**426 Active packaging: Films and coatings for extended shelf life.** Paul Dawson*, *Clemson University*.

Shelf life encompasses both safety and quality of food. Safety and spoilage-related changes in food occur by three modes of action; biological (bacterial/enzymatic), chemical (autoxidation/pigments), and physical. Active packaging may intervene in the deteriorative reactions by; altering the package film permeability, selectively absorbing food components or releasing compounds to the food. The focus of this report will consider research covering impregnated packaging films that release compounds to extend shelf life. The addition of shelf life extending compounds to packaging films rather than directly to food can be used to provide continued inhibition for product stabilization. For further-processed foods with greater than one week shelf life, active packaging can provide an added level of protection downstream in the distribution cycle. Direct addition of antimicrobials for instance, will have a strong initial effect but will have little effect later in the distribution cycle since the antimicrobial will react with food components or be absorbed into the food bulk. For non-fluid foods, the deteriorative reactions occur primarily at the food surface. Thus, less antimicrobial will be needed when used in the package since the compound will be released at the location of need, the food surface. Some research results will be highlighted that focus on using compounds that are either approved for food use or are food components. Antimicrobials used include nisin, lauric acid, and EDTA while antioxidants added to films include BHT, BHA, and rosemary extract. Film and coating materials include soy, wheat, corn, and polyethylene. Pathogens including Salmonella and Listeria have been inhibited by several combinations of antimicrobials and film or coating types. Fresh beef color has been extended by over-wrapping meat with BHA-impregnated polyethylene film and inoculated milk exposed to films containing nisin have had multiple log reduction of Listeria monocytogenes. Positive results for food shelf life extension have been shown by the application of active packaging.

**Key Words:** antimicrobial packaging, shelf life, active packaging

**427 Mold migration in paperboard materials for extended shelf-life milk.** J. E. Marcy*[1], L.D. Sammons[2], S.S. Sumner[1], and C.R. Hackney[3], [1]*Virginia Tech*, [2]*International Dairy Foods Assoc.*, [3]*West Virginia University*.

Research was conducted to elucidate the cause of past fungal contamination experienced by a local dairy in extended shelf-life fluid dairy products. Migration of Penicillium spinulosum from paperboard to milk during an extended shelf-life was investigated through inoculation of condia into paperboard test-squares. These 57.2 cm by 57.2 cm test-squares were sealed on three sides with melted paraffin wax, inserted with a steel pin at 3.2, 6.4, 9.5 and 12.7 mm from the uncoated edge and sterilized by gamma irradiation. A stock solution of P. spinulosum was injected at these four distances and the injection site sealed with melted paraffin wax. The squares were incubated at 7 C. in ultra-pasteurized skim milk for 60 days, allowing wicking of the milk to occur. An inverse relationship was seen between distance from the uncoated edge and presence of the test organism in the surrounding milk. The percentage of P. spinulosum was 84% at 3.2mm, 72% at 6.4mm, 50% at 9.5mm and 28% at 12.7mm. Survival of P. spinulosum was in paperboard test materials was studied.

**Key Words:** Paperboard , Extended Shelf-life

**428 The use of polymeric materials for extended shelf life products.** Susan Nielsen*[1], [1]*Eastman Chemical Company*.

The consolidation of dairies, centralization of meat packing operations, and expansion of distribution areas has led to an increase in the need for products with an extended shelf life. The challenge to the food industry is to meet this need while maintaining product quality and not compromising flavor or consumer acceptance. Plastics play an important role in meeting the challenge of extended shelf life. They offer unique advantages in food packaging to both producers and consumers. This talk will look at some of the common polymers used in food packaging, their properties, and how these properties can be used to meet food quality, processing, and storage requirements. The use of plastics in the packaging will be highlighted in a discussion of two products with extended shelf life, ESL milk and case-ready meat. In the last two years, there has been substantial growth in extended shelf life milk packaged in single serve PET or HDPE containers. The combination of ESL processing and a plastic container results in an extended shelf life of 60 to 90 days, and at the same time provides consumers with the attributes they are demanding from the package: convenience, portability, and resealability. The second example of how polymers are part of the solution to extend shelf life is focused on case-ready beef. Here, a combination of a polymer with the appropriate gas barrier and a modified atmosphere allows beef to retain its bright red color longer, extending its shelf life. Plastics are increasingly used in food packaging and will be part of the future of extended shelf life products.

**Key Words:** Shelf life, Polymer, Plastic

**429 Exploring Product-Package Research in an Interactive Session .** J. C. Acton*, *Clemson University*.

Three differing research areas (presented from invited posters) which address current product-package developments will be critiqued with audience participation. After an overview of the research areas, challenging questions will be provided, and those in attendance will actively engage in a brainstorming discussion. The objective is to foster thoughts on what if, why not, spin-offs, the future, and does it matter.

**Key Words:** Food Packaging, Brainstorming Packaging, Product-Package Developments

**430 Potential of biobased materials for food and dairy packaging.** Grete Bertelsen*[1], V.K. Haugaard[1], and T.H. Hansen[1], [1]*Department of Dairy and Food Science, The Royal Veterinary and Agricultural University*.

Biobased food packaging materials are defined as packaging materials derived from renewable sources. Generally, biobased materials are potentially biodegradable, i.e. composting is a potential technique for waste management. Biobased packaging materials include both edible coatings and edible films along with primary and secondary packaging materials. This presentation will focus on biobased primary packaging.
Biobased materials can be classified according to the method of production, resulting in the following three main categories: 1) Polymers directly extracted/removed from natural materials (mainly plants) as, for example, starch, cellulose, casein and wheat gluten, 2) polymers produced by "classical" chemical synthesis from renewable bio-derived monomers as, for example, polylactate, a biopolyester polymerised from lactic acids monomers and 3) polymers produced by microorganism as, for example, the polyhydroxyalkanoates. This presentation will review the wide range of biobased materials and their properties in relation to food packaging.
Prior to commercial use of biobased primary packaging materials several concerns must be addressed. First of all the biobased material must remain stable during storage of the food products, maintaining the mechanical and/or barrier properties. Ideally, the materials should biodegrade efficiently on disposal. Thus, environmental conditions conducive to biodegradation must be avoided during storage, whereas optimal conditions for biodegradation must exist after discarding. In order to reduce deterioration of the food products it is also important that the biobased packaging material meets the requirements of the individual food products. In this presentation the suitability of biobased materials as food packaging will be evaluated. In addition the challenges involved in using biobased packaging materials for different food and dairy products will be identified.

**Key Words:** Biobased materials, Packaging, Food and dairy product