

ASEPTIC BULK PROCESSING AND PACKAGING TECHNOLOGY AND THE AVAILABILITY OF NUTRITIOUS FOODS WORLDWIDE. Philip E Nelson, Professor Emeritus, Purdue University, 2007 World Food Prize Laureate, Nelson Hall of Food Science, West Lafayette, Indian 47907, USA.

Nicolas Appert invented canning in 1795 and ~ 150 years later, aseptic processing and packaging was introduced. The consumer has greatly benefitted. Today large quantities of fruits and vegetables are aseptically bulk processed and packaged for later remanufacture. This technology that began in the late 1960's can now be found in almost every part of the world. How it began and its uses will be discussed in this presentation. In addition, focus will also be given to the necessity of Food Scientist impacting the availability of sufficient food worldwide. Even today, millions are undernourished and lack sufficient food for normal survival. In addition, over a billion people live on less than a dollar a day and lack hope for the future. While increased production must occur, currently, valuable food produced in developing countries is lost due to spoilage and never reaches the intended consumer. Efforts to reduce losses and create local markets for small farmers can greatly assist in providing nutritious foods for even the rural poor. Appropriate processing and preservation is required.

THE BRAZILIAN FOOD INDUSTRY: PRESENT AND FUTURE PERSPECTIVES. Edmundo Klotz, President, Brazilian Association of Food Industries (ABIA), Brazil.

The Brazilian food and beverage industries let out products that are shipped and that are equivalent to 9% of the Gross Domestic Product (GDP) of Brazil. Besides creating a growing number of jobs, they generate a trade surplus greater than that created by the rest of the economy. The turnover of the sector totaled R\$ 388.7 billion in 2011, of which R\$ 321.1 billion came from food and \$ 67.6 billion from beverages. This performance puts the industry as the second largest in the gross value of production of the transformation industry, only behind the petrochemical industry. From the standpoint of the products, the industry has shown a great development in the last two decades. The Brazilian population has migrated heavily from fresh to processed food and the industry has increasingly explored new niche products such as dietary and functional food and beverages. In his presentation, Mr. Klotz intends to share with the audience the strengths of the Brazilian food sector and the reasons that explain why Brazil has the largest potential and responsibility to supply food to billions of new earth inhabitants in the next decade.

MATHEMATICAL MODELLING, NUMERICAL SIMULATION AND ADAPTIVE CONTROL OF PROCESSES IN FOOD AND BIOTECHNOLOGY. C. Rauh, A. Delgado, Institute of Fluid Mechanics, Friedrich-Alexander University, Erlangen-Nuremberg, Germany.

In production processes optimization of the impact of applied unit operations on the final product quality, microbiological/ (bio-) chemical safety as well as on functionality has crucial importance. Simultaneously, constraints defined by economy and ecology have to be fulfilled. This requires considerations far beyond classical approaches focussing merely on material

and energetic subjects but global approaches for realizing adaptive design of products and processes. The present contribution introduces knowledge based product and process design approaches for selected conventional and innovative techniques in food and biotechnology. Adaptive design starts with a detailed process characterization followed by process diagnosis, process prediction and development of control strategies. These steps strongly depend on the experimental and mathematical investigation of the reality. As experiments are often restricted to observe the process at single points in space and time and not in the whole process domain, mathematical modelling and numerical simulation are essential to overcome this disadvantage. Experimental information is described by mathematical models and implemented in numerical simulations. In complex cases where no balancing equations can be formulated, techniques based on cognitive algorithms are applied. The present results prove the high potential of knowledge based product and process design to meet prescribed product related, economical and ecological constraints. Using hybrid approaches it is possible to control the drying process of very sensitive products like gelatine. Process control strategies assure a stable and reliable operation even in industrial environment. Furthermore, economical/ecological advantages of these hybrid methods are shown in the pasteurization of milk by a pressure drop reduction of 20% and an increase in heat transfer of 25%. Reactor design can be achieved using modelling, simulation and hybrid adaptive control strategies and critical control points can be figured out. By this, guidelines for laboratory and industrial food treatment and bio technological processes can be formulated.

STRATEGIES TO COMBAT MICRONUTRIENT DEFICIENCY IN DEVELOPING COUNTRIES. Marilia Regini Nutti, Brazilian Agricultural Research Corporation – Embrapa, Brazil.

Most efforts to combat micronutrient deficiency in the developing world focus on providing vitamin and mineral supplements to the poor and on fortifying foods with these nutrients through postharvest processing. The introduction of biofortified crops – varieties bred for increased mineral and vitamin content – could complement existing nutrition interventions and provide a sustainable, low-cost way of combating malnutrition. Research and development of biofortified foods in Brazil highlight a unique aspect that makes Brazil different from other countries - Brazil is the only country where eight different crops are studied at the same time, namely, pumpkin, rice, sweet potatoes, beans, cowpeas, cassava, maize, and wheat. Within the Biofortification Net, Brazilian universities not only carry out studies to evaluate nutrients retention during processing/cooking, but also bioavailability studies. The project aims to fortify foods that are already part of the diet of the population providing access to more nutritious products without requiring any changes in their consumption habits. In the field, cultivars are selected and the most promising ones move on to the breeding stage. Ten nutritionally enhanced cultivars had been released during the implementation project phase, that also presented good agronomic qualities (yield, resistance to drought and pests and diseases), and will be tested now for consumer acceptance and nutrition efficacy.