approaches towards pomace valorisation are carried out, e.g. as supplements for food fortification, production of bioethanol or as feed, but the great volumes of pomace generated still represent an environmental and sustainability challenge.

### **OBJECTIVES**

Our aim was to investigate whether a wet micro-milling process is suitable to produce materials from pomace with particle size distributions in the submicron and/or nanosize range. Concerning bioavailability of SPM, the influence of particle size on their release from the milled plant tissue and their cellular uptake in vitro was of interest.

### **METHODS**

Chokeberry, apple and carrot pomace were coarsely milled in a cutting mill and subsequently micro-milled in a continuously operating laboratory scale agitator bead-mill. SPM were measured by HPLC in order to assess their stability during processing and their release from the submicron/nanosized plant materials. Cellular uptake and cytotoxicity of nanosized materials were evaluated using Caco-2 cells.

### **RESULTS**

Nanosized materials with averaged particle sizes ( $\times 50.0$ ) of about 90 nm were obtained by micro-milling chokeberry and carrot pomace. Lycopene and  $\beta$ -carotene contents (carrot) decreased by about 10%, while anthocyanins and hydroxycinnamic acid contents (chokeberry) remained unchanged. In contrast, particle sizes in the micrometre range and reduced polyphenols contents (65%) resulted from micro-milling of apple pomace. No cytotoxic effects were detected. The cellular uptake of quercetinglycosides (apple) and  $\beta$ -carotene/lycopene was about 2-3-fold higher after micro-milling as compared to the coarsely milled material.

### **CONCLUSIONS**

The results indicate a significant effect of the particle size of plant materials on the in vitro bioavailability of bioactive SPM. It was demonstrated that milling and micro-milling processes may be applied in order to obtain plant material products rich in bioactive SPM from the byproducts of commercial vegetable and fruit juice production.

# BIOAVAILABILITY 2014

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MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## **OR-09 - IN VITRO AND IN VIVO EVALUATION OF THE METABOLISM OF POLYPHENOLS FROM JABOTICABA (MYRCIARIA JABOTICABA (VELL.) BERG), A BRAZILIAN NATIVE FRUIT**

**Authors:** MARCELA ROQUIM ALEZANDRO; PASCAL DUBÉ; YVES DESJARDINS; FRANCO MARIA LAJOLO; MARIA INÉS GENOVESE

**Institution:** UNIVERSITY OF SAO PAULO

**Country:** BRASIL

**Session:** SHORT COMMUNICATION - Date: 14/05/2014 - Room: ANTHURIUM - Time: 12:00-12:15:00

### **BACKGROUND**

Ellagic acid derivatives are the main polyphenols found in jaboticaba (*Myrciaria jaboticaba* Vell. Berg), a Brazilian native fruit. Those compounds are known due to their cancer chemopreventive, cardioprotective and antioxidant potential. However, little is known about their metabolites, which are the biologically active compounds indeed.

### **OBJECTIVES**

Here, the aim was to investigate the metabolism of different classes of polyphenols, especially ellagitannins and ellagic acid derivatives, from jaboticaba in both in vitro and in vivo assays.

### **METHODS**

The metabolites formed from the jaboticaba polyphenols were identified in an in vitro fermentation model using human feces. In addition, the fate of a wide variety of metabolites was monitored after intragastric administration of jaboticaba extract (15 min – 8 h) in Wistar rats, using an UPLC-MS.

### **RESULTS**

The in vitro experiment showed that the ellagic acid derivatives were metabolized by the intestinal microbiota and degraded under testing conditions. Two compounds were identified after fermentation with fecal inoculum, p-hydroxybenzoic and p-hydroxyphenylacetic acids. In vivo, thirty eight metabolites were identified in plasma, stomach, liver, kidneys, brain, muscle and colon, and most of them were formed from ellagic acid derivatives.

### **CONCLUSIONS**

The dietary polyphenols are effective substrates for the action of the microbiota in human colon and are extensively metabolized, forming simpler phenolic or non-phenolic compounds. The type and amount of compounds generated by metabolism are influenced by the interindividual differences, which here was minimized by the use of a pool of feces. It is known that the formation of metabolites is essential for the absorption and consequently, their presence in target tissues in chemical form and concentration adequate to exert their physiological role. Thirty eight compounds were identified as metabolites formed from different classes of jaboticaba polyphenols and they were widely distributed in many biological tissues and plasma. The data obtained in this study are the first step towards the elucidation of the bioavailability of phenolic compounds from jaboticaba and provide important information about the possible compounds that may be found in the human body after consumption of this fruit.

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# Abstracts - E-Poster Presentation

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# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## **EP-01 - BONE MASS AND MICRO-ARCHITECTURE ARE IMPAIRED BY FEEDING GROWING RATS WITH A HIGH-FAT DIET**

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**Institution:** UNIVERSITY OF SÃO PAULO

**Country:** BRASIL

**Session:** TV1 - Date: 12/05/2014 - Room: FOYER - Time: 10:00-10:05:00

### **BACKGROUND**

Metabolic and immune derangements as a result of over-nutrition/ energy-dense diets could affect in an integrated manner the whole-body homeostasis at cellular and systemic levels.

### **OBJECTIVES**

In this study, we tested the hypothesis that feeding Wistar growing rats with a high-fat (HF) diet led to changes in bone mineral density (BMD), micro-architecture and bone metabolism.

### **METHODS**

Weanling male rats were assigned into control (7% lipids, soybean oil; n=6) and HF (32% lipids, a mix of soybean oil and lard; n=10) groups and euthanized after 8 weeks. An intraperitoneal IIT was performed in 12h-fasted animals. Body composition and femur BMD were evaluated by dual-energy X-ray absorptiometry. Micro-architectural changes in the femoral trabecular bone were assessed by micro-computed tomography. A three-point bending test was performed to measure bone biomechanics in the mid-diaphyseal region of the right femora. Femur minerals (Ca, Mg and Zn) were measured by atomic absorption spectrophotometry. Serum insulin and bone biomarkers (serum osteocalcin, 24h-urine deoxypyridinoline [DPD]) were analyzed by ELISA.

### **RESULTS**

HF rats had higher energy intake and body weight gain ( $P < 0.01$ ) compared to controls. HF feeding led to increased adiposity, insulin resistance and hyperinsulinemia, as well as decreased distal femur BMD and serum osteocalcin levels compared to controls. No effects were observed in bone strength and urinary DPD excretion between groups. Femur Ca was not affected whereas Mg and Zn were impaired by HF feeding. Despite being heavier, HF rats had lower femoral bone volume and trabecular thickness than controls ( $P < 0.05$ ). Moreover, serum osteocalcin was negatively associated with body fat ( $r = -0.56$ ,  $P = 0.03$ ) and insulin resistance ( $r = -0.61$ ,  $P = 0.02$ ).

### **CONCLUSIONS**

These findings suggest that increased adiposity induced by dietary lipid overload negatively influences the bone mass and micro-architecture due to impairment in bone formation. The consequences of insulin resistance and changes in bone minerals on these effects are currently being investigated in our laboratory.

FAPESP - 2010/05644-5; 2012/16284-5

## **EP-02 - SODIUM OFFER IN MUNICIPAL DAYCARE CENTERS, DETERMINED BY LABORATORIAL ANALYSIS, EXCEEDS THE UL FOR INFANTS BETWEEN 12 AND 36 MONTHS OF AGE**

**Authors:** ANABELLE RETONDARIO; LETÍCIA MAZEPA; MÁRCIA AURELINA DE O. ALVES; SÍLA MARY R. FERREIRA; DÉBORA LETÍCIA F. SILVA

**Institution:** UNIVERSIDADE FEDERAL DO PARANÁ

**Country:** BRASIL

**Session:** TV1 - Date: 12/05/2014 - Room: FOYER - Time: 10:06-10:11:00

### **BACKGROUND**

Two decades ago, the majority of infants in preschool age had feeding experiences at their own homes. In recent times, as a result of woman's placing in the job market, many remain full-time in educational institutions, what illustrates school importance in feeding and in forming eating habits. School feeding must provide healthy foods, suited to the age group of the students. Though sodium is essential to the organism, its excessive consumption may lead to rise of the arterial pressure, compromising kidneys and heart.

### **OBJECTIVES**

To evaluate the offer of sodium to infants between 12 and 36 months in municipal daycare centers, in a city in the metropolitan area of Curitiba, through laboratorial analysis.

### **METHODS**

Samples were collected from six daily meals provided to children between 12 and 36 months, in four municipal daycare centers, in the period of June to November 2013, for 20 nonconsecutive days, totaling 120 samples. During the serving of foods, the medium sized of the served portions in each meal were identified, through direct weighing of the plates ready for consumption. The content of sodium in each sample was determined in laboratory through the method of chlorides by volumetry, with silver nitrate (IAL, 2008). The results found were compared with the tolerable upper intake level (UL) established for the age group (1500mg/Day).

### **RESULTS**

The average amount of sodium served to children was 1255 mg/Day, which represents 83.7% of the UL for the age group. This value exceeds 80% of the tolerable upper intake level and was offered to the children attending the daycare center full-time, staying from eight to ten hours in the institution. The result confirms the concern with excessive consumption of sodium in the age group and the risk of early development of hypertension and cardiovascular disease. Furthermore, WHO and the Brazilian Ministry of Health do not recommend the addition of salt to the foods of children younger than two years old. Moreover, It was observed the presence of industrialized products in the menu, with excess of fat, sugar and sodium, and thus, they should not be a part of the feeding of children in this age group, especially if offered through school feeding.

### **CONCLUSIONS**

The average quantity of sodium provided in daycare centers exceeds 80% of the UL for children between 12 and 36 months of age, indicating hazard to the development of hypertension and cardiovascular disease. The school feeding should be improved to offer healthy foods and to promote healthy feeding habits.

**EP-03 - PREVALENCE OF ZINC DEFICIENCY AND STUNTING AMONG PRESCHOOL CHILDREN**

**Authors:** BRUNA ZAVARIZE REIS; DIVA ALIETE SANTO VIEIRA; DAYANNE COSTA; DANIELLE GÓES SILVA; RAQUEL SIMÕES MENDES-NETTO; SILVIA MARIA FRANCISCAT COZZOLINO

**Institution:** UNIVERSITY OS SÃO PAULO

**Country:** BRASIL

**Session:** TV1 - Date: 12/05/2014 - Room: FOYER - Time: 10:12-10:17:00

**BACKGROUND**

Zinc deficiency is considered one of the nutritional deficiencies of greatest epidemiological importance, having a major impact in the public health context worldwide. It is believed that approximately one third of the world's population has zinc deficiency. The consequences of this deficiency include since impairment the growth and development of children and adolescents, to damage the immune system, and is considered one of the risk factors most determinants on child growth deficit.

**OBJECTIVES**

Assess the nutritional status of zinc in preschool children and the prevalence of growth deficits.

**METHODS**

Were evaluated 139 children aged between 32 and 76 months who were enrolled in philanthropic nursery schools in Aracaju, Sergipe, Brazil. The nutritional status of zinc was assessed in plasma and erythrocytes by the method of atomic absorption spectrophotometry flame. Were considered zinc deficiency in plasma values below 65 µg/dL and erythrocyte values below 40 µgZn/g Hb. For height measurement a portable stadiometer was used, in which children were standing barefoot. For the classification of growth deficit was used the anthropometric index height-for-age, expressed as z-score. Children whose index was less than -2 z-score were considered with stunting.

**RESULTS**

The children had on average  $56.3 \pm 11.1$  months, height of  $107.7 \pm 7.9$  cm, plasma zinc levels of  $74.26 \pm 13.37$  µg/dL and  $26.46 \pm 5.64$  µgZn/g Hb on erythrocyte. It was observed that 26.6% of the children had zinc deficiency in plasma and 99.3% showed this deficiency in erythrocytes. Only 3.0% of children had low height for age (< -2 z-score), however 12.9% had risk of impaired height (< -1 z-score and  $\geq -2$  z-score). Children with plasma zinc deficiency were significantly shorter ( $p=0.034$ ) and younger ( $p=0.035$ ), with a positive correlation between age and plasma zinc levels ( $r=0.174$ ,  $p=0.040$ ). However, there was no correlation between height and plasma zinc levels ( $r=0.145$ ,  $p=0.087$ ) or erythrocyte ( $r=0.153$ ,  $p=0.072$ ).

**CONCLUSIONS**

The high prevalence of zinc deficiency among children assessed indicates a serious public health problem, a nutritional intervention is recommended to increase the intake of this nutrient and avoid developmental disorders.

**EP-04 - SEQUENTIAL EXTRACTION AND POTENTIAL BIOAVAILABILITY OF ANTIOXIDANT AND MINERAL ELEMENTS IN FRUIT AND VEGETABLE RESIDUE FLOUR**

**Authors:** LUANA SARPA REIS; MONICA CRISTINE P SANTOS; ANA ELIZABETH C FAI BUARQUE DE GUSM; ÉDIRA C B A GONÇALVES

**Institution:** UNIVERSIDADE FEDERAL DO ESTADO DO RIO DE JANEIRO

**Country:** BRASIL

**Session:** TV1 - Date: 12/05/2014 - Room: FOYER - Time: 10:18-10:23:00

**BACKGROUND**

It is known that there is no general protocol for sequential extraction in foods, and therefore the nature of the sample should be always taken into consideration. Mechanisms of sequential extraction in foods should be stimulated to provide a better understanding of metal speciation in the matrix, as well as mobility and bioavailability.

**OBJECTIVES**

The aims of this study were: i) to evaluate the total content of copper, iron, magnesium, manganese and zinc in in fruit and vegetable residue (FVR) flour; ii) to evaluate chemical forms of the FVR flour through the sequential extraction method during storage; and iii) to measure the antioxidant capacity of the FVR flour through the sequential extraction method.

**METHODS**

To evaluate mineral elements the sequential extraction was used in this sequence: 1M calcium chloride; 0.5M acetic acid/ 5% ammonium acetate (pH5.0); 0.5M acetic acid and 0.5M hydrochloric acid. Each extractor was in contact with the sample for one hour. The fractions obtained with sequential extraction were performed in triplicate and were analyzed by flame atomic absorption spectrometry. To determine the antioxidant capacity the following extractors were used: distilled water; ethanol; methanol; methanol: ethanol (2:1); methanol: ethanol (1:1). DPPH free radical-scavenging assay was performed to measure the antioxidant capacity in FVR flour. The free radical-scavenging activity of was measured using the method described by Brand-Williams (1995).

**RESULTS**

At least five distinct chemical species of each metal were analyzed, which could influence the bioavailability and metabolic processes inherent in the sample itself. It also was observed that storage for up to 60 days did not affect the total content of the metals. However, changes were observed in the chemical structure of the sample, which influenced the profile extraction of the metals. In the DPPH test it was observed that all extracts possess high antioxidant activity and free radical scavenging activity. 53% and 49% of free radical was reduced in each FVR flour extractor at time zero and 90 days, respectively.

**CONCLUSIONS**

Experimental data suggest that sequential extraction method provides more reliable values of mineral elements and antioxidant capacity, avoiding possible underestimate results. The use of different extractors can help in the elucidation of bioavailability of the chemical forms in food matrices.

**EP-05 - IMPACT OF FUNCTIONAL INGREDIENT INTAKE ON SATIETY HORMONES**

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**Institution:** UNIVERSITY OF SAO PAULO, NAPAN-USP, FORC-CEPID

**Country:** BRASIL

**Session:** TV1 - Date: 12/05/2014 - Room: FOYER - Time: 10:24-10:29:00

**BACKGROUND**

The intake of unavailable carbohydrates - functional ingredients - has presented an inverse relationship with the risk for non-transmissible chronic diseases. The unripe banana flour (source of resistant starch - 55%) is among these ingredients.

**OBJECTIVES**

To evaluate in healthy volunteers the impact of regular and discontinued consumption of unripe banana flour (UBF) for 6 weeks on parameters related to satiety.

**METHODS**

A medium-term clinical assay was conducted with healthy volunteers, males and females (n=32), who were oriented to consume soup, added UBF (UBF group) or maltodextrin (Control group), 3 times a week, during six weeks. Prototypes of two different kinds of frozen soups were elaborated by a food industry. Before and after the intervention, two parameters were evaluated: 1) plasma concentration of gastrointestinal hormones related to satiety; 2) evaluation of hunger/satiety by the Visual Analogue Scale, which is a subjective appetite measure. Blood collection and questionnaire application were done for 180 minutes after the consumption of breakfast ad libitum.

**RESULTS**

The consumption of UBF (8 g) for six weeks (3 times/week), comparing to the period before the intervention, provided significant satiety (T180 min), reduction of hunger (T0 and 180 min), and prospective food consumption and desire to eat (T180 min). These effects were accompanied by positive post-prandial variation in plasmatic levels of gastrointestinal hormones, with lower increase of ghrelin (T0, T60, T120 and T180 min) and decrease of insulin (T0 and T180 min), hormones related to hunger in high levels, as well as PYY increase in all times, which means higher satiety. When Control and UBF groups were compared after the intervention, the UBF group presented reduction in ghrelin (T0, 120 and 180 min) and insulin (T0 and 180 min), increase in PYY (T30 and 180 min) and significant difference in T0 for hunger and satiety parameters.

**CONCLUSIONS**

The UBF is an ingredient that presents several positive effects on satiety and may be used in the elaboration of products that stimulate healthy eating habits.

a-Food Research Center (FoRC/CEPID/FAPESP) and Food and Nutrition Research Center (NAPAN/USP); b-Department of Food and Experimental Nutrition, School of Pharmaceutical Sciences (FCF), USP; c-Post-graduation Program on Food Science; d-Sadia S.A.

Acknowledgements: CAPES (PNPD/2009) and CNPq (Process 559349/2010-6).

**EP-06 - ASSOCIATION BETWEEN C-REACTIVE PROTEIN, MICROALBUMINURIA AND RISK FACTORS OF THE METABOLIC SYNDROME**

**Authors:** ERIJESSYKA MARI OLIVEIRA MATOS; EDILENE MARIA QUEIROS ARAÚJO; LUAMA ARAÚJO SANTOS; RADAMÉS COUTINHO; DOMINGOS LÁZARO SOUZA RIOS

**Institution:** UNIVERSIDADE DO ESTADO DA BAHIA

**Country:** BRASIL

**Session:** TV2 - Date: 12/05/2014 - Room: FOYER - Time: 10:00-10:05:00

**BACKGROUND**

Metabolic Syndrome (MetS) is an important public health problem. The stimulus to the production of C-reactive protein (CRP) in the liver or adipose tissue is a strong predictor of cardiovascular risk, and potent inflammatory marker. Microalbuminuria, in turn, corresponds to an independent marker of progressive renal disease and cardiovascular events, which can be used to assess these changes. Although they are not part of the diagnostic criteria for MetS, mark its progression.

**OBJECTIVES**

Determine the prevalence of microalbuminuria and its association with creatinine, urea, uric acid, glucose and fasting insulin, triglycerides, total cholesterol and fractions, test of HOMA IR in patients with MetS, as well as to evaluate CRP values and their relationship as such markers.

**METHODS**

Cross-sectional Study, between April to August 2013, with 58 individuals, patients with metabolic Syndrome, submitted to collection of height and weight, as well as waist circumference and abdominal, systemic blood pressure and dosages of biochemical tests (test for microalbuminuria, creatinine, urea, uric acid, glucose and fasting insulin, triglycerides, total cholesterol and fractions, test of HOMA IR).

**RESULTS**

It was found prevalence 19% of microalbuminuria, 70% coursed with triglycerides elevados, 100% with HDL-c reduced, without changing the fractions of LDL-c and total cholesterol and 54.5% prevalence of insulin resistance, with greater prevalence of high uric acid. Average Values of CRP are higher in women and idosos. Hipertens to obtained higher incidence, followed by the HDL-c, hyperglycemia and hypertriglyceridemia. Without significance between CRP and systolic and diastolic blood pressure, waist circumference and blood glucose of jejum. Correla dog positive between CRP and HDL-c; BMI and percentage of body fat, and negative between the CRP and triglycerides. Insulin resistant exhibited higher average CRP, without correlation with the HOMA-IR values and between CRP and total cholesterol and LDL-c, and lactose intolerance.

**CONCLUSIONS**

Strong relationship between Microalbuminuria and risk factors of MetS and hypertension and diabetes. Monitoring of albumin excretion rate, especially among the diabetic and hypertensive patients, for which the renal function and cardiovascular is assessed in the most appropriate manner to avoid future complications. Predictors, high prevalence and development of microalbuminuria found in this study are modifiable and nutrition plays an important role in this treatment.

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## EP-08 - IRON AND TRACE ELEMENTS AMONG INFANTS AND ASSOCIATED FACTORS

**Authors:** ANNE JARDIM BOTELHO; GILBERTO SIMEONE HENRIQUES; CLAUDIMARY SANTOS; ALCEU JORDÃO; RICARDO QUEIROZ GURGEL; FERNANDA FARO; FERNANDA SOUTO; LUIS CUEVAS

**Institution:** UNIVERSIDADE FEDERAL DE SERGIPE

**Country:** BRASIL

**Session:** TV2 - Date: 12/05/2014 - Room: FOYER - Time: 10:12-10:17:00

### BACKGROUND

Although underweight is becoming less prevalent in these countries, other forms of malnutrition coexist with overweight. Micronutrient deficiencies represent the most generalized form of malnutrition in the world, and the inclusion of micronutrient status assessment in nutritional epidemiological research is of particular importance to approach the nutritional transition phenomenon.

### OBJECTIVES

This study describes the biochemical iron, zinc, copper, and selenium status of infants from a low income area in Brazil and their association to infant feeding, weight gain velocity and weight-for-length.

### METHODS

A prospective cohort study enrolling full-term infants, aged from 2 to 11 months. Hemoglobin, plasma ferritin, zinc, copper and selenium, and erythrocyte zinc and copper were assessed every 6 months of follow-up. Children with hemoglobin <11g/dL received iron supplementation. Multivariate linear regression analysis verified the mutual associations between micronutrients.

### RESULTS

153 infants underwent anthropometry to obtain length and weight and blood assays for hemoglobin, ferritin, plasma selenium, plasma and erythrocyte zinc and copper concentrations. 102 (68%) children had anemia (Hb <11.0 mg/dl), 59 (40%) iron deficiency, 139 (91%) low plasma selenium, 86 (57%) and 77 (51%) had low plasma and erythrocyte zinc concentrations, and 8 (5%) and 123 (82%) low plasma and erythrocyte copper. Breastfeeding and older age were independently associated with lower plasma ferritin concentrations. Zinc, copper and selenium concentrations were not associated with infant feeding. Weight gain velocity and weight-for-length z-score did not predict trace elements concentrations.

### CONCLUSIONS

Blood zinc, copper and selenium concentrations did not differ by feeding practices or weight status. Trace element deficiencies in infancy are associated with factors other than anthropometry.

## EP-10 - EVALUATION OF ACCEPTANCE OF PINEAPPLE, BANANA AND APPLE AND ITS DERIVATIVES IN SCHOOL

**Authors:** IVY CAZELLI PIRES; NARDJARA LEÃO; GREICYLANE NEVES SILVA; SAMILLI TAMARA SILVA; LUCILENE SOARES MIRANDA; MANUELA MARQUES RODRIGUES

**Institution:** UFVJM - DIAMANTINA

**Country:** BRASIL

**Session:** TV2 - Date: 12/05/2014 - Room: FOYER - Time: 10:24-10:29:00

### BACKGROUND

It is quite concerning the current food profile of children, characterized by a high consumption of sweets, fats and soft drinks and low intake of fruits, vegetables, roots and tubers. It is reported that what defines food intake by children is not its nutritional value, but the taste. The school-age child begins to develop autonomy to decide what to eat, however slightly is known about the acceptance of fruit per children making necessary to implement the nutrition education in order to aware them about healthy eating.

### OBJECTIVES

The objective of this study was to determine the acceptance of fruit "in natura" and some fruit-based preparations for school.

### METHODS

Samples of carrot cake, cereal bar, fresh fruit with gelatin and both pumpkin bread stuffed with apple, banana and pineapple and its fruits "in natura", have been evaluated by a minimum of 100 children 8-10 years not trained according to the suggested by STONE AND SIDEL for testing centrally located in Diamantina's schools. It was used for acceptance mixed hedonic scale of 7 points in local test given by the directors in their own school. The results acceptance tests (facial hedonic scale of 7 points) were analyzed by the chi-square at 5% of probability.

### RESULTS

It was observed that both tests with banana "in natura" (with acceptance of 94.57%), as apple "in natura" (with acceptance of 94.14%) as pineapple "in natura" (89.00%) and carrot cake with pineapple filling (86.28%), banana (79.71%), apple (73.86%) and fresh pineapple with gelatin (79.00%) and cereal bar pineapple (70.29%) were well accepted. According to the calculation of the revenue presenting a percentage above 70% acceptance rate, are considered as accepted, due to this reason it was observed that the preparation "pumpkin bread" was below the accepted percentage, and stuffed with pineapple showed 62.86% acceptance, with apple and banana 58.14% 49.57%.

### CONCLUSIONS

We have found that pineapple "in natura" was the one with the best acceptance in form of meals. By knowing the acceptability of children of different products containing fruit, this knowledge could be used to try to improve the quality of life.

SUPPORT: FAPEMIG, CNPq and PROEXC/ UFVJM.

**EP-11 - EVALUATION OF THE RS1050450 POLYMORPHISM OF GLUTATHIONE PEROXIDASE 1 (GPX1) IN HEALTHY INDIVIDUALS AND ITS RELATIONSHIP WITH OXIDATIVE STRESS**

**Authors:** KALUCE G. S. ALMONDES; SUELI M TEIXEIRA LIMA; HEILA D. S. P AGUIAR; CAMILA M. S. REVOREDO; KYRIA J. C. CRUZ; KÁTIA R. A. CALLOU; GRAZIELA S. BIUDE; JOSÉ A. C. PIMENTEL; DILINA N. MARREIRO; NADIR N. NOGUEIRA; SILVIA M. F. COZZOLINO

**Institution:** UNIVERSIDADE DE SÃO PAULO

**Country:** BRASIL

**Session:** TV3 - Date: 12/05/2014 - Room: FOYER - Time: 10:00-10:05:00

**BACKGROUND**

Oxidative stress occurs due to the accumulation of substances that cause oxidative damage to biomolecules such as DNA, lipids and carbohydrates. Studies have shown that individuals with chronic non-communicable diseases (NCDs) which have rs1050450 polymorphism of glutathione peroxidase 1 (GPx 1) present higher level of oxidative stress.

**OBJECTIVES**

This study aims to evaluate the state of oxidative stress in healthy subjects according to the genotyping of rs1050450 polymorphism in GPx1.

**METHODS**

University students that had no NCDs, not ingested vitamin or mineral supplements, anti-inflammatory and chronic alcohol, not pregnant, not elite athletes were selected. Venous blood was collected for analysis of GPx1 genotype (rs1050450), of the activity of GPx enzymes and erythrocyte superoxide dismutase (SOD) and of the total plasma antioxidant capacity. Analysis of genotyping was performed by PCR in real-time with StepOne Plus using probes and primers of Life Technologies and the enzymes in an automatic biochemical analyzer using a RANDOX commercial kit. To the total antioxidant capacity was used the method of absorption capacity of oxygen radicals (ORAC) in a microplate reader. Statistical analysis was performed using SPSS 14.0 software. Mann-Whitney and Student's t test was used for comparison of mean of the variables according to the normality and homogeneity of data.

**RESULTS**

343 healthy subjects with a mean age of  $24.4 \pm 5.0$  years participated of the study, where 57.7% were female. Of the total, 47.8% had polymorphism in GPx1. Individuals with this polymorphism had significantly lower GPx activity ( $11981,22 \pm 3814,10$  e  $10680,50 \pm 3029,73$  U/L;  $p=0,005$ ) and higher concentration of ORAC ( $0,96 \pm 0,22$  e  $1,02 \pm 0,23$   $\mu\text{mol}$  Equivalente de Trolox/mL;  $p=0,007$ ). The SOD activity was similar among individuals who did not have the polymorphism ( $338.29 \pm 84.09$  U/mL) and those who had presented ( $352.80 \pm 91.40$  U/mL).

**CONCLUSIONS**

By the results we can conclude that participants who have polymorphism rs1050450 are subject to high oxidative stress, with reduced GPx activity and increased total antioxidant capacity. This occurs probably to keep the organism in balance and reduce the risk for diseases that involve the formation of free radicals. CNPQ - 141366/2012-5

**EP-12 - ANTIOXIDANT ACTIVITY OF ANNONA SQUAMOSA L. X ANNONA CHERIMOLA MILL. (ATEMOYA)**

**Authors:** LETÍCIA MAZEPA; OBDÚLIO GOMES MIGUEL; CLÁUDIA C. HECKE KRUGER

**Institution:** UNIVERSIDADE FEDERAL DO PARANÁ

**Country:** BRASIL

**Session:** TV3 - Date: 12/05/2014 - Room: FOYER - Time: 10:06-10:11:00

**BACKGROUND**

Interest in use of natural products has been increasing in recent years by both pharmaceutical and food industry, especially due the presence of several bioactive compounds known to be essential for human health. Fruits have been associated with a protective role in maintaining health, its benefits in human diet are strongly supported by scientific evidence. The quantification of the bioactive components of both fruits as byproducts, is relevant to understanding its nutritional value, adding value to these products in market and enabling development of genres from the wasted fractions, increasing its interest in agribusiness and promoting health to population.

**OBJECTIVES**

Analyze the antioxidant activity of bark, pulp, seeds and leaves of Atemoya by DPPH assay.

**METHODS**

The fruits were collected at Marialva/Paraná, subjected to identification in Botanical Museum of Curitiba and taken to manual peeling and separation of parts. Part of bark and pulp were submitted to drying and lyophilization, respectively. Leaves were also dried. The extracts was obtained by using a Soxhlet extractor and etanol as solvent. The extracts were filtered and concentrated. The antioxidant activity was measured by the DPPH (2,2-diphenyl-1-picrylhydrazyl) method. Test carried out in triplicate, which consisted of adding 2.5mL of sample at different concentrations and 1mL of DPPH. Methanol was used as blank and ascorbic acid as control. After thirty minutes of reaction, absorbance values were measured in spectrophotometer at 518nm. The results were expressed as EC50 (concentration required to obtain a 50% antioxidant effect) that were calculated by linear regression of plots, where the abscissa represented the concentration of tested extracts and the ordinate the average percent of antioxidant activity from three separate tests.

**RESULTS**

The fresh bark extract showed better antioxidant potential, reaching EC50 at a concentration of  $52.34 \mu\text{g/mL}$ , followed by alcoholic extract of the dried bark ( $87.94 \mu\text{g/mL}$ ), dried leaves ( $89.01 \mu\text{g/mL}$ ) and finally, the seed ( $198.97 \mu\text{g/mL}$ ). Lyophilized and fresh pulp samples not presented antioxidant activity by this method.

**CONCLUSIONS**

The extracts of the bark, seed and leaf of atemoya showed significant antioxidant activity. This results, added to its lack studies, require encouragement for further research to increase knowledge of the species, providing the use of agro-industrial waste, propagation of this native fruit and product development for the benefit of human health.

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## EP-13 - IRON ABSORPTION STUDY FROM ENTERAL NUTRITION EVALUATED BY IRON SÉRUM CURVES IN HEALTHY ADULTS

**Authors:** MARCIA V. M. JUNQUEIRA-FRANCO; JULIO SERGIO MARCHINI; CARLA BARBOSA NONINO; FERNANDO BARBOSA; JOSÉ EDUARDO DUTRA DE OLIVEIRA

**Institution:** UNIVERSIDADE DE SÃO PAULO

**Country:** BRASIL

**Session:** TV3 - Date: 12/05/2014 - Room: FOYER - Time: 10:12-10:17:00

### BACKGROUND

Nutrology medical specialty that studies the functions and dysfunctions of nutrients in health and disease, is very important evaluate nutrients absorption from food, diets, supplements and nutritional formulations used for enteral nutrition. It has been shown that the interaction of these nutrient supplements can determine major, minor and / or by blocking the nutrients absorption.

### OBJECTIVES

Evaluate the iron bioavailability of enteral nutrition in order to demonstrate the availability of organic iron in adults.

### METHODS

Iron absorption from enteral nutrition containing multiple nutrients was evaluated in 13 healthy adults that was divided in 3 groups :Group EN 4 volunteers received oral enteral nutrition formula; Group EN+FeSO<sub>4</sub> – 4 volunteers received the enteral formula with an overload of ferrous sulphate (120mg) and Group EN+Vit C -5 received the enteral formula plus a capsule of vitamin C (60mg). After 8 hours fast, basal (T<sub>0</sub>) blood samples were collected: basal (T<sub>0</sub>), 1 ½ (T<sub>1</sub>) and, 3 hours (T<sub>2</sub>) after oral administration of formulas for analysis of serum iron curve. Iron was determined by inductively coupled plasma mass spectrometry. The results was analyzed with the program Statistica and was applied the Kolmogorov-Smirnov test to normality, variance analyze and Dunnet`s test applied to compare the treatment means (p<0.05).

### RESULTS

The means of iron absorption of EN Group (T<sub>0</sub>=1.15 mg/L, T<sub>1</sub> =0.92mg/L and T<sub>2</sub>=1.97mg/L) compared with the other two groups did not differ statistically on the different time, the means of EN-VitC Group (T<sub>0</sub>=1.52 mg/L, T<sub>1</sub> =1.86mg/L and T<sub>2</sub>=2.5mg/L) is different from EN+FeSO<sub>4</sub> Group(T<sub>0</sub>=0.90 mg/L, T<sub>1</sub> =0.72mg/L and T<sub>3h</sub>=1.10mg/L) in T<sub>1</sub> and T<sub>2</sub>.

### CONCLUSIONS

The use of ferrous sulphate supplement, together nutritional formula had a negative effect on iron absorption when compare with the use of vitamin C with enteral nutrition that had a positive effect on ron absorption from nutritional formula

## EP-14 - NEW PERSPECTIVES ON THE REGULATION OF IRON ABSORPTION VIA CELLULAR ZINC CONCENTRATIONS IN HUMANS

**Authors:** MARIJA KNEZ; ROBIN D. GRAHAM; ROSS M WELCH; JAMES C.R. STANGOULIS

**Institution:** FLINDERS UNIVERSITY

**Country:** AUSTRALIA

**Session:** TV3 - Date: 12/05/2014 - Room: FOYER - Time: 10:18-10:23:00

### ABSTRACT

Iron and zinc are essential trace elements for humans. Together, they play a major role in a wide variety of cellular functions. Systemic iron and zinc homeostasis is based on tightly coordinated processes and effective communication between the key sites of iron and zinc uptake, utilization and storage. The enterocytes and the hepatocytes perform the most important roles in homeostasis. Considering the similarities in ionic properties between divalent ferrous iron and divalent zinc, it is not unexpected that these trace metals influence the transport and absorption of one another across the entero- and hepatocytes. However, there is still a lack of information about the mechanisms that regulate these interactions. Therefore, this paper presents a comprehensive overview on the structure and roles of major iron and zinc transport proteins aimed at clarifying iron-zinc interactions at these sites, and providing a model of potential mechanism of these interactions both at the local and systemic level.

DMT1 is not the site of negative interaction between iron and zinc. Zip14 is a second iron transporter that can transport both NTBI and zinc. Cellular zinc dictates the course of events that determine the expression of proteins involved in cellular iron metabolism. Zinc controls the expression of both DMT1 and FPN1, as well as the expression of Zip4, Zip14 and ZnT1 transporters. Anemia develops due to impaired mobilization of iron from diet and stores rather than inadequate dietary intake, which demonstrate the crucial role of zinc on iron transporters. In addition, major regulatory protein of systemic iron regulation, hepcidin, is coordinated by intracellular zinc ion levels through MTF1/MREs interactions.

New perspective and proposed mechanisms on the role of cellular Zn concentrations in the regulation of Fe absorption in humans in this review are explained in detail using innovative graphic presentations. The regulation of iron absorption during pathological conditions has also been discussed.

In conclusion, this review clarifies some of the reasons for predominance of cellular zinc status in determination of iron/zinc interactions and explains mechanisms by which zinc brings about these changes.

Abbreviations: DMT1: Divalent metal transporter 1; NTBI: Non-transferrin bound iron; FPN1: Ferroportin 1; MTF1/MRE: Metal transcription factor 1/ Metal-regulated enhancer element; IRIDA: Iron refractory iron deficiency anemia.

**EP-15 - CHEMICAL ANALYSIS OF HOMEMADE ENTERAL DIETS: THE FOOD COMPOSITION TABLE EXPRESSES THE TRUE COMPOSITION?**

**Authors:** ANN KRISTINE JANSEN; GILBERTO SIMEONE HENRIQUES; SIMONE DE V. GENEROSO; EDUARDA GUIMARAES GUEDES; LIGIA AMANDA V O MIRANDA

**Institution:** UNIVERSIDADE FEDERAL DE MINAS GERAIS

**Country:** BRASIL

**Session:** TV3 - Date: 12/05/2014 - Room: FOYER - Time: 10:24-10:29:00

**BACKGROUND**

Homemade enteral low costs diets are prescribed at hospital discharge when home enteral feeding is necessary for a long time. However, the ingredients of these diets generate uncertainty regarding the supply of nutrients.

**OBJECTIVES**

The aim of this work was to evaluate the nutritional composition of enteral homemade diets through centesimal chemical composition, comparing it to the data from food composition tables.

**METHODS**

We analyzed ten standard enteral diets and six enteral diets for hyperglycemia, prescribed at discharge in two public hospitals of Belo Horizonte, Brazil. The concentrations of protein (Kjeldahl), fat (Soxhlet) and other components of the chemical composition was measured by Association of Analytical Chemists (AOAC) methods. Minerals (Ca, Fe, P, Mg, Mn, Zn, Cu and Na) were determined by atomic emission (ICP-OES) validated by certified reference material. For comparison, the theoretical calculation of nutrients was performed by national tables of food composition. We evaluated statistically the difference between the values analyzed and calculated for each nutrient, expressed as median, 25th and 75th percentiles and the variability of the distribution, using SPSS 19.0.

**RESULTS**

From macronutrients data, protein showed the greatest differences in comparison analyzed/calculated, obtaining 20.07% (9.66 to 23.81) and 15.64% (7.72 to 17.34), respectively, in the standard diets and hyperglycemia diets, however high interquartile range was found in carbohydrates and lipids in the standard diets. For minerals, differences between the calculated and analyzed remained above 75% for copper and manganese and about 35% for iron, in both type of diets. However the difference between the calculated and analyzed presented a high interquartile range for all minerals except iron, copper and sodium in the hyperglycemia diets.

**CONCLUSIONS**

The chemical analysis of enteral homemade diets prescribed at discharge differs from the calculated nutritional composition, particularly regarding protein, copper, manganese and iron. The variability found for minerals should also be considered when analyzing the composition of these diets. These results require a careful interpretation from the calculations using nutritional composition tables, especially for minerals and will improve the formulation of home enteral diets with appropriate nutritional composition. FUNDAÇÃO DE AMPARO À PESQUISA DE MINAS GERAIS

**EP-16 - SENSORIAL EVALUATION OF SALT AND SEASONED WITH AROMATIC ANTIOXIDANT POWDER AND REDUCED SODIUM CONTENT**

**Authors:** ORNELLA MARIA PORCU; MICHELE MAYARA PITOL

**Institution:** FEDERAL UNIVERSITY OF TECHNOLOGY (UTFPR), BRAZIL

**Country:** BRASIL

**Session:** TV4 - Date: 12/05/2014 - Room: FOYER - Time: 10:00-10:05:00

**BACKGROUND**

Sodium is an essential ingredient in food for human consumption and, in addition to its nutritional importance, physiological and functional, it contributes to the pleasant taste of food. However in the recent years has been reported a number of health problems caused by the excessive intake of this mineral.

**OBJECTIVES**

This study aimed to evaluate a sensory analyses of a salt seasoned with herbs and low sodium content.

**METHODS**

Two formulations were prepared: formulation F1 containing sodium chloride, potassium chloride and spice plants, medicinal and aromatic; and formulation F2 containing monosodium glutamate, potassium chloride and spice plants, medicinal and aromatic. The microbiological analyses (total coliforms at 35 °C, coliforms at 45 °C, Salmonella sp/25 g pursuant to Resolution – RDC no 12, January 2, 2001, the National Health Surveillance Agency (ANVISA) according to methodology described by Instruction no 62 of 2003 the Ministry of Agriculture and Supply (MAPA). Analyses were performed in duplicate.

**RESULTS**

The products elaborated, F1 and F2, presented in satisfactory hygienic health. The sensory attributes of flavor, color, aroma and overall acceptability were between the categories 'like moderately' and 'liked' corresponding to a score between 7 and 8 on hedonic scale of 9 points.

**CONCLUSIONS**

Thus, the formulated salt (F1, F2) were well accepted by 30 untrained panelists and resulted in wide application cooking being a viable option for human consumption.

**EP-17 - DEVELOPING A FUNCTIONAL FOOD INGREDIENT****Authors:** LAURA MEWS; RAFAELA CARMINATTI; ORNELLA MARIA PORCU; MANUEL S. V.PLATA OVIEDO**Institution:** FEDERAL UNIVERSITY OF TECHNOLOGY (UTFPR), BRAZIL**Country:** BRASIL**Session:** TV4 - Date: 12/05/2014 - Room: FOYER - Time: 10:06-10:11:00**BACKGROUND**

Foods can be produced by adding functional ingredients. These raw materials may be rich in bioactive substances, such as phenolic compounds, carotenoids, total flavonoids, vitamins, and are responsible to beneficial health effects. The presence of this bioactive substances prevents or reduces the risk of nutritional deficiencies and chronic degenerative diseases.

**OBJECTIVES**

In order to prepare a functional product the objective of this study was to developing and characterizing the influence of dextrin on color characteristics of guava pulp encapsulated obtained by spray dryer.

**METHODS**

Guava pulp (Paluma cultivar), was purchased from food industry (Indústria de Polpas e Conservas Val Ltda), Vista Alegre do Alto, in São Paulo state, Brazil. Dextrin was added to the guava pulp in a proportion of 1:1, homogenised in a colloid mill, until the complete dissolution. For guava pulp (G) it was necessary to add distilled water according to the carrier agent concentration. The spray dryer operates concurrently and has a spray nozzle with an orifice of 1.0 mm in diameter. The flow of the drying air was about 0.45 L/min and the temperature ranged from 120 °C. The powder (MG) produced were placed in amber bottles. Color parameters ( $L^*$ ,  $a^*$ ,  $b^*$ ) were performed in triplicate analysis using a colorimeter Hunter Lab Mini-Scan EZ. The results were interpreted through  $L^*$ (luminosity) and the chromaticity coordinates ( $a^*$ ,  $b^*$ ).

**RESULTS**

The solution (dextrin + water + guava pulp) presented pH =  $3.69 \pm 0.01$  and  $10.9 \pm 0.12$  OBrx. The decrease in value of  $L^*$  ( $85.66 \pm 2.01$ ) after the encapsulation process was due to mixing with dextrin ( $L^* = 99.40 \pm 0.16$ ), encapsulating agent, and suggests a lighter shade of rose powder. Addition of dextrin increased the chromaticity  $a^*$  and  $b^*$  ( $7.28 \pm 0.70$  and  $15.02 \pm 0.64$ , respectively) as compared to control ( $1.49 \pm 0.01$  and  $5.21 \pm 0.24$ , respectively). The water activity ( $A_w$ ) was equal to  $0.2617 \pm 0.0006$ .

**CONCLUSIONS**

The profile of color developed by guava pulp powder or guava pulp microencapsulated demonstrated that this supplement may serve as an alternative functional or nutritional ingredient in the development of new food products.

**EP-18 - BIOACCESSIBILITY OF  $\beta$ -CAROTENE IN ORANGE FLESHED SWEET POTATO COOKED ACCORDING TO HOME STYLES COMPARED TO HIGHLY PROCESSED BABY FOOD****Authors:** PAULO R. A. BERNI; CHUREEPORN CHITCHUMROONCHO; SOLANGE G. CANNIATTI-BRAZA; MARK L. FAILLA**Institution:** UNIVERSITY OF SAO PAULO AND OHIO STATE UNIVERSITY**Country:** BRASIL**Session:** TV4 - Date: 12/05/2014 - Room: FOYER - Time: 10:12-10:17:00**BACKGROUND**

WHO estimates that as many as 1/3 of pre-school children in the world are affected by vitamin A deficiency (VAD). Infants, children < 5 years of age, and women during birthing and 1y post-partum are particularly vulnerable to VAD, a condition associated with high morbidity and mortality and the primary cause of avoidable blindness in children. Biofortification programs are focused on increasing concentrations of essential micronutrients including provitamin A carotenoids that can be converted to vitamin A following ingestion in staple food crops by strategically breeding germplasm or using transgenic methods. The impact of style of cooking on transfer of  $\beta$ -carotene ( $\beta C$ ) from plant matrix to micelles (bioaccessibility) during digestion and the absorption of intact  $\beta C$  or its retinal cleavage merit attention.

**OBJECTIVES**

We have investigated the content and bioaccessibility of  $\beta C$  in two varieties of OFSP before and after cooking according to two common home styles in Brazil and in two commercially processed OFSP products for babies.

**METHODS**

Roots were analyzed raw and after boiling in water at 100°C only or after subsequent frying of boiled cassava in soybean oil at 180°C. Bioaccessibility was examined using in vitro oral, gastric and small intestinal digestion coupled with the Caco-2 human intestinal cells.

**RESULTS**

All trans- $\beta C$  was the major carotenoid in raw Amelia (A; 95% total) and Beaugard (B; 92% total) OFSP and in baby food products X (86% total) and Y (73% total) containing 38, 114, 44 and 40 of all trans- $\beta C$   $\mu g/g$  FW, respectively. Efficiency of micellarization (EM) of total  $\beta C$  during digestion of boiled and fried OFSP was 8.3 and 9.1% for A and 5.6 and 5.1% for B; EM of baby food X and Y was 6.7% and 10.1%. Estimated bioavailable vitamin A equivalents (VAE) from boiled and fried OFSP A was 25.0 and 48.4 IU/100g FW, respectively, and 33.9 and 32.8 IU/100g FW for boiled and fried OFSP B; baby foods X and Y potentially provide 28.6 and 43.4 IU/100g FW for absorption. Caco-2 cells accumulated 13.1 and 14.5% of all trans- $\beta C$  from micelles generated during digestion of boiled OFSP A and B, 17.5 and 19.6% from digested fried OFSP A and B, and 16.0 and 16.2% from micelles generated during digestion of baby food X and Y.

**CONCLUSIONS**

In summary, baby food contained greater % of cis- $\beta C$  than cooked OFSP, EM of  $\beta C$  was relatively low for OFSP and highly processed OFSP, and cooking style may affect uptake of micellar all trans- $\beta C$  by absorptive cells.

HARVESTPLUS, FAPESP, EMBRAPA AND IAC FAPESP 2013/00207-4



**EP-19 - IMPROVING TEMPERATURE STABILITY OF ESCHERICHIA ALBERTII PHYTASE BY ERROR-PRONE PCR****Authors:** RALF GREINER; ADJID SAJIDAN; DANIEL BLACKBURN-MENEZ; JACQUELINNE ACUÑA; MILKO JORQUERA**Institution:** MAX RUBNER-INSTITUT**Country:** GERMANY**Session:** TV4 - Date: 12/05/2014 - Room: FOYER - Time: 10:18-10:23:00**BACKGROUND**

Phytase [myo-inositol(1,2,3,4,5,6)hexakisphosphate phosphohydrolase], a phytate-specific phosphatase, is already used as a supplement in diets for simple-stomached animals to improve phosphate utilisation from phytate [myo-inositol(1,2,3,4,5,6)hexakisphosphate], the major storage form of phosphate in plant seeds and grains. In recent years, this class of enzymes has also found increasing interest to be used in food processing and manufacturing, particularly because reduction in dietary phytate is seen as a possibility to combat zinc and iron deficiencies by enhancing their bioavailability in plant-based foods. Several enzymatic properties of the *Escherichia albertii* phytase make this enzyme attractive for biotechnological applications. For many applications however, a higher temperature stability of the enzyme would be of advantage.

**OBJECTIVES**

Therefore, improving thermal stability of the *Escherichia albertii* phytase by error-prone PCR was the aim of the studies.

**METHODS**

Directed evolution was applied to improve temperature stability of the *Escherichia albertii* phytase. Error-prone PCR was performed using a plasmid containing the wild-type *Escherichia albertii* phytase encoding gene cloned into a *Saccharomyces cerevisiae* expression vector as a template. Approximately, 1500 clones were screened for increased temperature stability.

**RESULTS**

Compared with the wild-type enzyme, two variants (K46E and D144N/V227A) showed a significant increase in temperature stability. Compared to the wild-type phytase, the mutants showed a 33% (K46E) and a 95% (D144N/V227A) higher residual activity at 80°C after 10 min incubation. Overall catalytic efficiency (kcat /Km) of K46E and D144N/V227A was improved by 36% and 97% compared to the catalytic efficiency of the wild-type phytase at pH 4.5, respectively. Thus, the catalytic efficiency of these enzymes was not inversely related to their temperature stability. From an economic point of view it is worth mentioning that the mutants still exhibit excellent high specific activities.

**CONCLUSIONS**

In summary, *Escherichia albertii* phytase variants with a better overall catalytic efficiency and improved temperature stability were obtained. These improvements make these enzymes better suited for the intended biotechnological applications.

**EP-20 - THE BENEFITS OF USING A VEGETAL SEED SUPPLEMENTATION COMPLEMENTARY TO SELENIUM TREATMENT IN ACUTE EXPERIMENTAL INFECTION BY TRYPANOSOMA CRUZI****Authors:** PRISCILA MACHADO DE CERQUEIRA; ALINE RELVA; JACQUELINE DUNN; ANDRÉA PEREIRA DE SOUZA; TANIA C. DE ARAUJO-JORGE**Institution:** INSTITUTO OSWALDO CRUZ**Country:** BRASIL**Session:** TV4 - Date: 12/05/2014 - Room: FOYER - Time: 10:24-10:29:00**BACKGROUND**

Chagas disease, caused by the protozoan *Trypanosoma cruzi*, remains a serious public health problem in Latin America. The symptomatic stages present distinct clinical forms, such as a cardiac and digestive intestinal disorders; chronic constipation is a common symptom caused by infection. In this context dietary treatment could be a key in the modulation of the disease processes and treating the clinical symptoms. Food rich in dietary fibers and phenolic compounds have been investigated because of their functional properties.

**OBJECTIVES**

To evaluate the effect of dietary supplementation with vegetal seed (VS) on the clinical parameters of acutely *T. cruzi*-infected Swiss mice.

**METHODS**

Swiss mice were infected with Y strain of *T. cruzi* and followed clinically and parasitologically for 3 weeks, under a dietary treatment with selenium with or without VS. We evaluated weight consumption, intestinal transit, stool frequency and parasitemia. Mice received an aqueous suspension of charcoal by gavage and the time of its appearance in the feces determined the intestinal transit of infected and non-infected animals, in the selenium supplemented groups with or without VS.

**RESULTS**

Infected animals lost weight in second week post infection, independently of VS supplementation, indicating that weight decrease can not be only attributed to a burst in TNF production but also to a net reduction on food intake. Selenium has a beneficial effect in intestinal transit delay commonly seen in infected mice; supplementation with VS lead to a shorter ( $p < 0,05$ ) intestinal transit time and decreased the frequency of defecation, as compared to infected non-supplemented animals.

**CONCLUSIONS**

These results indicate that this nutritional approach can be suggested as an adjuvant therapy for intestinal disorders caused by *T. cruzi*.

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## EP-23 - SELENIUM ANALYSIS OF RICE AND BEANS PRODUCED BY CEARA STATE - BRAZIL

**Authors:** PRISCILA PEREIRA PESSOA; CARLA SORAYA COSTA MAIA; LARISSA BEZERRA SANTOS; CHRISTIELLE FELIX BARROSO; DENISE LIMA DE OLIVEIRA; SILVIA MARIA F. COZZOLINO

**Institution:** UNIVERSIDADE ESTADUAL DO CEARÁ

**Country:** BRASIL

**Session:** TV1 - Date: 12/05/2014 - Room: FOYER - Time: 15:12-15:17:00

### BACKGROUND

The selenium acts in the mammalian's organisms by the selenoproteins. Most part of These proteins have selenium in the selenocysteine form, which exerts many physiological functions, as defense against oxidative stress, regulating the thyroid's hormones and the redox of vitamin C and other molecules. The mineral also participates of the cells processes as breathing, production of nucleic acid, maintenance of cell membrane integrity, besides acting in immune system and other functions.

The geochemical distribution of selenium varies around the world. However, informations about this mineral in tropical coastal regions as the Brazilian aren't enough

### OBJECTIVES

This research has the objective to quantify the concentration of selenium in Brazilian typical meals, as rice and beans that are produced in Ceara Brazil.

### METHODS

The selenium concentration was determined by Atomic Absorption Spectroscopy with Hydride generation coupled to quartz cells

### RESULTS

The average Se concentration in 100 g of raw food in the state were: In rice (*Oryza sativa*): 18.54 µg/100g, the cassava flour (*Manihot esculenta*): 11.35 µg/100g, the bean (*Vigna unguiculata*): 23.72 µg/100g and cashew nuts (*Anacardium occidentale*): 49,23 µg/100g.

### CONCLUSIONS

It has been observed highest concentration of selenium in food produced in Ceara compared with food from other regions. Due to the high concentration of Selenium in these food, it can be concluded that them could contribute to the supply of selenium in the diet of the local population

## EP-24 - BIOFORTIFIED PEARL MILLET (*Pennisetum glaucum* L.) PROVIDES MORE BIOAVAILABLE IRON THAN STANDARD PEARL MILLET: STUDIES IN VIVO (*Gallus gallus*) AND AN IN VITRO DIGESTION/CACO-2 MODEL

**Authors:** ELAD TAKO; BINU CHERIAN; RAYMOND GLAHN

**Institution:** USDA/ARS, ROBERT HOLLEY CENTER FOR AG & HEALTH

**Country:** UNITED STATES

**Session:** TV1 - Date: 12/05/2014 - Room: FOYER - Time: 15:18-15:23:00

### BACKGROUND

The World Health Organization estimates that approximately one-third of worldwide infant deaths and one half in developing countries can be attributed to malnutrition, more specifically, iron (Fe) deficiency is the most common nutrient deficiency worldwide. Iron deficiency is particularly widespread in low-income countries because of a low consumption of animal products with a high content of bioavailable dietary iron. Pearl millet (*Pennisetum glaucum* L.) is the most widely grown type of millet, primarily in Africa and India. Dietary iron deficiency is common in these geographical regions.

### OBJECTIVES

Our objective was to compare the capacities of two isolines of pearl millet (standard and Fe biofortified) to deliver iron (Fe) for hemoglobin (Hb) synthesis.

### METHODS

In vitro analysis indicated that the biofortified line should provide more Fe ( $P < 0.05$ ), and indicate the presence of high levels of polyphenolic compounds that inhibit Fe absorption. Pearl millet based diets (75% w/w) were formulated except for Fe (dietary Fe concentrations were  $22.1 \pm 0.5$  and  $78.6 \pm 0.5 \mu\text{g/g}$ ) to be tested in vivo (*Gallus gallus*). Diets were fed for 6 weeks; Hb, liver ferritin and Fe related transporter/enzyme gene-expression were measured. Hb maintenance efficiency (HME) and total body Hb Fe values were used to estimate Fe bioavailability from the diets.

### RESULTS

From week 5 onward, Hb values were higher ( $P < 0.05$ ) in biofortified group vs. standard. Also, final total Hb-Fe content was higher in the biofortified vs. the standard ( $26.7 \pm 1.4$  and  $15.5 \pm 0.8$  mg, respectively) groups ( $P < 0.05$ ). DMT-1, Dcyt-B, and ferroportin expressions were higher and liver ferritin was lower ( $P < 0.05$ ) in the standard group vs. the biofortified group, indicating adaptive response to Fe deficiency.

### CONCLUSIONS

We conclude that the biofortified pearl millet diet delivered more absorbable Fe and thus represents a promising vehicle for increasing intakes of bioavailable Fe in human populations that consume this dietary staple. In vitro studies indicate that a strong polyphenolic inhibitory effect on Fe bioavailability is evident; thus further research into improving the nutritional content of pearl millet should involve assessment and if possible modification of the polyphenolic profile.

**EP-25 - EFFECTS OF IN VITRO DIGESTION ON THE PHENOLIC AND FLAVONOID CONTENTS IN PLANT FOODS CONSUMED IN BRAZIL****Authors:** ELOÁ ANGÉLICA KOEHNLEIN; CAMILA TURECK; VANESA GESSER CORRÊA; GELVANI LOCATELI; EDMAR SENA PARENTE; ERICA MARCELA KOEHNLEIN; ROSANE MARINA PERALTA**Institution:** UFFS/ REALEZA PR AND UEM/ MARINGÁ PR**Country:** BRASIL**Session:** TV1 - Date: 12/05/2014 - Room: FOYER - Time: 15:24-15:29:00**BACKGROUND**

Most studies perform the extraction of antioxidant compounds with organic solvents, not simulating normal physiological conditions. It is important to note that phenolic compounds occur in association with food matrices in plants, and that part of compounds absorbed in the small intestine after digestion and other part is associated with nondigestible components which possibly interact with the colon.

**OBJECTIVES**

The present study aimed to compare the phenolic and flavonoid contents of the 36 most popular Brazilian plant foods submitted to extraction in water and in vitro digestion.

**METHODS**

Thirty six of the most consumed plant foods and beverages were selected using the governmental publication entitled Family Budget Survey from 2008 to 2009. Three different popular brands or 3 samples of each food were purchased. The foods in their usual form of consumption were precessed with the aid of a vertical mixer of domestic use with 200 watts of power for 3 min, or until acquiring a pasty consistency and subjected to the in vitro digestion process or extraction in water under the same conditions, protected from light. Total phenolics were determined using the Folin-Ciocalteu method (Singleton and Rossi, 1965) and the flavonoids using the technique described by Alothman et al. (2009).

**RESULTS**

Milk chocolate and açaí were the foods with the highest levels of phenolics, both for those which were subjected to in vitro digestion as the extraction in water. In general, in vitro digestion improved the values of phenolics in all groups, cereals, legumes, vegetables, tuberous vegetables, chocolates and fruits, with the exception of the beverage group. The most important differences were observed for the groups of cereals (263.3 versus 52.2 mg GAE/100g, for in vitro digestion and extraction in water, respectively) and legumes (324.3 versus 98.4 mg GAE/100g). The impact of the in vitro digestion on the flavonoid values was less pronounced. For flavonoid content, milk chocolate occupied the first position both when subjected to in vitro digestion, as the extraction in water. No significant difference in the mean content of flavonoids for groups of cereals, legumes, tuberous vegetables and chocolate was observed. In the group of beverages, however, the in vitro digestion caused a drastic reduction.

**CONCLUSIONS**

These results demonstrate that the levels of antioxidants measured using organic solvents may not reflect the likely content available for absorption.

**EP-28 - ZINC BIOAVAILABILITY IN RATS FED WITH RICE FORTIFIED WITH ZINC OXIDE****Authors:** CERES MATTOS DELLA LUCIA; KELEN CRISTINA CRUZ RODRIGUES; LAURA LUIZA MENEZES SANTOS; VIVIAN CRISTINA CRUZ RODRIGUES; HÉRCIA STAMPINI DUARTE MARTINO; HELENA MARIA PINHEIRO-SANT A**Institution:** UNIVERSIDADE FEDERAL DE VIÇOSA**Country:** BRASIL**Session:** TV2 - Date: 12/05/2014 - Room: FOYER - Time: 15:12-15:17:00**BACKGROUND**

Numerous researches have shown the increasing number of chronic non-communicable diseases worldwide, which main etiological factor is the lifestyle. In general terms, the Western diet is rich in sugar, saturated and trans fats, low in dietary fiber and micronutrients and zinc (Zn) is one of the most deficient. The rice fortified with micronutrients (Ultra Rice® - UR®) is a viable alternative for fortification since this cereal is already inserted into the population habit.

**OBJECTIVES**

The aim of this study was to evaluate the bioavailability of zinc (Zn) in rice fortified with zinc oxide (UR®).

**METHODS**

During 42 days, rats were divided into four groups and fed diets containing two different sources of Zn (UR® fortified with zinc oxide - test diet or zinc carbonate (ZnCO<sub>3</sub>) - control diet), supplying 50 or 100 % of the recommendations of this mineral for animals. Weight gain, food intake, feed efficiency ratio, weight, thickness and length of femur; retention of zinc, calcium (Ca) and magnesium (Mg) in the femur and the concentrations of Zn in femur, plasma and erythrocytes were evaluated. A completely randomized design, in factorial 2x2 (source versus dose) with 10 replicates (animals) was used. Data were analyzed by analysis of variance, at 5 % probability.

**RESULTS**

Rats fed with the control diet showed higher weight gain, feed efficiency ratio, retention of Zn and Zn concentration in the femur when compared to the test diet ( $p < 0.05$ ). However, no differences were observed ( $p > 0.05$ ) for dietary intake, length and thickness of the femur, erythrocyte and plasmatic Zn between test and control groups.

**CONCLUSIONS**

Although UR® fortified with zinc oxide showed a lower bioavailability compared to ZnCO<sub>3</sub>, this food can be a viable alternative to be used as a vehicle for fortification.

**EP-29 - IN INDIAN WOMEN, OVERWEIGHT AND OBESITY LEAD TO IMPAIRED IRON ABSORPTION FROM FOOD AND TO AN INCREASED RISK FOR IRON DEFICIENCY****Authors:** ISABELLE AEBERLI; PRASHANTH THANKACHAN; BEENA BOSE; ANURA V. KURPAD**Institution:** ETH ZURICH, ZURICH, SWITZERLAND**Country:** SWITZERLAND**Session:** TV2 - Date: 12/05/2014 - Room: FOYER - Time: 15:18-15:23:00**BACKGROUND**

Predominantly in developed countries, obesity has been associated with an increased risk for iron deficiency. Iron absorption was shown to be reduced with increasing BMI, but only in a relatively low BMI range (<27 kg/m<sup>2</sup>). Whether this association is the same in a higher BMI range and whether transition countries with a high burden of both obesity and iron deficiency are similarly affected is less clear.

**OBJECTIVES**

The aim of this study was a) to assess the association between body weight/body fatness and iron status in women in Bangalore, India and b) to compare iron absorption between normal weight (NW) and obese (OB) women in the same region.

**METHODS**

In part a) 52 NW, 71 overweight (OW, BMI 23-29.9 kg/m<sup>2</sup>) and 23 OB (BMI ≥30 kg/m<sup>2</sup>) subjects were included. Weight, height, waist circumference and %body fat were determined and lipid and glucose profile, iron status, inflammatory markers and hepcidin were measured in a blood sample. For part b) iron absorption was determined in 16 OB and 13 NW subjects by measuring incorporation of stable iron isotopes (<sup>57</sup>Fe) into erythrocytes 14 days after consumption of a labeled test meal.

**RESULTS**

OW and OB subjects showed an increased metabolic risk (high LDL cholesterol and triglycerides, low HDL cholesterol, high CRP and high blood pressure). Iron status (as soluble transferrin receptor (TfR)) was significantly lower in OW and OB subjects compared to NW subjects (p<0.05) and the OR for having a higher TfR in the OW/OB group was 2.66 (95% CI: 1.318-5.382). CRP and Hepcidin concentrations were significantly positively associated with both BMI and %body fat in all subjects (p<0.05).

Iron absorption was significantly lower in the OB compared to the NW group (10.6%±6.5 vs. 16.7%±4.6, p=0.007) and this association remained after controlling for iron status (p=0.038). Hepcidin concentrations were significantly negatively correlated with iron absorption (p=0.048, r=-0.384) and TfR (p=0.018, r=-0.451).

**CONCLUSIONS**

In overweight and obese Indian women iron status seems to be reduced as a result of increased subclinical inflammation triggering hepcidin secretion. This can be explained by the decrease in iron absorption in OB subjects as observed in this study. Taken together, our results clearly demonstrate the importance of taking the entire nutritional status into account when considering public health actions to combat iron deficiency. The emerging epidemic of obesity in transition countries may be hampering efforts to control iron deficiency in those areas.

**EP-30 - BIOACCESSIBILITY OF CALCIUM IN MINAS PADRÃO CHEESE****Authors:** JOÃO PABLO FORTES PEREIRA; ANA CAROLINA MAGESTE; NÁIRA SILVA CAMPOS; ÂNGELA MARIA FERREIRA OLIVEIRA; RAFAEL ARROMBA SOUSA; PAULO HENRIQUE FONSECA SILVA**Institution:** FEDERAL UNIVERSITY OF JUIZ DE FORA**Country:** BRASIL**Session:** TV2 - Date: 12/05/2014 - Room: FOYER - Time: 15:24-15:29:00**BACKGROUND**

Calcium (Ca) is found in dairy products and plays important roles in the body such as in nerve transmission, muscle contraction, formation and maintenance of bones and teeth. The Minas Padrão cheese (MP) is a typical Brazilian product from the state of Minas Gerais. The cheese is an important source of Ca, with a recommended intake of 1g/day for adults. The composition of an equilibrated diet may be based on the average of nutrients from foods. Hence, variations in the minerals bioaccessibility can difficult the achievement of normal daily intakes.

**OBJECTIVES**

The aim of this work was to measure the bioaccessibility of Ca in MP, marketed in the city of Juiz de Fora - Brazil.

**METHODS**

Eight brands of MP were acquired in local markets. The bioaccessibility was determined according to Lutten et al, 1996 (modified). The samples were submitted to "gastric digestion" with pepsin solution in 0.1 M HCl and pH 1.7-2.0. The mixtures were placed under stirring at 37°C/2h. Then, the digested acidity was determined, adjusted with a NaHCO<sub>3</sub> solution and submitted to dialysis process with appropriate membranes (enteric digestion). The samples were placed under stirring at 37°C/4h and after about 40 min of this stage, the mixture reached a pH~5.0 and a solution of pancreatin and bile extract was added. At the end each dialysis bag was removed and their contents were taken for determination of Ca by atomic absorption spectrometry with flame (1). To obtain the Ca bioaccessible fraction, it was necessary to determine the Ca concentration in both cheese and digested samples, after mineralization of these samples, which were diluted in 2% v/v nitric acid (2). The % of bioaccessibility = [(1)/(2)]x100. The descriptive statistics were performed by ANOVA followed by Duncan test.

**RESULTS**

Average bioaccessibility of Ca=40.73%, standard error=4.40%, standard deviation=12.46%, coefficient of variation=30.60%, range=37.65%, minimum value= 21.58%, maximum value=59.23%. It was found statistically significant difference in the percentage of Ca bioaccessibility between the brands of MP. Three different groups were observed with the lowest to the highest average composed of group A (1 brand), group B (4 brands), group C (3 brands).

**CONCLUSIONS**

The bioaccessibility of Ca variation in the MP was probably due to the lack of standardization in manufacturing technologies. Factors such as composition, pH, temperature and ripeness time may have contributed to the range of variation, with potential impact on their nutritional value.

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# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## EP-32 - UTILIZAÇÃO DE CAMARÃO DA REGIÃO NORTE PARA ELABORAÇÃO DE MOLHO DESIDRATADO COM ERVAS

**Authors:** AMANDA MENEZES AGUIAR; KETLEN DA SILVA RODRIGUES; CILÉA MARIA DOS SANTOS OZELA; LUCIANE DO S. N. DOS S BRASIL; DAVI DO S. BARROS BRASIL

**Institution:** CENTRO UNIVERSITÁRIO DO ESTADO DO PARÁ

**Country:** BRASIL

**Session:** TV3 - Date: 12/05/2014 - Room: FOYER - Time: 15:06-15:11:00

### BACKGROUND

Currently, the food is in evidence and receives great attention in various parts of the world . The Para have a real bond with the natural foods of their homeland. Fauna and flora of the Amazon region are extracted the main raw materials used in this cuisine. Para traditional culinary preparations are made by the combination of aromas and flavors , using different techniques and accompaniments.

### OBJECTIVES

With this, we tend to aim to develop a regional culinary preparation having all of these features , in addition to presenting the nutritional properties preserved : sauce reconstituted using as main raw material regional shrimp ( *Macrobrachium amazonicum* ) and herbs from the North. The study was conducted in the laboratory of Food Technology of the University Center of Pará - CESUPA .

### METHODS

The study was conducted in a laboratory of Food Technology from a University of Belém do Pará The shrimp was selected, peeled, toilet was done, and then washing, marinating process was performed, and screening, where the liquid was dropped, with soon after processing, milling, and finally packaging . The vegetables were selected, cleaned, processed, ground, sieved and packed, occurring shortly after the mixing of the preparation, incorporated in the milk, corn starch, salt, monosodium glutamate, where the packaging, identification and storage under refrigeration occurred. After reconstitution and cooking Thus, making it fit for consumption was performed.

### RESULTS

From the analysis conducted microbiological preparation meets absence of coliforms and *Salmonella* spp . in 25g . From the physico-chemical analysis performed , the white sauce features : humidity ( 70.81 % ) , ash ( 0.30 % ) , lipid ( 0.56 % ) , protein ( 16.15% ) , carbohydrates ( 11 , 85%) and chloride ( 2.68 %).

### CONCLUSIONS

The preparation has lower nutritional values with respect to macronutrients, compared to the survey conducted in chemical and nutritional evaluation of ingredients used in preparing tables. Taking exception to the protein content, due to the muscular portion of Shrimp provide a significant source of this nutrient. The analysis performed on the sodium value in preparation, shows that it has minimum values, compared with the national reference table.

## EP-33 - IRON AND ZINC BIOAVAILABILITY OF BIOFORTIFIED BEANS (*PHASEOLUS VULGARIS*) IN CACO-2 CELLS

**Authors:** MARIA GRAÇAS VAZ-TOSTES; NEUZA MARIA B COSTA; ELVIRA GONZALEZ DE MEJIA

**Institution:** UNIVERSIDADE FEDERAL DO ESPÍRITO SANTO

**Country:** BRASIL

**Session:** TV3 - Date: 12/05/2014 - Room: FOYER - Time: 15:12-15:17:00

### BACKGROUND

Food biofortification is a strategy to ensure greater food security through increased levels of nutrients in the diet and may contribute to reduce the micronutrient deficiencies.

### OBJECTIVES

The purpose of this study was to evaluate the iron and zinc bioavailability of biofortified bean (*Phaseolus vulgaris*) BRS Pontal (PO) and conventional bean Perola (PE) in vitro, using a Caco-2 cell model.

### METHODS

The beans were cooked, freeze-dried, and ground to a fine powder. The iron and zinc levels were determined by atomic emission spectrometry. The in vitro simulated gastrointestinal digestion was performed by pepsin and pancreatin sample hydrolysis and maintained for 2 h at 37°C, for each enzyme at pH 2.0 and 7.5, respectively. The reaction was stopped by heating at 75°C for 20 min and the hydrolyzed samples were freeze-dried. Caco-2 cells were seeded at a density of 50,000 cells/cm<sup>2</sup> in collagen-treated six-well plates and were used for iron and zinc bioavailability experiments at 13 days post seeding. On experiment day, hydrolyzed and lyophilized samples were diluted in minimal essential medium and applied on the cells and incubated at 37°C in an incubator with 5% CO<sub>2</sub> and 95% air atmosphere at constant humidity. After 24 h, the cells were harvested, placing them in a sonicator and stored at -20°C. The total protein, ferritin and zinc analyses were performed in cell lysates and the ratios ferritin/protein and zinc/protein were calculated as an index of the cellular iron and zinc uptake. The experiments were performed in 6 replicates for each bean. The data were analyzed using t test ( $\alpha = 5\%$ ).

### RESULTS

The biofortified bean PO and the conventional bean PE presented the following levels of iron and zinc, respectively (PO: 60.6±0.2 mg/kg and 26.1±1.4 mg/kg; PE: 52.4±0.9 mg/kg and 20.5±1.2 mg/kg). The uptake of iron and zinc did not differ significantly between the two beans (PO: 12.5±2.6 ng ferritin/mg protein and 14.3±1.1 µg zinc/mg protein; PE: 11.5±1.6 ng ferritin/mg protein and 14.3±2.5 µg zinc/mg protein).

### CONCLUSIONS

The content of iron and zinc in Pontal was not sufficiently higher than the Perola variety to improve the uptake of these minerals by the Caco-2 cells. Besides, the bean components such as tannins, phytate and other polyphenols may complex minerals making them unavailable for absorption. Therefore, the breeding process to produce biofortified Pontal beans should focus on raising both the content and bioavailability of minerals.

**EP-34 - FERROPORTIN MEDIATES MURINE INTESTINAL ABSORPTION OF IRON FROM A SYNTHETIC FERRITIN CORE NANOPARTICLE**

**Authors:** MOHAMAD F ASLAM; DAVID M FRAZER; NUNO FARIA; SYLVAIN F A BRUGGRABER; SARAH WILKINS; CORNEL MIRCIOV; JONATHAN J POWELL; GREGORY J ANDERSON; DORA I A PEREIRA

**Institution:** MRC HUMAN NUTRITION RESEARCH

**Country:** UNITED KINGDOM

**Session:** TV3 - Date: 12/05/2014 - Room: FOYER - Time: 15:18-15:23:00

**BACKGROUND**

We have synthesised a novel ligand modified Fe(III) poly oxo-hydroxide (Nano Fe(III)), as a potential oral iron (Fe) supplement. Nano Fe(III) mimics (i) the ferritin core and (ii) the highly amorphous and nanoparticulate Fe(III) hydroxides that form when dietary ferric iron is ingested. We have shown that, unlike Fe(II) and soluble Fe(III) complexes, Nano Fe(III) is endocytosed at the apical surface of intestinal enterocytes

**OBJECTIVES**

To investigate whether the basolateral export of Fe, derived from Nano Fe(III) in the enterocyte, is ferroportin-1 (Fpn-1) mediated.

**METHODS**

The diets of Fe deficient mice with intestinal-specific disruption of Fpn-1 gene (Fpn KO) and littermate controls (WT) were supplemented with Fe(II) sulphate (FeSO<sub>4</sub>) or Nano Fe(III) for four weeks. Haemoglobin (Hb) levels were assessed at weeks 0, 1, 2 and 4 of Fe repletion. Fe distribution in duodenal, liver and spleen sections was assessed with Perls' Prussian blue staining at the end of the repletion period. Liver and spleen Fe levels were determined colorimetrically using a ferrozine based assay. The DMT1 and HAMP1 mRNA levels were assessed at the end of the repletion period. In a second separate experiment, isolated duodenal loops were performed to assess the uptake of Nano Fe(III) directly from the duodenum of WT and Fpn KO mice.

**RESULTS**

Hb levels increased equally in WT mice supplemented with Nano Fe(III) or FeSO<sub>4</sub>. Neither diet increased Hb for Fpn KO mice (both  $p < 0.0001$  versus WT). Fe was detected in duodenal enterocytes of all Fpn KO mice, but not in WT mice, for both diets. Hepatic and splenic Fe levels were significantly lower in Fpn KO mice than in WT mice for both diets ( $p \leq 0.006$ ). Finally, Fe derived from Nano Fe(III) regulated the expression of DMT1 and HAMP1 similarly to Fe from FeSO<sub>4</sub>. Fe from Nano Fe(III) was significantly absorbed from duodenal loops of WT but not from Fpn KO mice ( $p < 0.0001$ ).

**CONCLUSIONS**

Our data confirm that Nano Fe(III) is as effective as FeSO<sub>4</sub> at correcting diet induced Fe deficiency anaemia in WT mice. Studies in Fpn KO mice show that Fpn-1 is essential for the absorption of Fe from Nano Fe(III) and hence that it is under normal basolateral regulation even if its apical acquisition differs to that of soluble iron.

**References**

1. Pereira, D.I., et al., PLoS One, 2013. 8(11). 2. Powell, J., et al., Nanomedicine. Under review.

**EP-35 - BIOACTIVES CONTENT OF GUAVA PUREE AND MICROENCAPSULATED GUAVA PUREE**

**Authors:** ORNELLA MARIA PORCU; DANNIELLA XAVIER

**Institution:** FEDERAL UNIVERSITY OF TECHNOLOGY (UTFPR), BRAZIL

**Country:** BRASIL

**Session:** TV3 - Date: 12/05/2014 - Room: FOYER - Time: 15:24-15:29:00

**BACKGROUND**

An alternative to reduce or prevent the risk of nutritional deficiencies can be by developing food products with nutritionally enriched with functional ingredients as guava powder. The retention of bioactive compounds during food processing is still matter of study.

**OBJECTIVES**

The present study had the objective of quantifying total flavonoids and total phenolics of microencapsulating guava puree with dextrin atomized by spray dryer.

**METHODS**

Concentrated guava puree (*Psidium guajava*, Paluma cultivar) was purchased from local food industry, in Santa Catarina state, Brazil. Dextrin was added to the guava puree in a proportion of 1:1, homogenised in a colloid mill, until the complete dissolution. For guava puree (G) it was necessary to add water according to the carrier agent concentration. The spray dryer operates concurrently and has a spray nozzle with an orifice of 1.0 mm in diameter. The flow of the drying air was about 0.54 L/h and the temperature ranged from 40-60 °C. The microencapsulated guava puree (MG) produced were stored in desiccators, containing silica gel. The total flavonoids and total phenolics content was determined followed the methods described by Park et al (1995) and Singleton et al (1999), respectively.

**RESULTS**

The concentrations of total flavonoids and total phenolics of guava puree ( $1.34 \pm 0.05$  mg GAE/g and  $3.29 \pm 0.08$  mg quercetine/g, respectively) and microencapsulating guava puree ( $0.72 \pm 0.03$  mg GAE/g and  $1.81 \pm 0.04$  mg quercetine/g, respectively) showed significant difference ( $p < 0.05$ ).

**CONCLUSIONS**

This study showed that levels of bioactives substances, total flavonoids and total phenolics, were higher for the microencapsulating guava puree and this contribute to become an excellent ingredient for functional food industry, particularly for the bakery industry.

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## EP-36 - QUALITY NUTRITIONAL OF BEAN CULTIVAR: UIRAPURU

**Authors:** ORNELLA MARIA PORCU; DANNIELLA XAVIER

**Institution:** FEDERAL UNIVERSITY OF TECHNOLOGY (UTFPR), BRAZIL

**Country:** BRASIL

**Session:** TV4 - Date: 12/05/2014 - Room: FOYER - Time: 15:00-15:05:00

### BACKGROUND

Brazil is one of the largest producers and consumers of beans. The grains of beans fill the main dietary recommendations for good health because it provides essential nutrients.

### OBJECTIVES

In this study we selected the variety of bean as IPR88 Uirapuru (Uirapuru) to evaluate the chemical composition.

### METHODS

The sample (10 Kg of cultivar) were collected in 2012, February, March (Uirapuru: latitude -26° 7' 30.79"; longitude -52° 38' 57.31") at Pato Branco, Paraná state, Brazil. The physicochemical parameters followed the methods described by Analytical Standards methods of Institute Adolfo Lutz (2008). The concentrations of the micronutrients K, Na, Ca, P and Fe were analyzed by flame atomic absorption spectrometry. All the analysis were made in triplicate.

### RESULTS

The analytical parameters showed for the humidity ( $6.87 \pm 0.42$  %), mineral residues ( $4.20 \pm 0.07$  %), lipids ( $1.41 \pm 0.08$  %), protein ( $17.92 \pm 0.18$  %), fiber ( $11.87 \pm 0.97$  %), total carbohydrate by difference ( $57.73 \pm 1.72$  %) a rich nutrients composition. A higher value of potassium ( $1222.50 \pm 0.11$  mg/100g), sodium ( $17.77 \pm 0.26$  mg/100g), calcium ( $107.18 \pm 1.94$  mg/100g), phosphorus ( $417.21 \pm 2.51$  mg/100g and iron ( $3.62 \pm 0.05$  mg/100g), were found and confirmed the nutritional quality of these variety.

### CONCLUSIONS

It was concluded that the physico-chemical and mineral composition of the Uirapuru variety studied presented good nutritional values, distinguished IPR88 Uirapuru with greater protein and potassium value. Thus, it can be used as ingredient that add value to a food product.

## EP-37 - ADEQUACY OF MICRONUTRIENT SUPPLEMENTATION IN CHILDREN AND ADOLESCENTS TREATED WITH THE KETOGENIC DIET

**Authors:** PATRICIA AZEVEDO LIMA ; MARIANA BALDINI PRUDÊNCIO ; LETICIA BRITO SAMPAIO; DANIELA MURAKAMI; NÁGILA TEIXEIRA DAMASCENO

**Institution:** FACULDADE DE SAÚDE PÚBLICA - USP

**Country:** BRASIL

**Session:** TV4 - Date: 12/05/2014 - Room: FOYER - Time: 15:06-15:11:00

### BACKGROUND

The ketogenic diet is a high fat diet, low carbohydrates and poor in micronutrients, however, this diet is effective to reduce seizures in more than 50% children. Although studies show this benefit, few studies evaluate the accuracy of supplementation of vitamins and minerals associated with the ketogenic diet. Regarding that childhood and adolescence are in a critical periods for growth and development adequate intake of vitamins and minerals are essential for these physiology processes and prevention of morbidities.

### OBJECTIVES

Assess the adequacy of micronutrient supplementation in children and adolescents with refractory epilepsy under ketogenic diet treatment.

### METHODS

This protocol enrolled children and adolescents (n=16), both gender and 1-13 y old. After 3 m of ketogenic diet, micronutrient supplements and food consumption were monitored by three records. The conversion of food into nutrients was made using the Food Processor software and later supplements were added to this value. Nutrients were adjusted for intrapersonal variance through the Multiple Source Method (MSM). Adequacy of micronutrients was based in EAR second age: Group I – 1-3y; Group II – 4-8 y; Group III – 9-13y.

### RESULTS

Children (n=3 female, n=10 male) and adolescents (n=3 male) were included in this study. Data consumption showed inadequate values of vitamin D and calcium for all groups. For vitamin D inadequacy ranged from 68-78%. When calcium was evaluated, these percentages increased to 75 to 90% of inadequacy. Besides these micronutrients, vitamin E and folate was adequate only for group II. The inadequacy of vitamin E was about 30% and 40-50% for folate.

### CONCLUSIONS

Ketogenic diet is associated to inadequacies of vitamin D, calcium, vitamin E and folate in children and adolescents. These results indicate that effective measures for micronutrients supplementation need urgent review to ensure adequate bone health, growth and prevention of cardiovascular morbidities (oxidized lipoproteins and homocystein) of these individuals.

FAPESP - 2012/03775-0

**EP-39 - SCREENING FOR PHYTASES USING A METAGENOMIC APPROACH****Authors:** RALF GREINER; ADJID SAJIDAN; DANIEL BLACKBURN-MENEZ; JACQUELINNE ACUÑA; MILKO JORQUERA**Institution:** MAX RUBNER-INSTITUT**Country:** GERMANY**Session:** TV4 - Date: 12/05/2014 - Room: FOYER - Time: 15:18-15:29:00**BACKGROUND**

Phytase [myo-inositol(1,2,3,4,5,6)hexakisphosphate phosphohydrolase], a phytate-specific phosphatase, is already used as a supplement in diets for simple-stomached animals to improve phosphate utilisation from phytate [myo-inositol(1,2,3,4,5,6)hexakisphosphate], the major storage form of phosphate in plant seeds and grains. In recent years, this class of enzymes has also found increasing interest to be used in food processing and manufacturing, particularly because reduction in dietary phytate is seen as a possibility to combat zinc and iron deficiencies by enhancing their bioavailability in plant-based foods. Several phytase have been purified and characterized in respect to their biotechnological application and some are commercially available in the meantime. However, especially for food applications a higher temperature stability of the enzyme would be of advantage.

**OBJECTIVES**

Therefore, screening soil microorganisms for the production of a thermostable phytase by a metagenomic approach was the aim of the studies.

**METHODS**

Expression of environmental DNA in bacteria (metagenomic screening) has proven highly useful for identification of novel enzymes or enzymes with improved properties. Genomic DNA was obtained from agricultural soil using a method based on direct lysis and purified by gel filtration. The recovered DNA was of high molecular mass and sufficiently pure for subsequent cloning. Following enzymatic digestion, the DNA was cloned into the expression vector pBluescript SK+. The resulting expression plasmid library comprised a total of 25000 clones.

**RESULTS**

The library was screened for phosphatase activity using X-phosphate as a substrate. 27 clones with improved phosphatase activities were identified. Using sodium phytate as a test substrate revealed that 15 clones showed also an improved phytase activity. Compared to many phytases described in the scientific literature so far, 4 of the phytases identified by metagenomic screening exhibited an improved temperature stability. Residual activity after exposure to 80°C for 10 min was determined to be higher than 70%.

**CONCLUSIONS**

In summary, it was shown that direct cloning of environmental DNA is a suitable strategy to utilize the metabolic diversity in a given habitat for biotechnical innovations.

**EP-40 - INFLUENCE OF DIET, MENSTRUATION, AND GENETIC FACTORS ON IRON STATUS IN SPANISH WOMEN OF CHILDBEARING AGE****Authors:** RUTH BLANCO-ROJO; LAURA TOXQUI; ANA M LÓPEZ-PARRA; CARLOS BAEZA-RICHER; ANA M PÉREZ-GRANADOS; EDUARDO ARROYO-PARDO; M PILAR VAQUERO**Institution:** ICTAN-CSIC**Country:** SPAIN**Session:** TV4 - Date: 12/05/2014 - Room: FOYER - Time: 15:24-15:29:00**BACKGROUND**

Prevalence of iron deficiency in women at fertile age is high, and may have substantial health and economic costs.

**OBJECTIVES**

The aim of this study was to investigate the combined influence of diet, menstruation and genetic factors on iron status in Spanish menstruating women.

**METHODS**

A group of 142 healthy menstruating women participated in the study. Dietary intake was assessed by a 72-h detailed dietary report and menstrual blood loss by a questionnaire designed by the research group, to determine a Menstrual Blood Loss Coefficient (MBLC). Five selected SNPs (1,2) were genotyped by minisequencing assay. Iron biomarkers (haemoglobin, ferritin, soluble transferrin receptor, transferrin, serum iron and red blood cell distribution width) were determined and a cluster analysis using the k-means algorithm was performed. A categorical regression with optimal scaling was performed to identify the factors associated with cluster belonging.

**RESULTS**

Three clusters were identified: women with poor iron status (cluster 1, n=26); women with mild iron deficiency (cluster 2, n=59) and women with sufficient iron status (cluster 3, n=57). Three independent factors were included in the model that better explained cluster belonging ( $R^2=0.142$  and  $p<0.001$ ). The most influential factor was red meat consumption ( $p=0.001$  and importance coefficient=0.677); higher red meat intake predicts better iron status. MBLC was inversely related to clusters belonging, therefore, the higher MBLC the lower iron status ( $p=0.085$  and importance coefficient=0.170). Thirdly, presence of the minor allele of SNP rs1800562 (mutation C282Y) was related to higher iron status ( $p=0.095$  and importance coefficient=0.153).

**CONCLUSIONS**

We found, by a cluster approach method, that three factors: red meat consumption, menstrual blood loss and the C282Y mutation of the HFE gene, play a significant role in the iron status of menstruating women. These findings could help choose adequate strategies to improve iron status and prevent the development of iron deficiency anaemia in population at risk.

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1-Baeza-Richer C, Blanco-Rojo R, Lopez-Parra AM et al Dis Markers 2013 34:121-129

2-Blanco-Rojo R, Baeza-Richer C, Lopez-Parra AM et al Nutr Metab (Lond) 2011 8:69



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## **EP-41 - CHANGES IN MAGNESIUM STATUS IN OBESITY: PRELIMINARY RESULTS USING HIGH-FAT FED RATS AND LEPTIN-DEFICIENT OB/OB MICE**

**Authors:** ALEXANDRE RODRIGUES LOBO; JOSÉ DONATO JR; ISADORA CLIVATTI FURIGO; ANA LINA CC SALES; AMANDA BR ROMERO; PRYSCILA DS TEIXEIRA; EDUARDO DE CARLI; FABIANA DA SILVA LIMA; CÉLIA COLLI

**Institution:** UNIVERSITY OF SÃO PAULO

**Country:** BRASIL

**Session:** TV1 - Date: 13/05/2014 - Room: FOYER - Time: 10:00-10:05:00

### **BACKGROUND**

Magnesium deficiency is associated with worsening of some chronic diseases such as diabetes, osteoporosis and obesity.

### **OBJECTIVES**

Here, we report changes in tissue Mg distribution in two different obesity rodent models.

### **METHODS**

High-fat-diet fed growing Wistar rats and growing ob/ob mice were studied in two separate experiments for 8 weeks.

### **RESULTS**

Both diet-induced and leptin-deficient obese animals became fatter, insulin resistant (as demonstrated by the insulin tolerance test) and hyperglycemic compared to their control counterparts. Serum Mg was not affected by the high-fat diet consumption, however was slightly increased in ob/ob mice in comparison with wildtype littermates ( $P = 0.07$ ). Femur Mg concentrations were significantly decreased in both obesity models ( $P = 0.03$  and  $P < 0.01$  for high-fat rats and ob/ob mice, respectively). Nevertheless, significant associations of bone Mg with adiposity ( $r = -0.92$ ;  $P < 0.001$ ) and insulin resistance ( $r = -0.91$ ;  $P < 0.001$ ) were observed only when genetically-induced obesity was considered.

### **CONCLUSIONS**

Our data indicate a higher bone Mg mobilization in obesity rodents probably for maintaining blood Mg levels. Whether these changes are a result of increased systemic demand for the mineral in a condition of insulin resistance is a subject to be considered in further studies.

FAPESP - 2010/05644-5, 2012/16284-5

## **EP-42 - TAURINE BIOAVAILABILITY IN CACO-2 CELLS IS AFFECTED BY FUNCTIONAL COMPOUNDS OF FISH**

**Authors:** ANDREW VINCENT; NATHALIE SCHEERS; ANN-SOFIE SANDBERG

**Institution:** CHALMERS UNIVERSITY OF TECHNOLOGY

**Country:** SWEDEN

**Session:** TV1 - Date: 13/05/2014 - Room: FOYER - Time: 10:06-10:11:00

### **BACKGROUND**

A diet rich in fish reduces risk factors for cardiovascular disease. This has been mainly attributed to  $\omega$ -3 fatty acids but fish contain several other functional compounds that have proved to be important for cardiovascular health. Fish also contains high amounts of taurine, which has been shown to improve vascular health by regulating calcium transport and acting to maintain membrane stability and redox homeostasis. It is therefore important to investigate the bioavailability of taurine together with other functional compounds found in fish.

### **OBJECTIVES**

To determine if taurine bioaccessibility (uptake) and bioavailability (basal efflux) is influenced by vitamin B12, seleno-L-methionine (SeMet), and the  $\omega$ -3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

### **METHODS**

The human intestinal Caco-2 cell model was used to estimate the bioaccessibility and bioavailability of taurine. Transport of taurine (20 mM), as [3H]-taurine (0.5  $\mu$ Ci mL<sup>-1</sup>), in the presence of DHA (100  $\mu$ M), EPA (100  $\mu$ M), SeMet (20  $\mu$ M), or vitamin B12 (3.5 nM) was measured by liquid scintillation counting.

### **RESULTS**

Preliminary results indicated that taurine uptake was reduced in the presence of DHA (15 %), EPA (14 %), Vitamin B12 (20%), and SeMet (15 %) respectively. Similarly, taurine cellular efflux was reduced by EPA (13 %) and DHA (18 %).

### **CONCLUSIONS**

Taurine uptake was reduced by EPA, DHA, vitamin B12, and SeMet, which suggests that taurine is less bioavailable in the presence of these compounds.

# BIOAVAILABILITY 2014

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MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## **EP-43 - ESTIMATION OF FOLIC ACID BIOAVAILABILITY IN EGG WHITE NANOCARRIERS BY A MICROBIOLOGICAL MODEL**

**Authors:** CAROLINA ARZENI; OSCAR EDGARDO PÉREZ; JEAN GUY LEBLANC; ANA MARÍA R PILOSO

**Institution:** UNIVERSIDAD DE BUENOS AIRES - CONICET

**Country:** ARGENTINA

**Session:** TV1 - Date: 13/05/2014 - Room: FOYER - Time: 10:12-10:17:00

### **BACKGROUND**

Egg white (EW) is widely used in the food industry due to its excellent gelling, emulsifying and foaming properties. High intensity ultrasound (HIUS) is known to induce modifications in biopolymers, and this could be used to control particle size and generate nanocarriers. On the other hand, folic acid (FA), an important B vitamin, participates in many metabolic pathways, such as DNA and RNA biosynthesis and amino acid interconversions. FA is unstable to heat and light exposure, especially at acid pHs. Thus, its complexation with proteins could enhance its stability to manufacturing processes but its biological activity in the nanocomplexes must be guaranteed.

### **OBJECTIVES**

The aim of this work was to develop FA nanocomplexes with EW nanoparticles and evaluate the biological activity of FA after the nanocomplexes were subjected to an in vitro digestion process.

### **METHODS**

The nanoparticles were generated by applying HIUS to 5% EW solutions at pH 3 and 7, with (thermosonication) or without simultaneous heating. Then, FA was added to the nanoparticles and their interaction was evaluated by measuring the fluorescent quenching and the degree of binding by ultrafiltration. Stability to dehydration was also evaluated by dynamic light scattering. Samples were subjected to changes in pH involved in the digestion process. Then particle size and degree of FA binding was reassessed. Finally, a digestion of the nanocarriers was achieved by applying an in vitro digestion protocol and the biological activity of FA on the digested samples was determined with a microbiological assay (MA).

### **RESULTS**

At pH 3, a population of particles of about 70 nm of diameter was obtained after thermosonication at 85 °C for 20 min; using sonication without heating a monomodal population of about 200 nm was yielded. After the binding with FA a reduction of the nanoparticles fluorescence intensity was detected; this proved the interaction with FA. The percentage of binding was approximately 80% for both systems. Only a few aggregates were formed after drying the nanocomplexes. The nanocarriers were stable up to pH 4, then they aggregated and FA was partially released. The results of the MA showed that bound FA presented a higher biological activity in comparison to the free form of the vitamin.

### **CONCLUSIONS**

EW nanocarriers proved to be suitable for the preservation of FA biological activity and its transport across the gastrointestinal tract. EW nanoparticles might be used as a potential carrier for fortification of food products with FA.

## **EP-44 - CHEMICAL SPECIATION: A USEFUL TECHNIQUE TO PREDICT THE BIOAVAILABILITY OF MINERAL ELEMENTS IN FOOD MATRICES**

**Authors:** LUANA SARPA REIS; ANA ELIZABETH C. FAI BUARQUE DE GUSM; ÉDIRA C B A GONÇALVES

**Institution:** UNIVERSIDADE FEDERAL DO ESTADO DO RIO DE JANEIRO

**Country:** BRASIL

**Session:** TV1 - Date: 13/05/2014 - Room: FOYER - Time: 10:18-10:23:00

### **ABSTRACT**

Chemical speciation analyzes chemical forms of metals in a sample. Today it is generally recognized that the particular behavior of mineral elements in food matrices is determined by their specific physicochemical forms rather than by their total concentration. So the nutritional value of a food containing a given mineral depends not only on its content, but also on its bioavailability. An analytical procedure involving sequential chemical extractions has been used to determine the chemical associations of micronutrients and trace elements. Sequential extraction consists of the use of a number of extractors with different chemical properties that are progressively applied to a sample in order to evaluate the fractionation of the metals in solid matrices. The present abstract emphasizes the importance of element speciation in food for understanding biological activity. Chemical speciation can be defined as the individual chemical forms of an element, which together constitute the total concentration of the element in a given sample. Reagents with different chemical properties are used so that the chemical forms of an element can be leached out using various mechanisms, such as complexation or acidification. Thus, the sequential extraction method can help in the elucidation of bioavailability of the chemical forms. It is known that there is no general protocol for sequential extraction in foods, and therefore the nature of the sample should be always taken into consideration. Each food has a different chemical matrix; so chemical speciation must be carefully performed. Mechanisms of sequential extraction in foods should be stimulated to provide a better understanding of metal speciation in the matrix, as well as mobility and bioavailability. Low concentrations of these elements in food, complex chemical behavior and instability of the species are the reasons why there are not many studies in this area. As food matrices and sequential extraction procedures are very varied, it is possible to observe the diversity of chemical interactions between species. A better understanding of some micronutrients and trace elements bioavailability in food is important, but it is a challenge for chemical researchers. Stimulating research of the fractions obtained in sequential extraction studies with the application of technologies such as chromatography and mass spectrometry will enable a greater understanding of the chemical speciation these metals in food matrices.

**EP-46 - ASSOCIATION BETWEEN NON-ALCOHOLIC FATTY LIVER, LACTOSE INTOLERANCE AND DIAGNOSTIC CRITERIA OF METABOLIC SYNDROME****Authors:** ERIJESSYKA MARI OLIVEIRA MATOS; EDILENE MARIA QUEIROZ ARAÚJO; ISABELLA SANT ANNA LIMA; LAURA COSTA MENEZES; DOMINGOS LÁZARO RIOS SOUZA**Institution:** UNIVERSIDADE DO ESTADO DA BAHIA**Country:** BRASIL**Session:** TV2 - Date: 13/05/2014 - Room: FOYER - Time: 10:00-10:05:00**BACKGROUND**

Non-alcoholic fatty liver (NAFLD among) is defined by the accumulation of fat within the hepatocytes in individuals who do not consume significant quantities of alcohol to be considered harmful to the liver. Despite not being part of the diagnostic criteria for Metabolic Syndrome (MetS), the NAFLD among is commonly associated with the components of this syndrome, such as obesity, insulin resistance, diabetes mellitus and hypertriglyceridemia. The glucose intolerance (GI) is one of the factors in the MetS with high prevalence in the Brazilian population, having its primary etiology (genetic) or secondary.

**OBJECTIVES**

Analyze the association between lactose intolerance and NAFLD among, check the prevalence of NAFLD among a group of patients with MetS and compare the diagnostic criteria of MetS.

**METHODS**

Cross-sectional Study with 65 patients with SM, attended in the period April to August 2013, in clinical school of the University of the State of Bahia. They have been subjected to an anthropometric assessment (BMI, WC, BIA, & sum; 4 folds, PA) and the realization of biochemical tests (fasting glucose, total cholesterol and fractions; triglycerides; insulin; test of lactose intolerance and abdominal ultrasonography specifies for the search of hepatic steatosis). The chi-square test was used and/or Fisher's exact test, Mann-Whitney non-parametric test and Pearson's correlation (r). Being considered the level of significance  $p < 0.05$ .

**RESULTS**

The NAFLD among was prevalent in 62.5% of the studied population, with predominance of females and obese individuals. Patients with NAFLD among showed high prevalence of arterial hypertension, high levels of total cholesterol, LDL-cholesterol and triglycerides and low levels of HDL-cholesterol. There was statistical significance in the association between NAFLD among and lactose intolerance, probably due to the increased intestinal permeability in these individuals.

**CONCLUSIONS**

This study highlights the importance of investigations of lactose intolerance in patients with NAFLD among and vice-versa. They also observed a close association between the risk factors for the metabolic syndrome and NAFLD among. Despite not being part of the MetS, highlights the tendency to association of LDL cholesterol and the NAFLD among these patients. However, it is necessary more studies with a larger population to better analyze these associations.

**EP-47 - MINERAL PROFILE OF ENTERAL HANDMADE DIETS PRESCRIBED AT HOSPITAL DISCHARGE IN TWO BRAZILIAN PUBLIC HOSPITALS****Authors:** GILBERTO SIMEONE HENRIQUES; ANN KRISTINE JANSEN; SIMONE GENEROSO VASCONCELOS; EDUARDA GUIMARÃES GUEDES; LIGIA VENTURA MIRANDA**Institution:** UNIVERSIDADE FEDERAL DE MINAS GERAIS**Country:** BRASIL**Session:** TV2 - Date: 13/05/2014 - Room: FOYER - Time: 10:06-10:11:00**BACKGROUND**

Handmade enteral diets were the cheapest and naturally source of nutrients for subjects that need nutritional home care after hospital discharge. While they normally follow nutrient composition guidelines the mineral composition often remain unknown.

**OBJECTIVES**

Measure multielementar mineral contents and adequacy of ten types of enteral regular diets prescribed by 2 public hospitals of Belo Horizonte – Brazil to patients submitted to discharge procedure.

**METHODS**

The amounts of Ca, Cu, Fe, Zn, P, Na, K, Mg and Mn was determined in the triplicates of diets in two ranges of calories – 1000 to 1200 Kcal or 1800 to 2100 Kcal by ICP-OES in a Agilent 720 series spectrometer with an axial view configuration. Multi elementar standard solution was prepared in 5% HCl (v/v) from stock solutions of 10,000 mg/L for Ca, K, Mg, Na or 1,000 mg/L for Cu, Mn, Fe and Zn. The concentration ranges of the standard solutions were 0.01 to 1 mg/L of Cu, Fe, Mn and Zn or 1.01 to 101 mg/L of Ca, Mg, K, P and Na. Dietary Reference Intakes (DRIs) were used to determine the adequacy of the daily amounts provide by diets.

**RESULTS**

The medium values found in 100 mL for 1000 to 1200 Kcal diets was 145,33 mg of Ca, 1,67 mg of Cu, 2,12 mg of Fe, 2,41 mg of Zn, 64,65 mg of P, 109,37 mg of Na, 105,66 mg of K, 13,13 mg of Mg and 0,14 mg of Mn. The adequacy of minerals was 121% of Ca, 1113% of Cu, 141% of Fe, 163% of Zn, 54% of P, 91% of Na, 53 % of K, 38% of Mg and 70% of Mn. On the other caloric range (1800 to 2100 Kcal) the centesimal values were 136,11 mg of Ca, 2,06 mg of Cu, 2,76 mg of Fe, 3,29 mg of Zn, 65,47 mg of P, 132,54 mg of Na, 84,61 mg of K, 12,47 mg of Mg and 0,15 mg of Mn. This represents one adequacy of 113% of Ca, 686% of Cu, 219% of Fe, 219% of Zn, 55% of P, 110% of Na, 42% of K, 36% of Mg and 75% of Mn.

**CONCLUSIONS**

We found no significant difference between mineral concentration detected in both ranges of caloric levels. There is a maintenance of mineral concentrations on diets despite increased caloric levels, showed stability of minerals on the diets. Electrolytes, Mg and Mn are at risk of inadequacy.

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# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## **EP-50 - PROFILE AND FEEDING BEHAVIOR OF MOTHERS AND CHILDREN YOUNGER THAN 2 YEARS OF CITIES IN THE COUNTRY SIDE OF MINAS GERAIS**

**Authors:** IVY CAZELLI PIRES; RAFAELLA LEMOS ALVES; NATHÁLIA SOUZA LARA; LUCILENE SOARES MIRANDA

**Institution:** UFVJM - DIAMANTINA

**Country:** BRASIL

**Session:** TV2 - Date: 13/05/2014 - Room: FOYER - Time: 10:24-10:29:00

### **BACKGROUND**

The family meals represent an important event in the promotion of a healthy diet, considering that the eating habits of parents may extend to the entire family. The objective of this work was to evaluate the profile and feeding behavior of mothers and children younger than 2 years old.

### **OBJECTIVES**

The objective of this work was to evaluate the profile and feeding behavior of mothers and children younger than 2 years old.

### **METHODS**

A Study of transversal design was developed in three districts of Diamantina - MG and the city of President Juscelino - MG. The sample consisted in families of pre-school age children enrolled in the Family Health Strategy (ESF) of the different neighborhoods of the city. The families selected were those who had children between 1 to 2 years 11 months and 29 days of age, a total of 166 families. Questionnaire of habits and feeding frequency in mothers and children between 1 to 2 years and it was used the Pearson correlation (5% significance) to evaluate correlations between the profile and feeding behavior of mothers and children.

### **RESULTS**

The presence of their mothers during the meals was correlated with the achievement of meals for children respectively ( $r = 0.22$ ;  $p < 0.05$ ), snack ( $r = 0.39$ ;  $p < 0.001$ ); dinner ( $r = 0.42$ ;  $p < 0.001$ ) and supper ( $r = 0.18$ ;  $p < 0.05$ ). The food that stood out in terms of the frequency of daily consumption for mothers and children respectively were: rice (98,19 %; 93,37 %), tomatoes (9,04 %; 7,23 %), banana (13,25 %; 20,48 %), beef (47,59 %; 45,78 %) were %, whole milk (48,19 %; 79,52 %), beans (93,98 %; 96,39 %), vegetable oil (97,59 %; 96,39 %), white sugar (93,98 %; 92,17 %), salt (98,79 %; 97,59 %) and coffee (89,76 %; 68,07 %).

### **CONCLUSIONS**

It was found in the high-frequency consumption of complex carbohydrates, sugars, lipids, salt and coffee counterpoising to lesser consumption of fruit, vegetables, meat and milk by both mothers and children.

SUPPORT: FAPEMIG, CNPq AND PROEXC/ UFVJM.

## **EP-51 - CORRELATION BETWEEN PLASMA SELENIUM CONCENTRATION, GENDER AND AGE**

**Authors:** LARISSA BEZERRA SANTOS; CHRISTIELLE FÉLIX BARROSO; LILIANE VIANA PIRES; CARLA SORAYA COSTA MAIA; ISABELA SARAIVA ALMEIDA; PAULO CÉSAR ALMEIDA; SILVIA MARIA F COZZOLINO

**Institution:** UNIVERSIDADE DE SÃO PAULO

**Country:** BRASIL

**Session:** TV3 - Date: 13/05/2014 - Room: FOYER - Time: 10:00-10:05:00

### **BACKGROUND**

Selenium (Se) is an important mineral that displays activity as part of selenoproteins. Glutathione peroxidase (GPx) is one of these selenoproteins which has several importance due to its participation in antioxidant system. Inadequate consumption of Se causes a decrease in the enzyme activity, what in turn can affect the antioxidant protection.

### **OBJECTIVES**

This study aimed to verify the relationship of selenium nutritional status (plasma concentration), gender and age of an adult population living at Fortaleza/Ceará/Brazil, a known selenium rich area.

### **METHODS**

Plasma selenium concentration was detected by atomic absorption spectrometry with hydride generator coupled to the quartz cell.

### **RESULTS**

The study population consisted of 176 individuals (79 men and 97 women) with a mean age of  $30.4 \pm 8.9$  years. Significant differences for plasma selenium were found among men and women ( $p = 0.007$ ) and the values of the highest averages was presented for men. The participants age was positively correlated with the plasma selenium concentration ( $p = 0.011$ ,  $r = 0.191$ ).

### **CONCLUSIONS**

Food consumption relating to selenium sources improves with age. The improved purchasing power and better food choices can explain this fact. Men have better selenium status than women in this study.

CNPQ

**EP-52 - EFFECT OF TIME AND COOKING STYLE IN THE BIOACCESSIBILITY OF  $\beta$ -CAROTENE IN COMMERCIAL PUMPKINS (CUCURBITA MOSCHATA DUCH.)****Authors:** EDIANE MARIA GOMES RIBEIRO; LUCIA MARIA JAEGER DE CARVALHO; CHUREEPORN CHITCHUMROONCHO; MARK L. FAILLA**Institution:** UNIVERSIDADE FEDERAL DO RIO DE JANEIRO**Country:** BRASIL**Session:** TV3 - **Date:** 13/05/2014 - **Room:** FOYER - **Time:** 10:06-10:11:00**BACKGROUND**

Carotenoids are important for their wide distribution, structural diversity and various functions. Among more than 600 carotenoids which have pro-vitamin A activity, the most known are the  $\alpha$ - and  $\beta$ -carotene. Nowadays, vitamin A deficiency (VAD) still represents one of the major avoidable public health problems in the world, being one of the most important components of the high morbidity and mortality rates among children in developing countries. In low-income areas in the Northeast region of Brazil, there is a high prevalence of night blindness caused by vitamin A. The processing and storage of foods should be optimized to avoid or reduce degradation of carotenoids, accentuating the bioavailability. Pumpkins are considered a good source of pro vitamin A and widely consumed by the Brazilian population, in various forms of preparation.

**OBJECTIVES**

The aim of this study was to evaluate the effect of different cooking times on bioaccessibility in two commercial pumpkins (orange and yellow), boiled with water (5, 10, 15 and 20') and steamed (7, 14, 21 and 28').

**METHODS**

The simulated in vitro digestion was performed according to Garrett et al. (1999) and Chitchumroonchokchai et al., 2004, and extraction of carotenoids by AOAC (1993) and Seo et al. (2005), both with modifications.

**RESULTS**

Total carotenoid content in raw orange pumpkin (71.8  $\mu\text{g}\cdot\text{g}^{-1}$ ) was significantly ( $p < 0.001$ ) higher than the yellow pumpkin (9.6  $\mu\text{g}\cdot\text{g}^{-1}$ ). The loss of carotenoids after cooking in water (boiled) was significantly higher than that in steamed pumpkin, for dissolution, in both varieties. Recovery of carotenoids after simulated oral, gastric and small intestinal digestion was  $\geq 93\%$  for all samples. The efficiency of micellarization of carotenoids during digestion of yellow pumpkin (27.6 to 35.3%) markedly exceeded the orange pumpkin (3.2 to 7.3%) and increased approximately 25% by extending the cooking period. The micellarization in boiled and steamed orange pumpkin increased by 30% and 128%, respectively, with extended time of cooking.

**CONCLUSIONS**

These results showed that the duration of boiling and steaming of orange and yellow pumpkin did not significantly alter the amounts of all trans- or cis- $\beta\text{C}$  or  $\alpha$ -carotene. The total amount of provitamin A carotenoids in micelles increased with greater duration of cooking of both orange and yellow pumpkin.

BIOFORT/FUNDAÇÃO ARTHUR BERNARDES

**EP-53 - POTENTIAL MINERAL AVAILABILITY OF RAW MATERIALS FOR THE MANUFACTURE OF BAKERY PRODUCTS WITH IMPROVED NUTRITIONAL VALUE****Authors:** LUIS DYNER; CAROLINA CAGNASSO; VIVIANA RODRIGUEZ; VERONICA FERREYRA; NICOLÁS APRO; MARGARITA OLIVERA CARRIÓN**Institution:** UNIVERSIDAD DE BUENOS AIRES**Country:** ARGENTINA**Session:** TV3 - **Date:** 13/05/2014 - **Room:** FOYER - **Time:** 10:12-10:17:00**BACKGROUND**

A great variety of bakery products made with mixed flours are consumed all over the world. These products are perceived by the consumers as healthy foods with possible beneficial physiological effects. Previous studies had demonstrated that the extrusion process can maintain the nutritional quality of these flours making them appealing as ingredients for different products. This is why it would be important to know not only their mineral content but also their mineral availability as this may be limited by the presence of phytic acid (PA). PA/cation molar ratio is an accepted index for potential mineral availability.

**OBJECTIVES**

To study the potential availability of minerals of nutritional interest like Fe, Ca and Zn in extruded pea, soy and flaxseed flours and to evaluate the impact of the addition of these flours to commercial wheat flour for the manufacture bakery products

**METHODS** Fe, Ca and Zn were determined by atomic absorption spectrometry after wet ashing with  $\text{HNO}_3 - \text{HClO}_4$  (1:1) in commercial wheat flour (W) (*Triticum aestivum* L.), extruded pea flour (*Pisum sativum* L.) (P), semi defatted extruded soy flour (*Glycine max* L.) (S) and semi defatted extruded flaxseed flour (*Linum usitatissimum* L.) (F). Inositol phosphates (IP3, IP4, IP5 and IP6) were established by HPLC. Inositol phosphates were transformed to PA using conversion factors

**RESULTS** Fe, Ca and Zn content (mg/100g) for the different samples was respectively: W: 2.6, 0.9 and 0.3; P: 5.6, 101.8 and 2.9; S: 6.6, 256.6 and 3.3; F: 13.2, 117.7 and 4.7.

IP3, IP4, IP5 and IP6 content (mg/100g) was: W: 0.9, 3.5, 29.6 and 306.4; P: 15.6, 62.3, 175.9 and 265.1; S: 10.9, 69.0, 352.9 and 955.6; F: 10.1, 79.2, 387.7 and 746.7.

PA/cation (Fe, Ca and Zn) molar ratio for the different samples was: W: 11.1, 23.9 and 101.6; P: 7.5, 0.3 and 17.3; S: 17.5, 0.3 and 40.6; F: 7.7, 0.4 and 25.4.

**CONCLUSIONS** Fe, Ca and Zn content in P, S and F was significantly higher than W.

The indexes PA/Fe molar ratio, PA/Ca molar ratio and PA/Zn molar ratio must be lower to 6, 0.17 and 18 respectively for assure their availability. This means that for P and F PA/cation molar ratios values were near the limits and for S were upper the limits (except for PA/Ca molar ratio). For W PA/cation molar ratios values were higher than the reference limits. This implies that in all mixed flours Fe, Ca and Zn wouldn't be available. Nevertheless processes like fermentation and cooking involved in bread or cookie production can degrade phytates and improve mineral availability.

PARTIALLY FINANCED BY UBACYT N° 20020120100229BA

**EP-54 - EFFICACY OF EXTRUDED RICE GRAINS FORTIFIED WITH IRON, ZINC AND FOLIC ACID CONSUMED BY YOUNG ADOLESCENT GIRLS AS PART OF THEIR MID-DAY LUNCH PROGRAM IN A SOUTHEASTERN BRAZILIAN SCHOOL****Authors:** MARK ANTHONY BEINNER; SUELEN ROSA OLIVEIRA; ILKA AFONSO REIS; EDNA AFONSO REIS; ANN KRISTINE JANSEN; JOSÉ BB DA SILVA; LEONARDO VASCONCELLOS; TED GREINER**Institution:** UNIVERSIDADE FEDERAL DE MINAS GERAIS - UFMG**Country:** BRASIL**Session:** TV3 - Date: 13/05/2014 - Room: FOYER - Time: 10:18-10:23:00**BACKGROUND**

Micronutrient deficiencies such as iron (Fe), folic acid and zinc (Zn) are nutritional problems worldwide, especially in developing countries. Thus, food fortification, which refers to the addition of micronutrients to food products that are consumed regularly by a large part of the general public, such as cereal flour, rice and vegetable oils, makes them ideal for Fe, Zn and folic acid.

**OBJECTIVES**

The main objective of the present study was to determine the impact of triple-enriched extruded rice grains on Fe status in young adolescent girls as part of their daily school lunch program in southeastern Brazil.

**METHODS**

Although serum ferritin (SF) was the main outcome indicator, hair and serum Zn and folic acid were also assessed. Iron deficient girls (n = 61) were randomized to receive either fortified rice (URG: n = 34) or natural, long-grain rice (CG: n = 27) as part of their noon time lunch meal 4 d/wk for 8 mo. Iron status, hemoglobin (Hb), C-reactive protein, folic acid, hair and serum Zn concentrations were measured at baseline and 8 mo. All subjects were dewormed 2 mo prior to study intervention.

**RESULTS**

At baseline, the prevalences of ID and iron deficiency anemia (IDA) in both groups were 66 and 31%, respectively. After 8 mo of feeding, there was a significant increase in body iron stores (BIS) in both groups (p<0.05), however, the URG fared better than the CG (p<0.05). There was a significant time x treatment interaction for ID in the fortified rice group (68 to 41%) and ID increased in the CG (63 to 74%) at end-study. The percentage of girls with a deficiency of Zn, measured by hair and serum Zn in the URG (38 and 44%) and CG (41 and 59%) decreased to 15% and 0% and 37 and 48%, in the respective groups, at 8 mo. Mean s.d. serum folate concentrations were very low in both groups (URG: 10.8 ± 2.7 and CG: 9.2 ± 3.4 nmol/L) at baseline and increased significantly to 12.8 ± 3.5 nmol/L in the URG, and non significantly in the CG (10 ± 3.3 nmol/L). The effect x time for the study variables Hb, FS, BIS and hair and serum Zn was different from the effect in the CG (p<0.05). The young girls were unable to distinguish cooked fortified rice from unfortified rice in terms of smell, color, or taste.

**CONCLUSIONS**

The results add to the published evidence for the use of fortified rice consumed by Fe, Zn and folic acid deficient subjects as a strategy for controlling and preventing these prevalent diseases.

CNPQ - 476235/2010-3

**EP-55 - NUTRITIONAL QUALITY OF GUAVA PUREE AND MICROENCAPSULATE GUAVA PUREE****Authors:** ORNELLA MARIA PORCU; DANNIELLA XAVIER**Institution:** FEDERAL UNIVERSITY OF TECHNOLOGY (UTFPR), BRAZIL**Country:** BRASIL**Session:** TV3 - Date: 13/05/2014 - Room: FOYER - Time: 10:24-10:29:00**BACKGROUND**

The guava fruit (*Psidium guajava*, Paluma cultivar) is widely marketed fresh and processed. Guava is a nutritious fruit which has numerous health benefits. It is considered an excellent source of nutrients as antioxidants, including vitamin C, polyphenols, carotenoids, amounts of proteins, fats, other vitamins, minerals and total carbohydrates.

**OBJECTIVES**

In the present work we aimed to compare the chemical composition of the guava puree (G) and its microencapsulated (MG) obtained by spray dryer.

**METHODS**

Concentrated guava puree (Paluma cultivar)(G), was purchased from local food industry, in Santa Catarina state, Brazil. Dextrin was added to the guava pulp in a proportion of 1:1, homogenised in a colloid mill, until the complete dissolution. For guava pulp (G) it was necessary to add water according to the carrier agent concentration. The spray dryer operates concurrently and has a spray nozzle with an orifice of 1.0 mm in diameter. The flow of the drying air was about 0.54 L/h and the temperature ranged from 40-60 °C. The powder (MG) produced were stored in desiccators, containing silica gel. The physicochemical parameters followed the methods described by Analytical Standards methods of Institute Adolfo Lutz (2008). All analyzes were performed in triplicate.

**RESULTS**

For the humidity (46.05 ± 0.25 % and 3.75 ± 0.05 %), the lipid content (3.10 ± 0.10 % and 2.35 ± 0.05 %), protein (2.25 ± 0.15 % and 5.57 ± 0.03 %) and total carbohydrate by difference (46.85 ± 0.41 and 86.47 ± 0.01) obtained a significant difference however in the mineral residues (1.75 ± 0.09 % and 1.87 ± 0.03 %) parameter statistical showed no significant difference between (G) and (MG), respectively. A higher value of potassium (1420.50 – 1540.0 mg/100g), sodium (125.0 – 170 mg/100g) and iron (7.00 – 5.50 mg/100g) were found in the two samples (G and MG).

**CONCLUSIONS**

The composition of (G) and (MG) presented a nutritional relevant centesimal composition and showed scores no similar to each other, distinguished by higher potassium and sodium values.

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## EP-56 - EVALUATION OF THE ANTIOXIDANT CAPACITY OF DIFFERENT STRAWBERRIES CULTIVARS

**Authors:** ORNELLA MARIA PORCU; RAFAELA CARMINATTI

**Institution:** FEDERAL UNIVERSITY OF TECHNOLOGY (UTFPR), BRAZIL

**Country:** BRASIL

**Session:** TV4 - Date: 13/05/2014 - Room: FOYER - Time: 10:00-10:05:00

### BACKGROUND

The consume of fresh or processed fruits in the form of jams, nectars, liqueurs and even wines with high content of ascorbic acid, phenolic compounds, flavonoids, carotenoids, contributes to the beneficial health effects and may be related to the antioxidant capacity and the ability to fight free radicals.

### OBJECTIVES

In this study, we selected the varieties of strawberries as Albion, Camino Real, Palomar, Portolas and San Andreas, to evaluate the antioxidant capacity and its correlation with ascorbic acid, total phenolic compounds, anthocyanins, flavonols, DPPH<sup>•</sup> and ABTS.

### METHODS

The different cultivars were collect in 2013, October, December (latitude - 25° 41' 12"; longitude - 51° 38' 45") at Guarapuava, Paraná state, Brazil. The samples were washed, crushed, and stored frozen separately until the time of analysis. Analyses of total phenolic compounds, anthocyanins, flavonols, DPPH<sup>•</sup> and ABTS was used to quantify the antioxidant capacity of different strawberries cultivars. The results were analyzed by ANOVA, and significant differences were determined using Tukey's test. The antioxidant capacity was measured by the DPPH<sup>•</sup> method at 515 nm, ABTS method at 734 nm, and expressed in micromolar of trolox equivalent ( $\mu\text{M TE}$ ).

### RESULTS

Among the cultivars analyzed the San Andreas variety stood out positively. The cultivar obtained higher amounts of vitamin C ( $54,8 \pm 0,14$  mg/100 g), phenolic compounds ( $175,53 \pm 0,32$  mg of galic acid in 100 g), anthocyanins ( $31,95 \pm 0,75$  mg of cyanidin 3-glucoside in 100 g) and flavonoids ( $6,88 \pm 0,12$  mg of quercetin/100 g). The greater activity by DPPH<sup>•</sup> ( $44,78 \pm 0,45$   $\mu\text{moles}$  equivalent of trolox/100 g) and ABTS ( $171,21 \pm 0,33$   $\mu\text{moles}$  equivalent of trolox/100 g) was superior for San Andreas compared to other cutivars studied.

### CONCLUSIONS

The strawberry is an excellent source of bioactive compounds and therefore their consumption is highly advisable among consumers in the form of fresh fruit or processed.

## EP-57 - CRITERIA AND STRATEGIES APPLIED IN THE ASSESSMENT OF DIETARY INTAKE: THE CARDIONUTRI STUDY CASE

**Authors:** FLÁVIA CONTI CARTOLANO; PATRICIA AZEVEDO LIMA; CAROLINE PAPPIANI ; AUGUSTO FERREIRA CARIOCA; NAGILA TEIXEIRA DAMASCENO

**Institution:** FACULDADE DE SAÚDE PÚBLICA DA USP

**Country:** BRASIL

**Session:** TV4 - Date: 13/05/2014 - Room: FOYER - Time: 10:06-10:11:00

### BACKGROUND

Diet is a key factor in prevention and treatment of chronic non-communicable diseases (NCDs). Thus, estimative of nutrient intake in population represents a step of great relevance and difficult accuracy.

### OBJECTIVES

To establish criteria and strategies to the collection and analysis of food consumption data applied to studies of NCD.

### METHODS

From 374 individuals included in the CARDIONUTRI study, 1865 24-hour Dietary Recalls (24hDR) were evaluated. The CARDIONUTRI study was designed to evaluate the impact of supplemental fatty acids (omega 3, 6 and 9) on cardiometabolic parameters. Data consumption were analyzed in the Food Processor 10.11.0 (Esha Research ®).

### RESULTS

Phase I: Food list and household measure standardization, second PINHEIRO et al. 2005, YUKI et al. 2002, BOMBEM et al. 2012, and FISBERG et al. 2002. It was notable the importance of establishing an order of query because of the variations found between the tables of measures. Phase II: Check list of the food list, Only 63% foods were standardized using the software base. National tools to support the assessment of consumption as household measures tables, food composition tables, food labels and books preparations sources are insufficient to meet the needs of studies that reflect the dietary patterns of our population, reinforcing the importance of biomarkers to consumption.

FAPESP - 2012/03775-0

**EP-58 - CONVERTING RICE BRAN INTO A HIGH-VALUE FOOD INGREDIENT****Authors:** RALF GREINER**Institution:** MAX RUBNER-INSTITUT**Country:** GERMANY**Session:** TV4 - Date: 13/05/2014 - Room: FOYER - Time: 10:12-10:17:00**BACKGROUND**

Most rice bran is currently used for livestock feed or is discarded. However, rice bran contains nutrients and health-promoting compounds. Thus, it would be desirable to convert it to a high-value food ingredient.

**OBJECTIVES**

This study was performed to develop a proper manufacturing procedure especially in order to improve mineral availability from rice bran.

**METHODS**

Crude protein content was calculated (%N x 6.25) after determination of nitrogen content by the Kjeldahl method. Crude fat was determined by the Soxhlet method. Insoluble and soluble fibre contents were quantified by the enzymatic-gravimetric method. Acid value was determined by titration. myo-Inositol phosphates, oryzanol and the vitamins B1, B2, B3, B6, E ( $\alpha$ -tocopherol) were analysed by HPLC. Inorganic phosphate was quantified by the ammonium molybdate method and the minerals by ICP-MS.

**RESULTS**

Because of its oil content (up to 22%) rice bran is an unstable material. Extrusion is a common method used for its stabilisation. The process inactivates lipases and thus prevents lipids from hydrolysis during storage. It was found that rice bran extruded at temperatures above 130°C for more than 20 s could be stored at 25°C for at least 30 days without showing significant changes in acid value. To obtain the highest process efficiency, the shortest processing time (20 s) and the lowest processing temperature (130°C) were used for extrusion. To remove phytate, extruded rice bran was incubated at 40°C with phytases of different origin in a buffered system. Thereafter the suspensions were freeze-dried and ground to obtain a powdered product. The following rice bran components were quantified: crude protein, crude fat, insoluble dietary fibre (IDF), soluble dietary fibre (SDF), oryzanol, vitamins (B1, B2, B3, B6, E), minerals (Fe, Zn, Ca, Mg), phosphate and myo-inositol phosphates. Most of these components were not affected by extrusion. However, 10% of vitamin B2, 6% of vitamin B1 and 8% of SDF were lost during extrusion. Phytate could be removed completely during dephytinization resulting in increased phosphate content. Other components of rice bran are not significantly affected by dephytinization and freeze-drying. In an in vitro digestion system, dialysability of minerals (Fe, Zn, Ca, Mg) was shown to be significantly improved after dephytinization.

**CONCLUSIONS**

The resulting product contains almost all health-promoting components of the raw rice bran, but only minor amounts of phytate. Thus, it can be used as a new food ingredient.

**EP-60 - BIOAVAILABILITY OF MICROENCAPSULATED IRON PYROPHOSPHATE IN TWO FORTIFIED FOODS IN IRON-DEFICIENT WOMEN: SKIMMED MILK VS FRUIT JUICE****Authors:** LAURA TOXQUI; RUTH BLANCO-ROJO; ANA M PÉREZ-GRANADOS; IONE WRIGHT; CARMEN GONZÁLEZ-VIZCAY; M PILAR VAQUERO**Institution:** ICTAN,CSIC**Country:** SPAIN**Session:** TV4 - Date: 13/05/2014 - Room: FOYER - Time: 10:24-10:29:00**BACKGROUND**

Microencapsulation of iron may reduce the interference with other components of the diet that could inhibit iron absorption and therefore it is increasingly used in food fortification

**OBJECTIVES**

The aim of this study was to compare the effects of the consumption of an iron-fortified fruit juice and an iron-fortified skimmed milk on iron metabolism in iron deficient women.

**METHODS**

Iron-fortified skimmed milk and fruit juice products contained 3.1 and 3.6 mg of iron/100 ml, respectively, in the form of microencapsulated ferric pyrophosphate. Women aged 18-35 years, non-smoker, non-pregnant, non-breast-feeding, with low iron stores (serum ferritin <30ng/mL) and hemoglobin  $\geq 11$ g/dL, were recruited. Volunteers were distributed into two groups that consumed, as part of the usual diet, 500mL/day of the iron-fortified skimmed milk (FeM, n=53) or the iron-fortified fruit juice (FeJ, n= 64) during 16 weeks. At baseline and monthly hemoglobin, hematocrit, ferritin, transferrin and transferrin saturation were determined. Repeated measures ANOVA was used to study time effect and time $\times$ group interaction and both groups were compared by ANOVA at each time point.

**RESULTS**

There were no significant differences between groups at baseline. Significant time x group interactions were observed for all parameters ( $p < 0.001$ ), except for transferrin saturation. Ferritin and hemoglobin and hematocrit increased in the FeJ ( $p < 0.01$ ) and decreased in FeM ( $p < 0.05$ ) whereas transferrin increased in the FeM ( $p = 0.01$ ) and decreased in FeJ ( $p < 0.001$ ) during the assay. No time changes were observed in transferrin saturation. Ferritin and hemoglobin were higher at weeks 8, 12 and 16 in the FeJ compared to the FeM ( $p \leq 0.001$ ). Hematocrit and transferrin saturation were higher at weeks 12 ( $p < 0.01$ ) and 16 ( $p < 0.05$ ) in FeJ group compared to the FeM.

**CONCLUSIONS**

Microencapsulated iron pyrophosphate fortified fruit juice clearly improves iron status in iron deficient women. However the same iron form is not efficacious when added to a dairy product.

PROJECT AGL2009 11437 AND JAE-PREDOC GRANTS



# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## **EP-61 - IRON'S LABORATORY DETERMINATION IN SCHOOL FEEDING OF INFANTS FROM 6 TO 36 MONTHS**

**Authors:** ANABELLE RETONDARIO; LETÍCIA MAZEPA; MÁRCIA AURELINA DE O. ALVES; SILA MARY R. FERREIRA; DÉBORA LETÍCIA F. SILVA

**Institution:** UNIVERSIDADE FEDERAL DO PARANÁ

**Country:** BRASIL

**Session:** TV1 - Date: 13/05/2014 - Room: FOYER - Time: 15:00-15:05:00

### **BACKGROUND**

Health and quality of feeding in the first two years of life guarantees growth and appropriate development of an individual. In contrast, it is in the age group of 6 to 23 months that can be found the greatest incidence of deficit of weight and/or stature for the age group, of micronutrients deficiency and infectious diseases. Anemia, characterized as low concentration of hemoglobin for age and genre, is a public health issue that affects developed and developing countries. Its major cause is iron deficiency and has consequences in the physical, social, economical and cognitive development of affected individuals. WHO estimated, in Brazil, the prevalence of anemia in about 55% of infants of preschool age (from zero to five years).

### **OBJECTIVES**

To investigate the daily average consumption of iron by children attending daycare centers in a city of the metropolitan area of Curitiba, through laboratory determination.

### **METHODS**

Samples were collected from six daily meals provided to children from 6 to 36 months, in four municipal daycare centers, in the period of June through November 2013, for 10 nonconsecutive days, totaling 60 samples. During the serving of foods, the medium sized portions in each meal were identified, through direct weighing of the plates ready for consumption and leftovers (RODRIGO, BARTRINA, 1995). Iron concentration in each sample was determined in laboratory through spectrophotometric method proposed by Freitas et al. (1979) with previous nitroperchloric digestion. The average iron consumption was calculated and compared with the RDA for the age groups of 7 to 11 months and 12 to 26 months.

### **RESULTS**

The average amount of iron was 1.37 mg/day for children from 7 to 11 months and 1.32 mg/day for the age group of 12 to 36 months, which represents 12.5 to 18.8% of the RDA, respectively. It was observed the small portion of meat provided in the main meals and the absence of vitamin C-rich foods, which could increase bioavailability of non-heme iron. This low iron consumption may be even more alarming once the calcium amount offered observed was superior to the RDA, which may compromise the iron absorption when consumed with excess and characterize risk in the development of anemia.

### **CONCLUSIONS**

School feeding for children from 7 to 11 and 12 to 36 months of age in municipal full-time daycare centers corresponds to only 12.5 and 18.8% of the RDA of iron, respectively, which indicates the necessity of increase in the meat offering so as to reduce the incidence of anemia in those age groups.

## **EP-62 - SELENIUM NUTRITIONAL STATUS OF WOMEN LIVING IN RISK AREA OF MERCURY CONTAMINATION**

**Authors:** ARIANA VIEIRA ROCHA; KALUCE GONÇALVES ALMONDES; ISABELA SARAIVA ALMEIDA; BRUNA ZAVARIZE REIS; SILVIA F. COZZOLINO; DÉBORAH TEIXEIRA FÁVARO

**Institution:** UNIVERSITY OF SÃO PAULO - USP

**Country:** BRASIL

**Session:** TV1 - Date: 13/05/2014 - Room: FOYER - Time: 15:06-15:11:00

### **BACKGROUND**

Researches try to explain the dynamics of mercury in the Amazon region because studies show that soil, aquatic environments and consequently the fish has high concentrations of this metal, while some individuals living in these areas have no symptoms or obvious clinical signs of contamination. It is assumed that selenium, an essential mineral for human and naturally present in the soils of the Amazon region, is a possible contributor to the apparent tolerance of these populations to chronic mercury poisoning.

### **OBJECTIVES**

Given this scenario, this research aims to determine the selenium nutritional status in residents in risk area of mercury contamination.

### **METHODS**

The survey was conducted with women living in the city of Porto Velho (RO), Western Amazon. To determine the nutritional status of selenium in blood, plasma and erythrocyte were evaluated using the method of hydride-generation atomic absorption spectrometry coupled to the quartz cell. Analyses were performed in the laboratory of Mineral Nutrition and the Faculty of Pharmaceutical Sciences, University of São Paulo (FCF/USP). Data were analyzed using SPSS software version 14.0 and the results expressed as mean, standard deviation and relative frequency.

### **RESULTS**

Two hundred women participated of the study, which had a mean age of 27.6 years. Most attending higher education (64%) and had incomes above four times the minimum wage (48%). The mean plasma selenium was  $53.9 \pm 45.2 \mu\text{g/L}$  and 70% of participants had concentrations below the reference range (60-120  $\mu\text{g/L}$ ), while only 29% were within the normal range and 1% above the stipulated limit. The mean concentration of selenium in erythrocytes was  $77.5 \pm 36.9 \mu\text{g/L}$ , pointing out that 65% of participants had concentrations below the reference range (90-190  $\mu\text{g/L}$ ) and 35% had concentrations within the normal range.

### **CONCLUSIONS**

Despite the soils of the Amazon region are considered rich in selenium, as well as in its main food source, the Brazil-nut, most participants showed deficiency in the mineral concentrations in both parameters used, in other words there is a availability of selenium in the region that is not used by the population, which can exacerbate mercury contamination if present.

**EP-63 - GENE POLYMORPHISM S447X LIPOPROTEIN LIPASE AND THEIR ROLE IN OBESITY IN CHILDHOOD HOME OF THE STATE OF BAHIA AFRICAN DESCENT****Authors:** MÁRCIA CRISTINA ALMEIRA MA OLIVEIRA; DOMINGOS LÁZARO SOUZA RIOS; EDILENE MARIA QUEIROZ ARAÚJO; ERIJESSYKA MARI OLIVEIRA MATOS**Institution:** UNIVERSIDADE DO ESTADO DA BAHIA**Country:** BRASIL**Session:** TV1 - Date: 13/05/2014 - Room: FOYER - Time: 15:12-15:17:00**BACKGROUND**

Polymorphisms in the LPL gene have been studied as genetic factors related to the presence and severity of obesity. LPL is responsible for the hydrolysis of triglycerides, from the food intake and present in chylomicron particles, allowing the uptake and accumulation of these by adipose and muscle tissue. Polymorphisms affecting LPL may influence the plasma concentration and metabolism of all LPLs, generating risk factors for atherosclerosis, dyslipidemia, fatty liver, diabetes mellitus and obesity.

**OBJECTIVES**

Investigate the existence of the relationship between the S447X polymorphism in the LPL gene with a greater predisposition to obesity since childhood African descent in the State of Bahia.

**METHODS**

200 individuals with obesity starts in childhood and 200 eutrophic no previous history of obesity, all of African descent were studied. Matched by sex, age and smoking. Statistical analysis was performed using SPSS, genotype frequencies were compared between groups using Fisher's exact test, quantitative variables were analyzed by ANOVA or Student t test. Hardy-Weinberg and linkage disequilibrium were evaluated using the program Arlequin3:11.

**RESULTS**

The average BMI was  $44.4 \pm 9.1$  in the obese group compared to the control the value was  $23.3 \pm 4.8$ . The S447X polymorphism was associated with obesity in both sexes. In males, there was an increase in the frequency of heterozygotes (SX) in obese when compared to normal weight group. In females, homozygous for the 447X (XX) mutation genotype was only observed in the obese group. The XX homozygous women showed higher levels of BMI, characterizing them as morbidly obese. The higher mean waist circumference was observed in the group of mutants homozygous for the mutation (136.6 cm), when compared to heterozygous (99.1 cm) and wild homozygotes (104.8 cm). The mean hip circumference was also higher in homozygous mutants, compared heterozygous and wild homozygotes. This finding reinforces the strong association between this polymorphism and obesity, the point of the genotype frequencies differ from the expected Hardy-Weinberg equilibrium in the obese group.

**CONCLUSIONS**

The S447X polymorphism of the LPL gene was associated with risk of childhood-onset obesity in both sexes of African Descent. In males, the 447X mutation carriers were more frequent in obese than in controls. In women, the 447XX genotype had their increased in obese compared to normal weight frequency. Homozygous for the 447X variant had measures of BMI, waist circumference and hip increased when compared to other genotypes.

**EP-64 - DIETARY ZINC DEFICIENCY AFFECTS BLOOD LINOLEIC ACID: DIHOMO-GAMMA-LINOLENIC ACID (LA:DGLA) RATIO; A SENSITIVE PHYSIOLOGICAL MARKER OF ZINC STATUS IN VIVO (GALLUS GALLUS)****Authors:** SPENSER REED; RAYMOND GLAHN; J THOMAS BRENNAN; ELAD TAKO**Institution:** USDA-ARS, ROBERT HOLLEY CENTER FOR AG & HEALTH**Country:** UNITED STATES**Session:** TV1 - Date: 13/05/2014 - Room: FOYER - Time: 15:18-15:23:00**BACKGROUND**

Zinc is one of the most abundant trace minerals in cells, and is essential for growth and development of nearly all organisms. With 1.5-2.5 g of zinc present in the average adult, zinc is second only to iron in total body trace mineral content. It is found primarily in tissues such as the brain, kidneys, pancreas, and liver with smaller concentrations in hair, skin and fingernails. Zinc is a vital micronutrient for numerous physiological and metabolic processes, such as acting as a cofactor in over 300 enzymatic reactions and multiple biochemical and structural processes in the body. To date, sensitive and specific biological markers of zinc status are still needed.

**OBJECTIVES**

The aim of this study was to evaluate the sensitivity of a previously unexplored potential zinc biomarker, erythrocyte linoleic acid: dihomogamma-linolenic acid (LA:DGLA) ratio in vivo (Gallus gallus).

**METHODS**

Diets identical in composition (except Zn concentration) were formulated and two groups of birds (n=12) were randomly separated upon hatching into two diets, Zn(+) (Zn adequate control, 42 µg/g Zn), and Zn(-) (Zn deficient, 2.5 µg/g Zn). Dietary Zn intake, body weight, and serum Zn were measured weekly. Additional blood was collected each week for erythrocyte fatty acid analysis. At the conclusion of the study, tissues were collected for gene expression analysis.

**RESULTS**

As expected, body weight, feed consumption, Zn intake, and serum Zn were significantly higher in the Zn(+) versus Zn(-) group (P<0.05). Hepatic TNF-α, IL-1β, and IL-6 gene expression were higher in the Zn(+) group (P<0.05). Hepatic Δ6-desaturase was significantly higher in the Zn(+) group (P<0.001). The LA:DGLA ratio was significantly elevated in the Zn(-) group compared to the Zn(+) group ( $22.6 \pm 0.5$  and  $18.5 \pm 0.5$ ), % w/w, respectively, P<0.001).

**CONCLUSIONS**

This study suggests erythrocyte LA:DGLA is able to differentiate Zn status between zinc adequate and Zn deficient birds, and may be a biomarker to assess dietary Zn manipulation in vivo. This justifies further feeding trials, especially those in which a diet more representative of the target Zn-deficient population is used.

**EP-65 - TOTAL ANTIOXIDANT CAPACITY AND PHENOLIC CONTENT OF THE BRAZILIAN DIET: A COMPARISON BETWEEN THE EFFECTS OF IN VITRO DIGESTION AND EXTRACTION IN WATER****Authors:** ELOÁ ANGÉLICA KOEHNLEIN; CAMILA TURECK; VANESA GESSER CORRÊA; GELVANI LOCATELI; ERICA MARCELA KOEHNLEIN; ROSANE MARINA PERALTA**Institution:** UFFS/ REALEZA PR AND UEM/MARINGÁ PR**Country:** BRASIL**Session:** TV1 - Date: 13/05/2014 - Room: FOYER - Time: 15:24-15:29:00**BACKGROUND**

Data on intake of phenolic compounds and antioxidant capacity of Brazilian diet are scarce. Whereas phenolic compounds occur in association with food matrices in plants, and that part of compounds is absorbed in the small intestine after digestion and other part is associated with nondigestible components which possibly interact with the colon the levels of antioxidants measured using organic solvents may not reflect the likely content available for absorption.

**OBJECTIVES**

The present study aimed to compare the contents of total phenolics and total dietary antioxidant capacity (TDAC) from the main plant foods of the Brazilian diet subjected to in vitro digestion and extraction in water.

**METHODS**

For analysis, 36 plant foods from effective food consumption data of the Brazilian population published in the Family Budget Survey, 2008-2009 were evaluated. 3 different popular brands or 3 samples of each food were purchased. The foods were prepared according to their usual form of consumption were preprocessed with the aid of a vertical mixer of domestic use with 200 watts of power for 3 min, or until acquiring a pasty consistency and subjected to the in vitro digestion process or extraction in water under the same conditions, protected from light. The phenolic content was determined by Folin-Giocalteu method and the antioxidant capacity by TEAC assay.

**RESULTS**

The daily intake of phenolics was estimated to be 2.3 g/day for the in vitro digestion and 1.4 g/day for the extraction in water. The TDAC estimated by the TEAC assay was 9.4 mmol/day for the in vitro digestion and 5.5 mmol/day for the extraction in water. Phenolics from fruits and vegetables were also lower when foods were subjected to extraction in water compared to in vitro digestion (104 mg GAE/day versus 133 mg GAE/day). The percentage contribution of fruits and vegetables to TDAC was low in both methods (< 6%).

**CONCLUSIONS**

More studies that bring the antioxidant content of foods consumed in the habitual diet to the quantities available for absorption and physiological effects are needed.

**EP-66 - INFLUENCE OF SNP RS7903146 VARIANT IN TCF7L2 GENE AND ITS INTERACTION WITH NUTRITIONAL FACTORS IN THE PREDISPOSITION TO METABOLIC SYNDROME: A REVIEW****Authors:** ERIJESSYKA MARI OLIVEIRA MATOS; EDILENE MARIA QUEIROZ ARAÚJO; SIDNEY ROSA RANGEL; DOMINGOS SOUZA RIOS**Institution:** UNIVERSIDADE DO ESTADO DA BAHIA**Country:** BRASIL**Session:** TV2 - Date: 13/05/2014 - Room: FOYER - Time: 15:00-15:05:00**BACKGROUND**

Single nucleotide Polymorphisms (SNPs) in the gene TCF7L2 are strongly related to disorders in the metabolism of carbohydrates and diabetes mellitus type 2 (DM2). Recent studies indicate that new associations of this genetic variant with clinical parameters of the metabolic syndrome (MetS), represented by an increase in insulin resistance, atherogenic dyslipidemia, in addition to changes in anthropometric and blood pressure measurements. The large exposure to specific nutrients seems to exacerbate such physiological dysfunctions.

**OBJECTIVES**

Metabolism of insulin and atherogenic dyslipidemia for each study population, for each study population. This review brings together scientific evidence of polymorphism rs7903146 as one of etiological bases of MetS.

**METHODS**

The clinical trials reported in this study showed significant correlation between the risk allele of rs7903146 and physiopathological features of MetS, with findings for more consistent changes in glycemic homeostasis, metabolism of insulin and atherogenic dyslipidemia for each study population, for each study population. This review brings together scientific evidence of polymorphism rs7903146 as one of etiological bases of MetS.

**RESULTS**

Systematic Review of the literature from original studies, between 2000 and 2013, respondents in the databases Medline, PubMED, Wiley library, SciELO, Scencedirect, Springer link, The University of Adelaide, Deepdyve and Combridge Journals.

**CONCLUSIONS**

It is evident, through analysis of current experimental assays, the strong correlation between the variant rs7903146 and disorders in the metabolism of carbohydrates and insulin dysfunctions. Clinical Evaluations allow us to infer that the single nucleotide polymorphism in the gene TCF7L2 promotes significant sub-capacity in production or secretion of insulin by pancreatic beta cells. Despite the strong association between rs7903146 in TCF7L2 and pathophysiological disturbances, such variant is not well characterized among individuals syndromic.

**EP-67 - NUTRITIONAL STATUS OF IRON, ZINC AND COPPER IN CHILDREN AND ADOLESCENTS LIVING IN A BRAZILIAN RURAL AREA****Authors:** GILBERTO SIMEONE HENRIQUES; FLÁVIA GAZZINELLI BETHONY; JEFFREY MICHAEL BETHONY; LUANA CAROLINE DOS SANTOS**Institution:** UNIVERSIDADE FEDERAL DE MINAS GERAIS**Country:** BRASIL**Session:** TV2 - Date: 13/05/2014 - Room: FOYER - Time: 15:06-15:11:00**BACKGROUND**

The nutritional status of children and adolescents is strongly associated with cultural, nutritional and socioeconomic and demographic features and represents a direct impact on the health and development.

**OBJECTIVES**

This study aimed to investigate the nutritional status and its association with parasitosis and sociodemographic factors in infant and adolescent population residents in Brazilian rural area.

**METHODS**

Cross-sectional study with children and adolescents residents in rural area of Minas Gerais, Brazil were we assessed the socioeconomic, nutritional and intake status, by anamnesis pre-tested, 24-hour recall and food frequency questionnaire. The nutritional status was assessed by height/age and body mass index/age according with the criteria of the World Health Organization. The influence of sociodemographic variables, economic and health on food consumption was assessed by testing correlation tests and association. The amounts of Cu, Fe and Zn, was determined in the triplicates of plasma by ICP-OES in a Agilent 720 series spectrometer with an axial view configuration.

**RESULTS**

The study included 105 children and adolescents, 61,9% was male, with median age of (2-11) years and monthly per capita income of US\$ 29,00 (US\$ 7,20 to 130,50). The prevalence of helminth infection was 31,4%. Was indentified 14,3% stunting growth, and this prevalence is higher among children with lower income ( $p=0,02$ ) and among those with helminth infection (30,3% vs 7,2%,  $p=0,008$ ). The prevalence of overweight (28,8%) was similar between sexes ( $p>0,05$ ). There was prevalence of insufficient intake of protein, calcium, iron, zinc and vitamin A in 45,5%, 94,1%, 30,7%, 46,5% and 82,2%, respectively. Caloric intake was excessive in 60,4% o of the sample. Identified a relationship between per capita income and calorie intake ( $r=0,25$ ,  $p=0,012$ ), protein ( $r=0,22$ ,  $p=0,028$ ), calcium ( $r=0,40$ ,  $p<0,001$ ), zinc ( $r=0,33$ ,  $p<0,001$ ) and vitamin A ( $r=0,26$ ,  $p=0,009$ ). Had been further a relate between the number of residents per household and calorie intake ( $r=-0,25$ ,  $p=0,011$ ) and calcium ( $r=-0,32$ ,  $p=0,001$ ).

**CONCLUSIONS**

The relationship between per capita income, number of residents and food consumption suggests the influence of this factors in relation to the acquisition and access to some kind of food, demonstrating the importance of sociodemographic variables on nutritional status and appropriate interventions.

FAPEMIG

**EP-68 - "HUMAN RATION" A NATURAL PRODUCT RICH IN FIBER DID NOT AFFECT THE IRON AND ZINC BIOAVAILABILITY DURING WEIGHT LOSS****Authors:** HÉRCIA STAMPINI D MARTINO; BÁRBARA NERY ENES; NATÁLIA E G ALVES; RITA DE C G ALFENAS; ANTÔNIO P S CARNEIRO; SÔNIA M R RIBEIRO; NEUZA M B COSTA**Institution:** UNIVERSIDADE FEDERAL DE VIÇOSA**Country:** BRASIL**Session:** TV2 - Date: 13/05/2014 - Room: FOYER - Time: 15:12-15:17:00**BACKGROUND**

The obesity management is based on consumption of a nutritionally balanced calorie restricted diet, including the regular dietary fiber intake. However, natural products rich in fiber present compounds which may decrease the mineral bioavailability. The "Human Ration" (HR) is a Brazilian mixture of cereals, seeds and grains, rich in dietary fiber, used to increase weight loss. HR ingredients include oat bran, sesame, flaxseed and wheat fibre, among others, which alone have a positive effect on human health. Nevertheless, the implication of HR consumption on mineral bioavailability and bone health has not been studied.

**OBJECTIVES**

We evaluated whether HR as part of a dietary caloric restriction to weight control, may affect iron and zinc bioavailability and bone mineral density (BMD).

**METHODS**

Overweight and obese women ( $n=22$ , body mass index (BMI) 25 to 45; aged 24–45) were randomized in a prospective, single blind crossover (2x2) study, to receive one serving per day of a drink containing HR (20 g) or a placebo drink (control), as part of a reduced energy (15% of Energy Estimated Requirements deficit) dietary program. This study included a 1-week screening/baseline period followed by 5 weeks of each treatment, and a 1-week washout between them. Iron status was accompanied by dosage of a complete haemogram (by electrical impedance) and ferritin (by chemiluminescence). Zinc status was measured by evaluation of plasmatic and erythrocyte zinc. The BMD was measured by DEXA. We used Student's test or Mann Whitney U-test to analyse differences between treatments and the paired t-test or Wilcoxon matched-pairs to detect differences inside each treatment. The Stata 10.0 software was used, adopting P-value  $<0,05$ .

**RESULTS**

The body weight and BMI mean were  $73.84\pm 9.53$  kg and  $29.07\pm 2.87$  kg/m<sup>2</sup>, respectively. Both treatments resulted in weight loss, without differences between them ( $P=0.92$ ). Haemoglobin concentration increased in HR treatment ( $12.71\pm 0.33$  to  $13.26\pm 0.31$  g/dL) and it was significant when compared to control. Ferritin concentration, zinc status and BMD did not change in any treatment.

**CONCLUSIONS**

HR is an important vehicle of dietary fiber and micronutrients, which associated to energy restriction increased the haemoglobin concentration, without affect zinc metabolism.

ACKNOWLEDGMENT: FAPEMIG, CAPES, CNPQ and UFV

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## EP-69 - NUTRITIONAL VALUE OF NUTRIENT MEALS CONTAINING FRUIT AND ATTRACTIVE FOR CHILDREN

**Authors:** IVY CAZELLI PIRES; NARDJARA LEÃO; GREICYLANE NEVES SILVA; SAMILI TAMARA SILVA; LUCILENE SOARES MIRANDA; MANUELA MARQUES RODRIGUES

**Institution:** UFVJM - DIAMANTINA

**Country:** BRASIL

**Session:** TV2 - Date: 13/05/2014 - Room: FOYER - Time: 15:18-15:23:00

### BACKGROUND

The feeding must be done in a healthy way given the nutritional needs of schoolchildren and looking to improve their eating habits. The prevalence of overweight and obesity has increased in developed and developing countries, affecting all age ranges. According to the IBGE and POF (2008-2009), overweight has reached more than 30% of children between 5 and 9 years of age. Due to this reason crawling are encouraged to consume fruits and vegetables, in virtue of its benefits.

### OBJECTIVES

The objective of this work was to develop nutritious and attractive meals in order to encourage the consumption of healthy foods by children.

### METHODS

It was developed: carrot cake, pumpkin bread, mini pizza, cookie bar, full of cereal and sweet fruit with gelatin stuffed with pineapple, banana or apple. It was evaluated the calorific value, amount of macronutrients, micronutrients and minerals of portions of 150 Kcal (equivalent to a portion of cereals of Brazilian food guide, 2006). It was excluded food with high caloric content and lipid and it was encouraged food with high fiber content.

### RESULTS

wheat biscuit with the different fillings fruit presented greater lipid content (7.45g/ 38g) and the sweet fruit with gelatin obtained lower lipid content (0.23g/ 126g). Carrot cake presented lower content of fibers (0.59g/ 50g), and the sweet fruit with gelatin higher content (1.67g/ 126g). In relation to Vitamin A, that showed the greatest content was t bread of pumpkin (51,78 $\mu$ g/ 47g), followed by carrot cake (49.82 $\mu$ g/ 50g) and with lower content of cereal bar (0.41  $\mu$ g/ 36g). The meals had low levels of vitamin C. calcium proved with greater content in carrot cake (won 46.44mg/ 50g), and with lower in wheat biscuit (7.13mg/ 38g). Iron had higher content in cereal bars (1.15mg/ 36g) and lowest in mini pizza (0.34mg/ 63g). The protein and zinc levels were quite close to six recipes and the carbohydrate proved to be higher in the sweet fruit with gelatin (37.46g/ 126g).

### CONCLUSIONS

It is concluded that the sweet fruit with gelatin is the most indicated thus its lower lipid content and higher fiber content and the carrot cake and bread pumpkin by having greater content of vitamin A. There is thus the possibility to develop and encourage the consumption of healthy meal for children using fruit.

SUPPORT: FAPEMIG, CNPq and PROEXC/ UFVJM.

## EP-70 - FAMILY FARM AND THE OFFER OF MICRONUTRIENTS IN SCHOOL MEALS

**Authors:** JOSÉ DIVINO LOPES FILHO; ANN KRISTINE JANSEN; ANA CAROLINA S COSTA; ANA BEATRIZ FARIAS

**Institution:** UNIVERSIDADE FEDERAL DE MINAS GERAIS

**Country:** BRASIL

**Session:** TV2 - Date: 13/05/2014 - Room: FOYER - Time: 15:24-15:29:00

### BACKGROUND

Food and nutrition insecurity in Brazil reaches 34.8% of Brazilian households. An alternative to overcome this vulnerability is strengthening social programs on food and nutrition, associated with production and increased consumption of food from the family farm. The National School Feeding Program (PNAE) requires that 30% of the resource for the purchase of foods is acquired from family farms. The examination of the nutritional impact of family farm in school feeding is considered an important improvement of the Program.

### OBJECTIVES

To investigate the impact of family farming in the supply of micronutrients and fiber on school menus.

### METHODS

An observational, descriptive study of weekly menus of all public schools from two cities in the state of Minas Gerais, participants in the Rural Youth Extension Project, developed with support from the Ministry of Education. The supply of 11 micronutrients (Vitamins A, C, B1, B3, B6 and folic acid, calcium, iron, magnesium, sodium, zinc and fiber), was evaluated. The daily values of each nutrient offered were compared to the recommendations of the Program, by age 6 to 10 or 11 to 15 years. Then we analyzed the contribution of family farming in the supply of these micronutrients. We used SPSS 17.0 for statistical calculations.

### RESULTS

All the school menus (n=20) were analyzed. For the age group 6-10 years the recommendations of the Program were not met for folic acid (83.45  $\pm$  41.72 %). Only 35% of the menus were adequate. At aged 11 to 15 years, the recommendations were not met for vitamin B6 (86.00  $\pm$  51.58 %) and folic acid (62.59  $\pm$  31.29 %), with only 45.0% and 10.0%, respectively, appropriate menus. Family farm contributes more in the supply of vitamin C (85.84 $\pm$ 27.19%), folic acid (74.10 $\pm$ 20.23%), fiber (66.10 $\pm$ 26.93%), vitamin A (56.78  $\pm$  29.94%) and magnesium (52.52 $\pm$ 20.36%), widely nutrients found in vegetables and fruits, whose input is favored by family farm.

### CONCLUSIONS

The menus of school meals for both municipalities, do not meet the recommendations of the PNAE for folic acid and vitamin B6, requiring adjustments. Family farm impacts the supply of vitamin C, folic acid, vitamin A, magnesium and fiber. However it is necessary to diversify the food purchases to expand its contribution to the supply of iron, zinc, niacin, thiamine and vitamin B6, important for health promotion and growth of school children.

GOVERNO FEDERAL/MINISTÉRIO DA EDUCAÇÃO

**EP-71 - USE OF GREEN TEA AS ALTERNATIVE THERAPY IN PREVENTION AND CONTROL OF OBESITY - A REVIEW****Authors:** LETÍCIA MAZEPA; CLÁUDIA CARNEIRO H KRÜGER; OBDÚLIO GOMES MIGUEL**Institution:** UNIVERSIDADE FEDERAL DO PARANÁ**Country:** BRASIL**Session:** TV3 - Date: 13/05/2014 - Room: FOYER - Time: 15:00-15:05:00**ABSTRACT**

Obesity is a chronic disease with increasing rates in several populations worldwide. In addition to the neuroendocrine system involving signals of satiety and appetite, changes in lifestyle (diet and physical activity) also incorporate the etiology of the disease and should be considered in the treatment of obese individuals, and, when appropriate, the use of pharmacological interventions. The therapies used in obesity affect one or more aspects of the energy balance of individuals: appetite, nutrient absorption and thermogenesis. Certain traditional, complementary or alternative medicines are becoming increasingly popular in the treatment of obesity. The development of these alternative forms of intervention includes the use of vitamins, nutritional supplements, meal replacements and herbs, among which is green tea, produced from fresh leaves of *Camellia sinensis*, a plant that contains water, proteins, polyphenols, carbohydrates, minerals, vitamins and flavonoids. Its main flavonoids are catechins epigallocatechin gallate, comprising a third of its total dry weight. Many studies have found effects of green tea in thermogenesis and substrate oxidation, which are mediated by the sympathetic nervous system. Other mechanisms include decreased appetite, regulation of hepatic enzymes involved in lipid metabolism and reduction in absorption of nutrients. This study aimed to review experimental studies in animal and human models, and the most recent meta-analysis of the use of green tea as alternative treatment in overweight/obesity. Science Direct and Medline databases were consulted under the indexers: tea, obesity, overweight and supplementation, published between 2009 and 2013. All referenced papers refer to positive scientific evidence, some stronger and others of lower reproducibility, demonstrating: reduction/maintenance of body weight, body fat and others anthropometric indices; improvements in lipid and glycemic profiles, optimizing the antioxidant system and thereby preventing pathologies. As clinical management, moderate consumption of beverage can be stimulated to patients in addition to diet, but not as the main element of the treatment. Fomentation in studies with plants for the treatment of diseases, such as obesity, contributes to the development of alternative therapies in reducing public health problems. The constant analysis of new studies increases scientific knowledge and gives greater reliability and safety for its recommendation.

**EP-72 - THE ENZYMATIC ACTIVITY OF GPX IS RELATED TO SELENIUM STATUS AND MDA CONCENTRATION IN HEALTHY ADOLESCENTS****Authors:** LUCIANE LUCA ALENCAR; LEILA LEIKO HASHIMOTO; LILIANE VIANA PIRES; FABIANA ALMEIDA SANTOS; ANA PAULA DE MELO LOUREIRO; SILVIA MF COZZOLINO**Institution:** UNIVERSITY OF SAO PAULO**Country:** BRASIL**Session:** TV3 - Date: 13/05/2014 - Room: FOYER - Time: 15:06-15:11:00**BACKGROUND**

Studies show that adolescence is a phase that deficiency of antioxidant micronutrients, such as selenium (Se), is commonly found. This mineral has an important action in the detoxification of reactive species to be part of the process of glutathione peroxidase (GPx) catalytic site, and its efficiency depends on the status of body Se.

**OBJECTIVES**

To evaluate the relationship between the nutritional status of selenium and oxidative stress markers in adolescents.

**METHODS**

This study is cross-sectional. 38 participants were selected, of both sexes, aged between 14 and 19 years living in the state of Sao Paulo. Measurements of weight (kg), height (m) and waist circumference (cm) were measured for anthropometric assessment. The Se status was evaluated by determinations of Se concentrations in plasma and erythrocytes. The enzyme activity in erythrocyte GPx and MDA (MDA) in plasma were determined to evaluate the oxidative stress. To assess the correlation between the data of the status of Se and markers of oxidative stress, we used the Pearson ( $p < 0.05$ ).

**RESULTS**

Anthropometric assessment showed that approximately 80% of participants were normal. The mean values of plasma and erythrocyte Se concentrations were respectively  $43.4 \pm 7.7$  mg / L and  $59.2 \pm 12.2$  mg / L, with the reference value for plasma 60-120 mg / L and 90-110 mg / L for erythrocyte. The mean GPx enzyme activity in adolescents assessed corresponded to  $39.0 \pm 11.0$  U / g Hb. Regarding the concentration of MDA in plasma, secondary product of lipid peroxidation, the average was  $0.44 \pm 0.18$   $\mu$  M. From these results, we observed a significant correlation between the concentration of Se in erythrocytes and GPx ( $r = 0.184$ ,  $p = 0.007$ ) activity, and the lower the activity of this enzyme, the higher the concentration of MDA found in plasma ( $r = -0.103$ ,  $p = 0.05$ ).

**CONCLUSIONS**

Adolescents evaluated were deficient in Se and this nutritional status reduced the enzymatic activity of GPx and increased indirectly the concentration of MDA.

**EP-73 - MINERAL CONTENT AND POTENTIAL AVAILABILITY AND CONTRIBUTION IN COOKIES INCLUDING AMERICAN CAROB FLOUR (PROSOPIS ALBA) AND OATS****Authors:** MARIA JULIETA BINAGHI; KARINA COSTA; SILVANA DI GERONIMO; SARA MACIAS; SILVINA GENEROSO; PATRICIA RONAYNE DE FERR**Institution:** SCHOOL OF PHARMACY AND BIOCHEMISTRY. UBA**Country:** ARGENTINA**Session:** TV3 - Date: 13/05/2014 - Room: FOYER - Time: 15:12-15:17:00**BACKGROUND**

Some regional ingredients have been recently revalued. American carob flour (*Prosopis alba*) traditionally consumed in Northern Argentina, contains minerals, such as iron, and calcium, in substantial amounts. However, little is known about their bioavailability; it is assumed that the presence of fiber and polyphenols would interfere with mineral absorption

**OBJECTIVES**

The aim of this study was to assess iron, zinc and calcium dialyzability as an indicator of potential iron, zinc and calcium availability in cookies made up of mixtures of wheat and carob flours and oats, with or without fortification. Cookies were designed as follows: wheat flour: carob flour: oat flour 80:10:10 (WCO); WCO + orange essence (WCOO); WCOO fortified with a vitamin-mineral premix containing iron and zinc but not calcium (FWCOO); WCO + cocoa (WCOC); and fortified WCOC (FWCOC).

**METHODS**

Total iron, zinc and calcium concentrations were assessed by Atomic Absorption Spectrometry. Potential mineral availability was assessed using an in vitro modified method, which measures dialyzability (D%) under controlled pH conditions, after a digestion simulating physiological processes. Determinations were quadruplicates and statistical analysis was performed by ANOVA and a posteriori Tukey test.

**RESULTS**

Iron, zinc and calcium concentrations in WCO were 4.2; 0.9 and 111 mg/100g, respectively. FWCOO and FWCOC contained 16.2 and 17.5 mg/100g of Fe and 8.3 and 9.0 mg/100g of Zn, respectively.

FeD% in WCOO (7.4) was higher than in WCO (5.9) and lower in WCOC (3.7) ( $p < 0.05$ ). Results for ZnD% were similar: 27.5 in WCOO; 23.4 in WCO, and 19.3 in WCOC ( $p < 0.05$ ). This could be attributed to the presence of an absorption promoter like citric acid in WCOO and the presence of absorption inhibitors (polyphenols) in WCOC. Regarding the fortified samples, both FeD% and ZnD% decreased in FWCOO (1.6 and 12.2, respectively) and FWCOC (1.8 and 12.0, respectively). However, the potential Fe contributions (calculated according to iron total amount and its dialyzability) were similar in all cookies. Potential Zn contributions were higher in the fortified cookies. Calcium content, D% and potential contribution did not differ among samples.

**CONCLUSIONS**

Mineral dialyzability may be enhanced or decreased according to the used combination of different ingredients. While fortification increased total iron amounts, it also decreased its potential availability, leading to similar potential contributions

**EP-74 - CAROTENOID PROFILE OF PITANGA (EUGENIA UNIFLORA L.)****Authors:** ORNELLA MARIA PORCU**Institution:** FEDERAL UNIVERSITY OF TECHNOLOGY (UTFPR), BRAZIL**Country:** BRASIL**Session:** TV3 - Date: 13/05/2014 - Room: FOYER - Time: 15:18-15:23:00**BACKGROUND**

Pitanga (*Eugenia uniflora* L.) belongs to Myrtaceae family and it is also known as Surinam cherry or Brazilian cherry. The fruits passes from green to yellow (unripe) and orange (partially ripe), reaching intense red when totally ripe.

**OBJECTIVES**

The present study had the objective of quantifying the principal carotenoids of pitanga fruit from Medianeira, Paraná state (Brazil), at two stages of maturity.

**METHODS**

The carotenoids were extracted with acetone, partitioned to petroleum ether and the carotenoid solutions were dried with anhydrous sodium sulfate, concentrated in a rotary evaporator and dried under N<sub>2</sub>. Immediately before the injection, the carotenoids were redissolved in HPLC grade acetone and filtered with a 0.22 µm PTFE syringe filter, 10 µL was automatically injected into the HPLC equipment. Quantification was done by external standardization. The HPLC system consisted of a Waters separation module (model 2690), equipped with an autosampler injector and a UV-visible photodiode array detector (Waters model 996) controlled by a Millennium workstation (version 2010). The column C18 (Spherisorb ODS2, 3 µm, 4.6x150 mm). The mobile phase consisted of acetonitrile containing 0.05 % triethylamine, methanol and ethyl acetate; the flow rate was 0.5 mL/min., average room temperature was 21 °C.

**RESULTS**

A higher value of lycopene ( $14.0 \pm 4.6$  µg/g), rubixanthin ( $11.5 \pm 5.3$  µg/g) and β-cryptoxanthin ( $12.8 \pm 2.8$  µg/g) were found at the ripe stage. The levels of β-cryptoxanthin, rubixanthin and lycopene, increased markedly from the partially ripe to the ripe stage. As would be expected the chloroplast carotenoids, violaxanthin and lutein, decreased with ripening.

**CONCLUSIONS**

The orange (partially ripe) and red (ripe) fleshed pitanga had higher lycopene, rubixanthin and β-cryptoxanthin levels than those of the yellow (unripe) fruit. The red (ripe) fleshed-pitanga fruit, cultivated in Paraná, is a rich source of carotenoid compounds.

**EP-75 - STUDY OF STABILITY OF THE TOTAL CAROTENOIDS CONTENT IN YOGURT OF GUAVA PULP****Authors:** ORNELLA MARIA PORCU; GILMAR PAULO LENZ**Institution:** FEDERAL UNIVERSITY OF TECHNOLOGY (UTFPR), BRAZIL**Country:** BRASIL**Session:** TV3 - Date: 13/05/2014 - Room: FOYER - Time: 15:24-15:29:00**BACKGROUND**

The guava fruit (*Psidium guajava*, Paluma cultivar) presents a rich composition of carotenoids and other bioactive compounds. Potential health benefits are present in the fleshed-guava and in the processed products.

**OBJECTIVES**

The objective of the present work was carried out to study the stability of carotenoids in yogurt of guava pulp during storage at 5 °C.

**METHODS**

The formulation of yogurt nominated F1 was prepared using milk, lactic mesophilic culture (13 EZAL MYE 95 Rhodia) containing mixed strains of *Lactobacillus delbrueckii* subsp. *Bulgaricus* and *Streptococcus salivarius* subsp. *thermophilus*, sugar, and guava pulp (Paluma cultivar). The second formulation (F2) was developed in the same way but in this composition was added starch. The carotenoids were extracted from 10 g of sample with cold acetone (80 mL), partitioned to petroleum ether (20 mL) and the carotenoid solutions were dried with anhydrous sodium sulfate, concentrated in a rotary evaporator, and taken to known volumes (50 mL) for spectrophotometric reading (300 to 550 nm) and concentration calculation.

**RESULTS**

The total carotenoid content of guava pulp was  $34 \pm 0.4 \mu\text{g/g}$ . The concentrations of total carotenoids for yogurt F1 after 15 and 34 days were  $5.7 \pm 0.1 \mu\text{g/g}$  and  $5.2 \pm 0.2 \mu\text{g/g}$ , respectively, showing no significant difference ( $p < 0.05$ ). The yogurt F2 the total carotenoids evaluated after 15 and 34 days were  $3.8 \pm 0.2 \mu\text{g/g}$  and  $1.7 \pm 0.1 \mu\text{g/g}$ , respectively, showing significant difference ( $p < 0.05$ ). The presence of starch in the formulation F2 may have influenced the decrease of the levels of total carotenoids during storage.

**CONCLUSIONS**

Considering the value of total carotenoids in yogurt of guava pulp (F1 and F2) the products formulated are a viable option for human consumption up to 15 days.

**EP-76 - VARIATION OF PHYSICO-CHEMICAL PARAMETERS IN DIFFERENT STRAWBERRIES CULTIVARS****Authors:** RAFAELA CARMINATI; ORNELLA MARIA PORCU; CARLA ADRIANA PIZARRO SCHMIDT**Institution:** FEDERAL UNIVERSITY OF TECHNOLOGY (UTFPR), BRAZIL**Country:** BRASIL**Session:** TV4 - Date: 13/05/2014 - Room: FOYER - Time: 15:00-15:05:00**BACKGROUND**

The strawberry stands out mainly for consumption as fresh fruit, juice and pulp. The rich nutritional composition brings important benefits to human health.

**OBJECTIVES**

The objective of this work was to evaluate chemical and physicochemical variability of five different strawberries cultivars.

**METHODS**

The Albion, Camino Real, Palomar, Portolas and San Andreas cultivars were collected in 2013, October, December (latitude - 25° 41' 12"; longitude -51° 38' 45") at Guarapuava, in the southeast region of the state of Paraná, Brazil. The samples were washed, crushed, stored frozen and packaged separately until the time of analysis. Analyses of Degree of Brix (oBrix), acidity, TSS/TTA ratio, pH and ascorbic acid content were used to quantify the chemical and physico-chemical properties of different varieties of strawberries. The physico-chemical parameters followed the METHODS described by Analytical Standards METHODS of Institute Adolfo Lutz (2008). The results were analyzed by ANOVA, and significant differences were determined using Tukey's test.

**RESULTS**

Among the cultivars studied, San Andreas presented the highest level of ascorbic acid ( $54.8 \pm 0.14 \text{ mg}$  in 100 g) and the lowest TSS/TTA ( $10.03 \pm 0.26$ ) ratio, whereas Camino Real cultivar ( $19.81 \pm 0.49$ ) had the highest TSS/TTA ratio. The measure of pH ranged from  $3.37 \pm 0.01$  to  $3.61 \pm 0.01$  and therefore all the varieties showed acid character. Considering all the chemical and physico-chemical determinations, there is variation in the degree Brix, pH, acidity and ascorbic acid content between varieties.

**CONCLUSIONS**

From the data, at a quantitative level, the strawberries cultivars can be considered a good source of nutrients, and the resulting physicochemical parameters, would be very helpful for policy makers to take precautionary measures to quality control.



**EP-77 - IMPACT OF GENOTYPE AND STYLE OF COOKING ON CONTENT, RETENTION AND BIOACCESSIBILITY OF  $\beta$ -CAROTENE IN BIOFORTIFIED CASSAVA****Authors:** PAULO R. A. BERNI; CHUREEPORN CHITCHUMROONCHO; SOLANGE G. CANNIATTI-BRAZA; MARK L. FAILLA**Institution:** UNIVERSITY OF SAO PAULO AND OHIO STATE UNIVERSITY**Country:** BRASIL**Session:** TV4 - Date: 13/05/2014 - Room: FOYER - Time: 15:06-15:11:00**BACKGROUND**

Vitamin A deficiency (VAD) increases the incidence of morbidity and mortality among infants, children < 5 years of age, and women during birthing and 1 year post-partum. Biofortification is a strategy aimed at decreasing global micronutrient deficiencies in vulnerable populations by increasing the nutrient density in staple food crops. Insights regarding the interactions among carotenoid content of plant foods, effects of cooking style and transfer of  $\beta$ C from the food matrix to micelles in the small intestine are needed to guide efforts to eliminate VDA. The coupled in vitro digestion/Caco-2 human intestinal cell model has been employed to evaluate carotenoid accessibility and transport by cells with an enterocyte-like phenotype.

**OBJECTIVES**

We report the effects of genotype and cooking styles on the content, retention and bioaccessibility of  $\beta$ C in biofortified cassava.

**METHODS**

Five genotypes of biofortified cassava, three parental accessions, and one white cassava were studied. Cassava roots were analyzed raw and after boiling in water at 100°C only or after boiling and frying in soybean oil at 180°C. Carotenoid extractions and analysis by HPLC were carried out according to Kimura et al (2007). Bioaccessibility was examined using in vitro oral, gastric and small intestinal digestion coupled with the Caco-2 human intestinal cell model (Chitchumroonchokchai et al., 2004; Thakkar et al., 2009).

**RESULTS**

Only  $\beta$ C was detected in all tested genotypes of cassava root, although its content varied markedly (0.45 $\mu$ g/g FW – 10.3 $\mu$ g/g FW). Biofortified genotypes contained at least 10-fold higher  $\beta$ C than the white variety. Boiling and frying were associated with some loss of total  $\beta$ C ( $p < 0.01$ ). There was an interaction of genotype and cooking style on total  $\beta$ C content ( $p < 0.01$ ). Efficiency of micellization of all trans- $\beta$ C in boiled cassava ranged from 8.9% to 40.1% and in fried cassava from 32.4% to 56.8%. Cassava root containing the highest content of  $\beta$ C provided an estimated 26.2 IU/100g FW of vitamin A equivalents in the micelle fraction. Uptake of all trans- $\beta$ C in micelles generated during digestion by Caco-2 cells was 8.63% -12.6 % from digested boiled cassava and 8.61%-19.2% from fried cassava.

**CONCLUSIONS**

These results show that the biofortification programs selectively increased all trans- $\beta$ C, that frying boiled cassava delivered more  $\beta$ C to mixed micelles than boiling alone, and that cassava genotype and cooking style may influence uptake of all trans- $\beta$ C by absorptive intestinal cells.

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**EP-78 - ENZYMATIC PHYTATE DEPHOSPHORYLATION IN THE GASTRO-INTESTINAL TRACT****Authors:** RALF GREINER**Institution:** MAX RUBNER-INSTITUT**Country:** GERMANY**Session:** TV4 - Date: 13/05/2014 - Room: FOYER - Time: 15:12-15:17:00**BACKGROUND**

A diet rich in phytate leads to a considerably reduced absorption of dietary minerals. Different strategies have been studied to improve mineral bioavailability in such diets. One approach is the addition of exogenous phytases to diets, because these enzymes dephosphorylate phytate in the human stomach once the meal is consumed.

**OBJECTIVES**

This study was performed to resolve the importance of the kinetics of myo-inositol phosphate dephosphorylation on bioefficacy of phytases. Furthermore, indication on an advantage to add two phytases simultaneously should be obtained.

**METHODS**

Phytase activity was determined at pH 3 (biologically relevant pH value) and pH 5 (standard pH value for phytase activity determination) using different myo-inositol phosphates as substrates. The kinetic constants (KM, kcat) were calculated from the Lineweaver-Burk plots of the data. The individual myo-inositol phosphates were obtained by enzymatic treatment of sodium phytate and purification by anion exchange chromatography.

**RESULTS**

Two commercially available phytase preparations were included in the study; Natuphos® (BASF, Aspergillus niger phytase) and Quantum™ (AB Enzymes, Escherichia coli phytase). Both phytases belong to the group of histidine acid phosphatases and are extensively used as an animal feed supplement. Both enzymes showed lower affinity and reduced turnover numbers at pH 3 compared with pH 5 towards all myo-inositol phosphates included in the study. The kinetic constants were shown to be dependent on the number and distribution of phosphate groups on the myo-inositol ring. Representatives of the individual phytate dephosphorylation pathways were identified as the best substrates of the phytases. Within the individual phytate dephosphorylation pathways, the pentakisphosphates were better substrates compared to the tetrakisphosphates or phytate itself. E. coli phytase showed comparable activities at both pH values towards the tetrakis- and trisphosphate, whereas A. niger phytase exhibited a higher activity towards the tetrakisphosphate. It was also shown that myo-inositol phosphates with alternate phosphate groups were not significantly dephosphorylated by both enzymes.

**CONCLUSIONS**

The kinetic constants obtained do not fully explain bioefficacy of the phytases added to diet. Other factors such as their pH profile and pH stability will also contribute. The data obtained also show that simultaneous supplementation of two phytases does not necessarily result in a synergistic effect on phytate dephosphorylation.

## **EP-80 - ASSESSMENT OF NUTRITIONAL STATUS OF ZINC AND ITS RELATION TO FOOD INTAKE IN WOMEN LIVING IN SÃO PAULO**

**Authors:** VERÔNICA DA SILVA BANDEIRA; ISABELA SARAIVA ALMEIDA; GRAZIELA BIÚDE SILVA; SILVIA M. F. COZZOLINO

**Institution:** UNIVERSITY OF SAO PAULO

**Country:** BRASIL

**Session:** TV4 - Date: 13/05/2014 - Room: FOYER - Time: 15:24-15:29:00

### **BACKGROUND**

Zinc is a micronutrient considered the second most abundant in the body and has interests in more than 300 enzymatic reactions. Understanding the bioavailability of zinc is associated with aspects of absorption, transportation, storage and use, since there are several dietary components that can interact with zinc and can facilitate or not its absorption.

### **OBJECTIVES**

The aim of this study was to evaluate the relationship between nutritional status of zinc and dietary intake of this mineral in women living in the city of São Paulo.

### **METHODS**

A cross sectional study, in which 55 women residents in the city of São Paulo were selected. Measurements of weight (kg) and height (m) were assessed for anthropometric evaluation. The nutritional status of zinc was evaluated by determining the concentrations of this mineral in plasma and erythrocytes. We assessed dietary intake by the 24 hours recall of three non-consecutive days and with the aid of software Nutwin from Escola Paulista de Medicina/UNIFESP we compared the results with the Dietary Reference Intake. The correlation between biomarkers of zinc and dietary zinc intake was assessed using the Pearson test ( $p < 0.05$ ) in SPSS 20.0 software.

### **RESULTS**

The ages of the participants ranged from 21 to 63 years, with mean  $35.4 \pm 9.5$  years. About anthropometric evaluation, the mean BMI was  $23.16 \pm 2.42$  kg/m<sup>2</sup>. The mean values of plasma zinc concentrations and erythrocyte were  $55.7 \pm 10.5$  µg/dL and  $44.1 \pm 4.3$  µg/g Hb, respectively, with the reference values for plasma of 70-110 µg/dL and erythrocyte 40-44 µg/g Hb. The mean dietary intake of zinc was  $6.46 \pm 3.33$  mg/day, being proposed by the EAR 6.8 mg/day for this age group. No correlation between dietary intake of zinc and its concentration in plasma ( $r = 0.018$ ,  $p = 0.913$ ) and in erythrocytes ( $r = -0.027$ ,  $p = 0.868$ ) was observed.

### **CONCLUSIONS**

The participants had plasma zinc deficiency and inadequate intake of the mineral. No correlation between the variables was observed, suggesting that other dietary and physiological factors may have influenced the biomarkers evaluated.

## **EP-81 - NANOFORMULATIONS FOR NUTRIENT DELIVERY**

**Authors:** RALF GREINER; KATHLEEN OEHLKE; DIANA BEHSNILIAN; VOLKER GRÄF; ESTHER MAYER-MIEBACH; ELKE WALZ

**Institution:** MAX RUBNER-INSTITUT

**Country:** GERMANY

**Session:** TV1 - Date: 14/05/2014 - Room: FOYER - Time: 10:00-10:05:00

### **ABSTRACT**

Recently, the development of engineered nano-sized materials (ENM) produced with food-grade ingredients and designed as delivery systems for organic and inorganic compounds, has gained increased interest. The major reason for this trend is the aim to overcome problems associated with the low bioavailability of many of those compounds which are usually claimed to benefit human health. Such ENM can be produced from single molecules via chemical reactions or by the self-assembly of the individual components. This procedure typically results in the creation of capsules, fibres or tubes that can be used as carrier or delivery systems for smaller molecules. Various lipid, polysaccharide or protein based ENM are already described including e.g. micelles, liposomes or biopolymer particles. In general, ENM designed for the delivery of minerals, secondary plant metabolites and other bioactive compounds have been studied. Experimental evidence for an enhanced bioavailability (up to a factor of 10) of the above mentioned compounds when using ENM was already provided by in vitro as well as in vivo studies. The mechanisms leading to an enhanced bioavailability are based on (i) the chemical stabilisation of the compounds in the gastrointestinal tract (GIT), (ii) their controlled release within the GIT or (iii) an improved transfer of the compounds through the intestinal wall. Particle size, surface properties and the physical state of the ENM are key parameters to be controlled aiming at an enhancement nutritional value of food materials. In addition, such systems must be robust enough to withstand food processing conditions, and environmental changes during distribution and handling by the consumer. However, before nano-sized materials will find wide-spread application in the food sector, information on potential health risks that may arise from their consumption must be available. There are major gaps in knowledge with regard to the behaviour, fate and effects of nano-sized material via the gastro-intestinal route. An important issue for example is whether the nano-sized material is differently digested compared to its individual building blocks. As long as the targeted transport of ENM is not an issue, the uptake of intact ENM may be critical, because the encapsulation might result in an altered tissue and organ distribution with possible negative consequences for human health.

## **EP-82 - CAROTENOID PROFILE OF GUAVA PULP MICROENCAPSULATE OBTAINED BY SPRAY DRYING**

**Authors:** ORNELLA MARIA PORCU; DANNIELLA XAVIER

**Institution:** FEDERAL UNIVERSITY OF TECHNOLOGY (UTFPR), BRAZIL

**Country:** BRASIL

**Session:** TV1 - Date: 14/05/2014 - Room: FOYER - Time: 10:06-10:11:00

### **BACKGROUND**

Guava was found to be one of the richest fruit sources of carotenoids, particularly lycopene, which has antioxidant properties. An alternative to reduce or prevent the risk of nutritional deficiencies can be by developing food products with nutritionally enriched with powder guava.

### **OBJECTIVES**

This study aimed to investigate the content of total carotenoids in guava pulp microencapsulate with dextrin obtained by spray dryer process.

### **METHODS**

Guava pulp (*Psidium guajava*, Paluma cultivar) was purchased from local food industry, in Santa Catarina state, Brazil. Dextrin was added to the guava pulp in a proportion of 1:1, homogenised in a colloid mill, until the complete dissolution. For guava pulp (G) it was necessary to add water according to the carrier agent concentration. The spray dryer operates concurrently and has a spray nozzle with an orifice of 1.0 mm in diameter. The flow of the drying air was about 0.54 L/h and the temperature ranged from 40-60 °C. The carotenoids were extracted with acetone, partitioned to petroleum ether and the carotenoid solutions were dried with anhydrous sodium sulfate, concentrated in a rotary evaporator, and taken to known volumes for spectrophotometric reading and concentration calculation.

### **RESULTS**

The total carotenoids concentration of guava pulp and guava pulp microencapsulate were  $36.81 \pm 5.22 \mu\text{g/g}$  and  $27.56 \pm 1.74 \mu\text{g/g}$ , respectively. Although the pulp had the highest carotenoid content the production of guava pulp microencapsulate showing no significant difference ( $p < 0.05$ ).

### **CONCLUSIONS**

The presence of rich content of total carotenoids demonstrated that they become an excellent raw material and an alternative ingredient for functional food industry and could be used for the development of specific food products.

## **EP-83 - ANTIOXIDANT EFFECT OF RED PITAYA (HYLOCEREUS POLYRHIZUS) EXTRACT ON CELL VIABILITY IN HUMAN BREAST CANCER CELL LINE**

**Authors:** DEBORAH DE ALMEIDA BAUER; DANIELLE DOS SANTOS BONFIM; MARCO ANTONIO DA SILVA; ANDERSON JUNGER TEODORO

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**Country:** BRASIL

**Session:** TV1 - Date: 14/05/2014 - Room: FOYER - Time: 10:12-10:17:00

### **BACKGROUND**

Breast cancer is the type of cancer most diagnosed on the world. It is a complex disease caused by progressive genetic mutations, associated with other factors. Currently, great attention has been given to strategies that may prevent cancer. Food compounds can act as anticarcinogenic, antioxidant and anti-inflammatory factors. They can also act against cancers that are induced or sustained by hormones, or they may have antiangiogenic activity. Red pitaya is known to have a number of nutritional benefits, including cholesterol-lowering effects, protection against diabetes and cancer.

### **OBJECTIVES**

The aim of the study was to determine the antioxidant effect of red pitaya (*Hylocereus polyrhizus*) extract on cell viability in human breast cancer cell line.

### **METHODS**

The antioxidant activity of hydro-alcoholic extract obtained from red pitaya was evaluated using DPPH (2,2-diphenyl-1-picrylhydrazyl) and ORAC (oxygen radical absorbance capacity) antioxidant assay. Human breast cancer cell line (MCF-7) were treated with hydro-alcoholic extract of pitaya (2,5 to 1000  $\mu\text{g/mL}$ ) during 24 h. Cell viability was monitored using MTT test ((3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide).

### **RESULTS**

DPPH assay showed that hydro-alcoholic extract of pitaya had high scavenging capacities with maximum reduction of DPPH (83.99%) with 10  $\text{mg/mL}$  of extract and with  $\text{IC}_{50}$  value of 2.52  $\text{mg/mL}$ . ORAC values showed a potent antioxidant activity with a reduction of up to 1000  $\mu\text{mol Trolox/mg mL}^{-1}$ . Extract of pitaya showed a significant decrease (40,30%) in the number of viable cells of breast cancer cell line (MCF-7) after 24 and 48 h treatment.

### **CONCLUSIONS**

These results suggest that the red pitaya may be a valuable ingredient in foods and may also be useful in nutraceutical and pharmaceutical applications.

FAPERJ

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## **EP-84 - POLYPHENOLIC COMPOUNDS APPEAR TO LIMIT THE NUTRITIONAL BENEFIT OF BIOFORTIFIED HIGH IRON BLACK BEANS (PHASEOLUS VULGARIS L.)**

**Authors:** ELAD TAKO; STEVE BEEBE; RAYMOND GLAHN

**Institution:** USDA-ARS, ROBERT HOLLEY CENTER FOR AG & HEALTH

**Country:** UNITED STATES

**Session:** TV1 - Date: 14/05/2014 - Room: FOYER - Time: 10:18-10:23:00

### **BACKGROUND**

Iron (Fe) deficiency is the most common nutrient deficiency worldwide. A major cause of Fe-deficiency is low bioavailability from plant-based diets containing mineral absorption inhibitors such as polyphenols. The common bean, provides significant quantities of protein and energy and is a source of vitamins and minerals including Fe. The common bean is an attractive candidate for Fe-biofortification because there is genetic variability of Fe concentration and therefore it is possible to breed for significant increases in Fe concentrations in beans. Also, Fe concentrations in beans are high relative to the cereals and therefore beans can deliver substantial increased amounts of Fe.

### **OBJECTIVES**

Our objective was to compare the capacities of biofortified (88 $\mu$ g-Fe/g) and standard (59 $\mu$ g-Fe/g) black beans to deliver Fe for hemoglobin (Hb) synthesis.

### **METHODS**

Bean based diets (no added Fe) were formulated (dietary Fe concentrations were 39.4 $\pm$ 0.2 and 52.9 $\pm$ 0.9mg/kg). Chicks were fed the diets for 6wks (n=12) and Hb, feed-consumption and BW were measured.

### **RESULTS**

Hb-maintenance-efficiency was different between groups on wks 2-4 (P<0.05). Total body Hb-Fe contents were different between standard (23.32 $\pm$ 0.6mg) and biofortified (25.50 $\pm$ 0.8mg) bean groups (P<0.05). Duodenal DMT1, DcytB, and ferroportin expressions were higher and liver ferritin was lower (P>0.05) in standard vs. the biofortified groups. In-vitro analysis showed no significant differences in Fe bioavailability between diets. The in-vivo results suggested a relatively small nutritional

### **CONCLUSIONS**

Evidence suggests that the nutritional benefit of the biofortified

## **EP-85 - IN VITRO DIGESTION AND EXTRACTION IN WATER OF THE MOST POPULAR BRAZILIAN FOODS: EVALUATION OF ANTIOXIDANT ACTIVITIES**

**Authors:** ELOÁ ANGÉLICA KOEHNLEIN; CAMILA TURECK; VANESA GESSER CORRÊA; GELVANI LOCATELI; ERICA MARCELA KOEHNLEIN; ROSANE MARINA PERALTA

**Institution:** UFFS/REALEZA PR AND UEM/MARINGÁ PR

**Country:** BRASIL

**Session:** TV1 - Date: 14/05/2014 - Room: FOYER - Time: 10:24-10:29:00

### **BACKGROUND**

Given the importance of dietary antioxidants in reducing the risks of chronic diseases, it is important to evaluate the antioxidant properties of the foods regularly consumed by a population. Most studies perform the extraction of antioxidant compounds with organic solvents, not simulating normal physiological conditions.

### **OBJECTIVES**

The present study aimed to compare the antioxidant properties of the 36 most popular Brazilian plant foods submitted to extraction in water and in vitro digestion.

### **METHODS**

Thirty six of the most consumed plant foods and beverages were selected using the governmental publication entitled Family Budget Survey from 2008 to 2009. Three different popular brands or 3 samples of each food were purchased. The foods in their usual form of consumption were preprocessed with the aid of a vertical mixer of domestic use with 200 watts of power for 3 min, or until acquiring a pasty consistency and subjected to the in vitro digestion process or extraction in water under the same conditions, protected from light. Two assays (FRAP and TEAC) were used to evaluate the antioxidant properties.

### **RESULTS**

Analysis of total antioxidant capacity (TAC) measured by FRAP assay demonstrated that açai, milk chocolate, coffee, kale, red wine and mate tea showed higher antioxidant activity in both extractions. In the groups of food is found that TAC measured by FRAP assay of the groups of cereals, legumes, vegetables and chocolate were higher in foods subjected to in vitro digestion (p < 0.05). No significant differences were observed for groups of fruits and tuberous vegetables by FRAP assay. The results obtained by TEAC assay showed the açai had higher antioxidant power both when subjected to in vitro digestion as the extraction in water. Milk chocolate, brown bread, coffee and green beans had the highest TAC in response to in vitro digestion and coffee, milk chocolate, mate tea and wine for extraction in water. Only the beverages had higher TAC when subjected to extraction in water. For the other food groups, the largest TAC was observed in those undergoing in vitro digestion. In the cereals group content was 10 times higher (1004.77 micromol TE/100g for in vitro digestion and 102.92 micromol TE/100g for extraction in water).

### **CONCLUSIONS**

More studies that bring the antioxidant content of foods consumed in the habitual diet to the quantities available for absorption and physiological effects are needed. This will provide information that may help to improve the quality of nutrition and population health.

**EP-86 - ASSOCIATION BETWEEN ACANTHOSIS NIGRICANS, INSULIN RESISTANCE, THE CIRCUMFERENCES OF THE WAIST AND ABDOMINAL AND RISK FACTORS OF METABOLIC SYNDROME****Authors:** ERIJESSYKA MARI OLIVEIRA MATOS; EDILENE MARIA QUEIROZ ARAÚJO; JEANE BASTOS MELO; LAURA COSTA MENEZES; DOMINGOS LÁZARO SOUZA RIOS**Institution:** UNIVERSIDADE DO ESTADO DA BAHIA**Country:** BRASIL**Session:** TV2 - Date: 14/05/2014 - Room: FOYER - Time: 10:00-10:05:00**BACKGROUND**

Metabolic Syndrome is represented by a set of pro-atherogenic metabolic abnormalities, usually associated with abdominal obesity and IR. The isolated measurement of WC is used as a marker of central adiposity independently of BMI, thus, this measurement is directly associated with the incidence of diseases. Acanthosis Nigricans, in its turn, has been associated with several metabolic disorders that IR and obesity.

**OBJECTIVES**

Determine in patients with MetS, the prevalence of AN; identify the correlation of AN with IR, overweight, by age, gender, and use of anti-hypertensive drugs, lipid-lowering and hypoglycemic agents; to compare the average values of the criteria for the diagnosis of MetS in patients with AN and to assess the association of IR with the waist and abdominal circumferences.

**METHODS**

Cross-sectional Study, with 58 individuals, patients with MetS. Subject to the collection of weight, height, WC, AC, systemic arterial pressure, dosage of HDL-c; triglycerides; insulin and fasting glucose and test of HOMA IR.

**RESULTS**

Higher prevalence of AN in female gender, followed by adults and overweight. IR was identified in 62% and AN in 48.3% of patients, with association between AN and IR, and AN and overweight; however, there was no association of AN with sex, age, and use of some drugs. Evaluating the BMI, it was observed to be greater index of overweight, followed by obesity grade I, with higher prevalence of obesity in adults. Mean values of weight, BMI, WC, AC, glucose and fasting insulin and HOMA-IR were higher in the group with AN. All showed elevated AC and 96.9% WC high. It was found that the most frequent criterion in the studied group was elevated BP, followed by reduction of HDL-c, fasting plasma glucose and triglycerides. The majority was with excess weight according to BMI. For insulin resistance, a high BMI was the isolated parameter more followed by the HOMA-IR isolated and high BMI associated with HOMA-IR. Insulin resistantes showed 50% more chance of possessing AN, and strongly associated with overweight. The presence of AN wasn't associated with sex, age, and use of antihypertensive drugs, medicines hypolipidemic and hypoglycemic.

**CONCLUSIONS**

Strong correlation between AN and obesity and with the IR, in addition to variables that diagnose the MetS have presented higher averages in the group with AN. Strong correlation between WC and AC, because the patients with higher values of AC exhibit higher values of WC. The data associations as well as to corroborate with the literature about the pathophysiology of the disease.

**EP-87 - TRACE ELEMENTS AND WEIGHT STATUS AMONG LOW INCOME INFANTS IN BRAZIL****Authors:** GILBERTO SIMEONE HENRIQUES; ANNE JARDIM BOTELHO; RICARDO QUEIROZ GURGEL; CLAUDIMARY SANTOS; ALCEU JORDÃO; FERNANDA FARO; ANNA SANTOS; LUIS CUEVAS**Institution:** UNIVERSIDADE FEDERAL DE SERGIPE**Country:** BRASIL**Session:** TV2 - Date: 14/05/2014 - Room: FOYER - Time: 10:06-10:11:00**BACKGROUND**

Trace element deficiencies among children are widespread in low-income countries and often associated with underweight. Infants are at particular risk for trace element deficits which may be overlooked in low-income populations undergoing the nutritional transition.

**OBJECTIVES**

This study describes the biochemical iron, zinc, copper, and selenium status of infants from a low income area in Brazil and their association to infant feeding and weight.

**METHODS**

Cross-sectional study. 153 infants from a rural community from Northeast-Brazil underwent anthropometry to obtain height and weight and blood assays for hemoglobin, ferritin, C-reactive protein, plasma selenium, plasma and erythrocyte zinc and copper concentrations.

**RESULTS**

102 (67%) children had anemia (Hb <11.0 mg/dl), 59 (40%) iron deficiency, 139 (91%) low plasma selenium, 86 (58%) and 100 (67%) had low plasma and erythrocyte zinc concentrations, and 7 (5%) and 113 (76%) low plasma and erythrocyte copper. Breastfeeding and older age were independently associated with lower plasma ferritin concentrations. Zinc, copper and selenium concentrations were not associated with infant feeding. Weight gain velocity and weight-for-height z-score did not predict trace elements concentrations.

**CONCLUSIONS**

Breastfed infants from low-income areas may be at risk for iron deficiency because breast milk is low in this nutrient. Blood zinc, copper and selenium concentrations did not differ by feeding practices or weight status. Trace element deficiencies in infancy are associated with factors other than anthropometry.

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## **EP-88 - IRON BIOAVAILABILITY IN WISTAR RATS FED WITH FORTIFIED RICE WITH MICRONIZED FERRIC PYROPHOSPHATE IS HIGH**

**Authors:** CERES MATTOS DELLA LUCIA; MARIA GRAÇAS VAZ TOSTES; CARLOS MÁRIO MARTINS SILVEIRA; LÍVIA AZEVEDO BORDALO; NEUZA MARIA BRUNORO COSTA; HÉRCIA STAMPINI D MARTINO; HELENA MARIA PINHEIRO-SANT A

**Institution:** UNIVERSIDADE FEDERAL DE VIÇOSA

**Country:** BRASIL

**Session:** TV2 - Date: 14/05/2014 - Room: FOYER - Time: 10:12-10:17:00

### **BACKGROUND**

Iron deficiency is the most common and widespread nutritional disorder in the world, and is a public health problem in both industrialized and non-industrialized countries. Food fortification is a well recognized approach to overcome hidden hunger in many parts of the world, particularly in developing countries. Additionally, fortification is a method of controlling micronutrient deficiency as an intervention alternative mainly recommended for locations where high prevalence rates are found. Rice can be used for fortification in countries where it is a staple food and specific deficiencies reach high prevalence rates. Through Ultra Rice® (UR®) technology rice flour can be combined with a binder and other nutrients, and refurbished by extrusion as reconstituted rice grains with the same size, shape and texture of conventional rice.

### **OBJECTIVES**

To evaluate iron bioavailability in Wistar rats fed with rice fortified with micronized ferric pyrophosphate by Ultra Rice® technology with or without addition of yacon flour.

### **METHODS**

Diets were supplied with 12 mg iron/kg from the following sources: ferrous sulfate (FS - control diet), fortified rice (Ultra Rice®) (UR® diet), ferrous sulfate + yacon flour (FS + Y diet) or Ultra Rice® + yacon flour (UR® + Y diet). At the end of the study, blood samples were collected for determination of hemoglobin concentration and calculation of the relative biological value (RBV). Also, the content of short chain fatty acids (SCFA) (acetic, propionic and butyric acids) from animals' stools and caecum weight were determined.

### **RESULTS**

UR® diet showed high iron bioavailability (RBV = 84.7 %). However, the addition of yacon flour in the diet containing fortified rice (UR® + Y diet) decreased RBV (63.1 %) ( $p < 0.05$ ). Groups that received yacon flour showed higher acetic acid values compared to those who did not. Yacon flour caused a significant increase in the absolute caecum weight of animals ( $p < 0.001$ ), more pronounced in the diet containing ferrous sulphate and yacon flour. The relative caecum weight was higher in animals fed with yacon flour and more prominent in the group that received ferrous sulfate with yacon flour ( $p < 0.001$ ).

### **CONCLUSIONS**

Fortified rice with micronized ferric pyrophosphate by UR® technology showed high iron bioavailability. The addition of yacon flour, in order to provide 7.5 % of fructooligosaccharides (FOS) in the diet, increased caecum weight and SCFA concentration, although it reduced iron bioavailability.

## **EP-91 - PLASMA SELENIUM CONCENTRATION IN DIFFERENT GROUPS FROM A RICH BRAZILIAN SELENIUM AREA**

**Authors:** LARISSA BEZERRA SANTOS; CHRISTIELLE FÉLIX BARROSO; LUANA MARA SILVA CASTRO; ANA FILOMENA CAMACHO S DALTRO; CARLA SORAYA COSTA MAIA; MARIA IZABEL FLORINDO GUEDES; PAULO CÉSAR ALMEIDA; SILVIA MARIA F COZZOLINO

**Institution:** UNIVERSIDADE DE SÃO PAULO

**Country:** BRASIL

**Session:** TV3 - Date: 14/05/2014 - Room: FOYER - Time: 10:00-10:05:00

### **ABSTRACT**

Selenium concentration in food depends on where it was cultivated and it reflects directly the soil mineral content. Food from North and Northeast Brazilian areas seems to be richer in selenium when compared to other regions, according to some previous studies. The state of Ceara, located in Northeast Brazil, has been appointed as a rich selenium area with higher selenium concentrations in food than other Brazilians states. In order to verify the adequacy of Se status in individuals residing in the state, some studies were conducted to evaluate the plasma selenium concentration both in healthy and sick populations. Plasma selenium concentration was detected by atomic absorption spectrometry with hydride generator coupled to the quartz cell in all studies conducted at Ceara. In 2008, we evaluated 22 patients with thyroid disorders which presented Se plasma concentration mean of  $61.8 \pm 19.1$  µg/L. In 2013, the evaluation of 47 patients with chronic renal failure found a mean of  $57.8 \pm 4.8$  µg/L. Also in 2013, a group of 176 healthy subjects was evaluated and found a mean of  $62.6 \pm 8.5$  µg/L for plasma Se concentration. In 2014, a review of 35 patients in pre-liver transplant found plasma Se concentration of  $46.3 \pm 10.4$  µg/L. Finally, also in this year, we evaluated 27 men with infertility and found a plasma Se concentration mean of  $62.46 \pm 12.3$  µg/L. There are no reference values for plasma selenium concentration specific for the Brazilian population, which demonstrates the importance of conducting more studies to the mineral status situation of the population be known and valued.

CNPQ

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## **EP-92 - USE OF WASTE FISH FROM NORTH REGION OF BRAZIL TO ELABORATE CONDIMENTS IN TABLET FORM**

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**Institution:** UNIVERSIDADE FEDERAL DO PARÁ

**Country:** BRASIL

**Session:** TV3 - Date: 14/05/2014 - Room: FOYER - Time: 10:06-10:11:00

### **BACKGROUND**

The use of industrial fish processing generates a lot of waste that is largely unexplored, thus several studies have highlighted its nutritional potential in order to increase the amount of processed products for human and animal consumption.

### **OBJECTIVES**

This study aimed to develop formulations of spice in tablet form from the waste processing of two species of Amazonian fishes: Pescada Branca (*Plagioscion squamosissimus*) and Dourada (*Brachyplatystoma flavicans*), establishing the physicochemical, microbiological and sensory characteristics of the final product and to determine the calorific value and prepare nutritional information.

### **METHODS**

The final products analyzed in this study showed microbiological parameters within the standards required by law, the physico-chemical analyzes showed that the final products were satisfactory which favors the use of this species for the preparation of dehydrated products.

### **RESULTS**

It was found that there are several alternatives for sustainable use of waste generated in the fishing industry.

### **CONCLUSIONS**

The proposals can ensure better conditions for the by-products from fish waste is recovered, increasing income generation for communities of artisanal fishermen.

FAPESPA

## **EP-93 - IRON BIOAVAILABILITY AND PROTEIN QUALITY OF BIOFORTIFIED BEANS (PHASEOLUS VULGARIS)**

**Authors:** MARIA GRAÇA VAZ TOSTES; CARMELITA Z. SCOLFORO; PAULA A. CLAUDINO; TEREZA C. S. LUZ; TIEMI SAITO; VANESSA S. CONSTANCIO; ROGÉRIO G. PEDROSA; NEUZA M. B. COSTA

**Institution:** UNIVERSIDADE FEDERAL DO ESPÍRITO SANTO

**Country:** BRASIL

**Session:** TV3 - Date: 14/05/2014 - Room: FOYER - Time: 10:12-10:17:00

### **BACKGROUND**

Food biofortification has been pointed as a strategy to minimize the issues resulting from bad nutrition mainly in low-income populations. Iron and zinc biofortified beans may contribute to reducing the micronutrient deficiency.

### **OBJECTIVES**

The purpose of this study was to evaluate the iron bioavailability and protein quality of biofortified beans BRS Pontal (*Phaseolus vulgaris*) and conventional beans Perola (*Phaseolus vulgaris*).

### **METHODS**

Two experiments were carried out with Wistar rats, Experiment I, protein quality evaluation and Experiment II, Iron bioavailability evaluation. The protein quality evaluation was determined by the protein efficiency ratio (PER), net protein ratio (NPR) and true digestibility. Bioavailability was evaluated by the hemoglobin depletion-repletion method.

### **RESULTS**

The biofortified bean (group PO) presented high iron bioavailability not differing from the control group (group C) (PO: 105,34%; C: 96,07%) and the protein quality of biofortified beans was similar to that of common beans (group PE), according to digestibility (PO: 66,90±1,93; PE: 71,58±8,83), PER (PO: 1,66±0,42; PE: 2,13±0,47) and NPR (PO: 2,69±0,42; PE: 3,14±0,44) analysis.

### **CONCLUSIONS**

The biofortified BRS Pontal bean is a potential source of bioavailable iron and may contribute, equally to the common beans, with the dietary intake of protein.

EMBRAPA, HARVEST PLUS, FAPES, CAPES

# BIOAVAILABILITY 2014

UNDERSTANDING THE BIOAVAILABILITY OF MICRONUTRIENTS AND BIOACTIVE COMPOUNDS SO AS TO IMPROVE PUBLIC HEALTH

MAY 12-14, 2014 - HOTEL RECANTO - IGUASSU FALLS - BRAZIL

## EP-94 - IN VITRO ASSESSMENT OF IRON ABSORPTION ENHANCERS IN FORTIFIED RICE

**Authors:** MEGAN E. PARKER; MATTHEW FREY; ZOEY CHANIN; CARMEN FORSMAN; PEIMAN MILANI; GAURAV C. PATEL; JOHN B. LASEKAN; PAUL W. JOHNS

**Institution:** PATH

**Country:** UNITED STATES

**Session:** TV3 - Date: 14/05/2014 - Room: FOYER - Time: 10:18-10:23:00

### BACKGROUND

Extruded rice kernels (e.g., Ultra Rice®) fortified with micronutrients (e.g., iron, zinc, vitamin A, folic acid, thiamine, niacin, vitamin B12, etc.) may be blended with natural rice as a means of delivering lacking nutrients to rice-consuming populations. Because of key sensory (e.g., color, taste) and stability (e.g., vitamin loss) considerations, the iron fortificant used in these rice kernels is typically an insoluble iron compound (e.g., micronized ferric pyrophosphate, or "mFePP") with relatively low bioavailability.

### OBJECTIVES

In an effort to identify suitable options for enhancing the physiological absorption of rice kernel iron, we have used a published in vitro assay to evaluate the effectiveness of various ingredients for increasing iron solubility.

### METHODS

The evaluated ingredients include (a) low levels of a soluble iron salt (e.g., NaFeEDTA, ferrous bisglycinate, ferrous lactate) used in combination with mFePP; (b) a low level of a non-iron ingredient such as ascorbate, EDTA, or phytase; and (c) a protein isolate or concentrate (derived from rice, soy, pea, whey, or milk). In addition, the effect of natural rice variation on rice analogue iron solubility has been evaluated by the same method.

### RESULTS

The assay results show that significant enhancements in iron solubility (and thereby presumably iron absorption) may be achieved via the use of many of these options. Iron solubility was increased by 20% when NaFeEDTA was added at only 2% of total iron, 30% when ascorbate was added at 0.1% of the formulation, and 20% when a pea protein concentrate was evaluated as a replacement for the rice flour component of the extruded rice kernel.

### CONCLUSIONS

While METHODS have been identified to significantly improve iron solubility, further examinations of impact on sensory properties, vitamin stability, and cost are needed prior to implementation. On the basis of the in vitro assay results obtained from these evaluations, new formulations of extruded rice are being tested in an in vivo study for confirmation of improved iron solubility and absorption.

## EP-95 - COLOR PARAMETERS OF GUAVA PUREE MICROENCAPSULATE

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**Country:** BRASIL

**Session:** TV3 - Date: 14/05/2014 - Room: FOYER - Time: 10:24-10:29:00

### BACKGROUND

The scientific name is *Psidium guajava* L. and is a fruit which consumption is very important in the diet of people because, it is a rich source of antioxidant compounds, including carotenoids. An alternative to reduce or prevent the risk of nutritional deficiencies can be by developing food products with nutritionally enriched with functional ingredients as powder guava.

### OBJECTIVES

In the present work we evaluated the color parameters of guava puree microencapsulate.

### METHODS

Concentrated guava puree (Paluma cultivar) was purchased from local food industry, in Santa Catarina state, Brazil. Dextrin was added to the guava puree in a proportion of 1:1, homogenised in a colloid mill, until the complete dissolution. For guava puree (G) it was necessary to add water according to the carrier agent concentration. The spray dryer operates concurrently and has a spray nozzle with an orifice of 1.0 mm in diameter. The flow of the drying air was about 0.54 L/h and the temperature ranged from 40-60 °C. The powder (MG) produced were stored in desiccators, containing silica gel. Color parameters (L\*, a\*, b\*) were performed in quadruplicate using a colorimeter Minolta Chroma Meter CR-400. The results were interpreted through the CIELAB system: L\*(luminosity), the chromaticity coordinates (a\*, b\*), C\*ab and H\*ab.

### RESULTS

A higher value of L\* ( $90.86 \pm 0.63$ ) after the encapsulation process was due to mixing with dextrin, encapsulating agent, and suggests a lighter shade of white powder. The decrease in chromaticity a\* and b\* ( $-0.04 \pm 0.12$  and  $13.65 \pm 0.17$ , respectively) showed a tendency for depigmentation. The mean value for C\*ab and H\*ab was  $13.65 \pm 0.17$  and  $-89.60 \pm 0.13$ , respectively. The negative value of Hue angle (H\*ab) indicated the position in the fourth quadrant of colors.

### CONCLUSIONS

The visual appearance could be useful in the development of innovative functional food ingredient. The color developed by guava puree microencapsulated is strongly dependent on the way of technological production process.



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