2.9±0.05). Clean WGR was significantly greater in young ewes than in old ewes (0.71±0.02 VS 0.62±0.02 mg/cm^2/d, P<0.01). The same trend was also found for AFW (2.65±0.07 VS 2.49±0.07 Kg, P<0.01). Dry ewes had significantly (P<0.01) greater LW (52.7±0.42 VS 50.40±0.47 Kg), BCS (3.3±0.05 VS 2.2±0.05),clean WGR(0.77±0.02 VS 0.60+0.02 mg/cm^2/d), FD(34.6±0.18 VS 34.0±0.21um) and AFW (2.8±0.07 VS 2.3±0.07 Kg) than comparative wet ewes. Dry ewes were compared with wet ewes in the four season of year. The measured traits particularly ewe LW and WGR were not affected by season of year in dry ewes, but these traits were lowest (P<0.01) for wet ewes during Autumn season. The lack of effect of season on dry ewes, but highly affected of wet ewes by Autumn indicates that WGR of this breed of sheep is not influenced directly by season, and the differences of WGR between Autumn and other seasons in wet ewes depends the effect of their lactating period not seasonal effect.

Key Words: Seasonal wool growth, Fiber diameter, Ewe age, Dry (non pregnant) ewes, Wet (pregnant/lactating) ewes, Fleece weight

304 Growth and carcass characteristics of Awassi, Awassi x Romanov and Awassi x Charollais ram lambs fed different planes of nutrition. A. Y. Abdullah*[1], M. Momani Shaker[2], R. T. Kridli[1], and I. Sada[2], [1]*Jordan University of Science and Technology, Irbid/Jordan,* [2]*Czech University of Agriculture, Prague/Czech Republic.*

Thirty newly weaned Awassi (A), F1 Awassi x Romanov (AR) and F1 Awassi x Charollais (AC) ram lambs of similar BW (23.9 5.8 kg) were used to evaluate growth and carcass performance on two planes of nutrition. Animals of all genotypes were randomly assigned to receive ad lib diet (TRT1) or 75% of the feed offered to TRT1 (TRT2) following a 15-d adjustment period. Animals were fed the diets for a period of 119 days. The two diets were isocaloric and isonitrogenous (16% CP and 11 MJ ME). Fifteen animals were slaughtered at the end of the experiment for body and carcass evaluation. No treatment by genotype interactions were detected (P > 0.05) in any of the measured parameters. Total feed consumption was higher (P < 0.001) in TRT1 than TRT2 animals while feed efficiency (kg feed/kg gain) was better (P < 0.05) in TRT2 animals (7.8 and 6.90.3 kg feed/kg gain for TRT1 and TRT2, respectively). Other growth parameters were not influenced by treatment (P > 0.05). Genotype, however, significantly affected final weight (P < 0.01), total gain (P < 0.001), ADG (P < 0.001), and feed efficiency (P < 0.01). Average daily gain was 198 8.3, 152.0 10.9 and 147 8.7 g/d for AR, AC and A ram lambs, respectively. Feed efficiency was 6.4 0.3, 7.8 0.4 and 7.9 0.3 kg feed/ kg gain for AR, AC and A ram lambs, respectively. Dressing percentage was influenced (P < 0.05) by genotype but not by plane of nutrition (P > 0.05). Awassi and AC had higher dressing % compared with AR ram lambs (52.1 0.9, 50.9 1.0 and 47.6 0.9 % for A, AC and AR ram lambs, respectively). Meat: bone ratio was not affected (P > 0.05) by genotype nor by plane of nutrition. In conclusion, plane of nutrition did not influence growth and carcass characteristics except for feed efficiency. Growth performance was better while dressing % was lower in AR than AC and A ram lambs due to the presence of more tail fat in A and AC.

Key Words: Growth, Sheep, Nutrition

Contemporary and Emerging Issues
Homeland Security and Animal Agriculture

305 Current thought on bioterrorism: The threat, preparedness and response. D.R. Franz*, *Southern Research Institute.*

In just the last 5 years, the public has learned of the threat of biological terrorism in America. Why biological terrorism? Why now? What is the threat, what are our vulnerabilities and how have they changed since the end of the cold war? How have international political change and biotechnological advances altered the threat? What are the technical issues for the proliferator and for the defense? What assumptions can we make about intent to harm in the post-9/11 world? A biological terrorist attack could have many faces. It might be delivered through inhaled aerosol particles, contaminated food or water, or introduced by an infected insect or animal host. It could affect humans, animals, or both. It could be based on any of hundreds of bacterial, viral or toxin agents. It might occur in any of our cities—or in our agricultural communities—at any time. Although the likelihood of occurrence is probably low, the potential for harm—and for terror—is enormous. These issues and the fundamentals of preparedness and response will be examined to put agro-terrorism in context within the broader view.

Key Words: Bioterrorism, Threat, Preparedness

306 The agroterror threat: An overview of issues and potential impacts. J. Jaax*, *Kansas State University, Manhattan KS.*

The presentation will outline a broad perspective of agroterrorism, ranging from the genesis and nature of the threat, through possible impacts upon our national interests. Key themes will be discussion of factors contributing to agricultural vulnerabilities, examination of the devastating potential economic implications of agroterrorism, and understanding posssible motivations of perpetrators. Additionally, factors that might make an agroterror event possible if not probable will be examined. Finally, some correlations and lessons learned from key past emerging disease events will be briefly discussed.

Key Words: Agroterrorism

307 Security of the food supply. G. Clarke*[1], [1]*Agriculture & Agri-Food Canada/Canadian Food Inspection Agency.*

Security of the food supply is an important issue of homeland security due to the possibility of sabotage and disruption that could occur. Steps that the food industry and government organizations, from the processor through to retail, could or are taking to deter and try to prevent incidents from occurring together with the important elements and principles involved are described. Mechanisms currently in place plus recommendations for future action to minimize disruption should an incident occur, both economic disruption and threats to public health, are also discussed.

Key Words: Security, Food

Dairy Foods
Milk Protein Gelation and Their Mixtures with Polysaccharides

308 Protein-polysaccharide interactions in emulsions and gelled emulsions. Eric Dickinson*, *University of Leeds, Leeds, United Kingdom.*

Proteins and polysaccharides are the two main classes of functional macromolecules involved in controlling stability, shelf-life and texture of dairy foods. Both act as structure-making and gelling agents in multiphase colloidal systems, and as #stabilizers# of oil-in-water emulsions. The action of milk proteins is predominantly through the formation of a macromolecular barrier at the oil#water interface. This protects droplets from sticking together by a combination of steric and electrostatic stabilization mechanisms. The action of polysaccharides (hydrocolloids) typically involves the formation of a polymeric barrier in the aqueous phase between droplets. Polysaccharides like pectin and carrageenan can affect the stability and rheology of milk protein-based emulsions in several ways. The main factors are (i) the nature of the adsorbed milk protein (caseinate, whey protein, micellar casein, etc.), (ii) the nature of the polysaccharide (degree of methoxylation of pectin, type of carrageenan), (iii) the relative proportions of protein and polysaccharides, (iv) the solution conditions (pH, ionic strength), (v) the processing conditions (heating, high pressure treatment, acidification, etc.), and (vi) the protein#polysaccharide interaction (attractive/repulsive, weak/strong). An attractive protein#polysaccharide interaction may lead to improved stabilization of a protein-based emulsion by formation of a secondary adsorbed layer or by strengthening interparticle interactions in emulsion gel networks. But, at low protein/polysaccharide ratios, the attractive protein#polysaccharide interaction may cause loss of stability through bridging flocculation. A repulsive protein#polysaccharide interaction implies thermodynamic incompatibility between the two biopolymers in mixed solutions at high concentrations, and flocculation and enhanced creaming of the corresponding emulsions due to depletion flocculation.

Key Words: Emulsions, Protein-polysaccharide interactions, Colloid stability

309 Milk protein-polysaccharide interactions. Cornelis G De Kruif*[1,2], [1]*NIZO food research, P.O. Box 20, 6710 BA Ede, The Netherlands*, [2]*Van #t Hoff Laboratory for Physical and Colloid Chemistry, Debye Institute, University of Utrecht.*

The interaction of polysaccharides and proteins is of great relevance to food products, as, for instance in the stabilisation of acidified milk products by pectin. The functionality of carrageenan and other polysaccharides in food products depends on the interaction with the proteins, be it repulsive or be it attractive. Proteins are often present on the surface of emulsion droplets. Also the ropiness and structure of yoghurt products depends on the presence of exo-polysaccharides which are produced by the lactic acid bacteria. In this contribution I will discuss the various types of interaction of proteins and polysaccharides. On mixing polysaccharides and proteins three situations may be distinguished, just as in classical polymer theory as developed by Flory. Firstly, the protein and polysaccharide may mix, which is the less probable situation. Secondly, the protein-polysaccharide mixture may have an attractive interaction. Then the mixtures tend to phase separate into a (bio) polymer rich and a (bio) polymer poor phase. A special case occurs if the protein and the polysaccharide form a so-called (complex) coacervate, due to electrostatic attractions. The coacervation mechanism is used for encapsulation purposes. I will discuss the system with gum Arabic and whey proteins. The third and most common situation occurs if the protein and the polysaccharide tend to demix or phase separate. Adding too much of a thickener to a product may lead to adverse effects of increased instability. As an example I will discuss the interaction of exo-polysaccharides as produced by lactic acid bacteria, guar and carrageenan with casein micelles and whey proteins.

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Key Words: Milk protein, polysaccharides, casein micelles

310 Gelation of globular proteins: Current and future perspectives. A. H. Clark*[1], W. S. Gosal[2], and S. B. Ross-Murphy[2], [1]*Unilever Research & Development Colworth, Bedford, U.K.*, [2]*King's College, London, U.K.*

The gelation of globular protein solutions, particularly by heat, has long been a subject of both practical and academic interest. From a scientific point of view the phenomenon is now fairly well understood, but even today, important details remain unclear such as the exact molecular processes which occur during network building, and the best way to describe these theoretically. There are also issues surrounding the formation of highly heterogeneous gels, i.e. when some form of phase separation is involved; and the whole area of linking failure and water-holding properties to gel microstructure remains highly empirical. The present talk considers what is known about the structural features of heat-set globular protein gels from the molecular level upwards. It will also examine the kinetic description of network building, highlighting the cure curve from mechanical spectroscopy, and its specific features such as gel times and long-time limiting modulus values. Models for cure curve behaviour will be described, and used to confront real experimental data. The idea of a critical gel concentration will be discussed in relation to its possible origins and significance. Comparison will be made between heat-set gel systems, and their properties, and globular protein gelation by other methods such as alcohol addition. Limitations in current knowledge will be identified, and consideration given to the direction that future research might take in this area.

Key Words: Globular Proteins, Gelation, Structural and Mechanical Properties

311 Mixed gels from whey proteins and polysaccharides. Sylvie L. Turgeon*, Maude Girard, Martin Beaulieu, and Nakhle Haddad, *Dairy Research Centre, Laval University.*

Whey proteins (WP) are well known functional and nutritional ingredients. WP are nowadays incorporated in many foods and the presence of other biopolymers like polysaccharides influence their properties and the resulting mixed solution and gel behavior. Depending on the aqueous environmental conditions (pH, ionic strength, cations, etc.) and the structural characteristics of the biopolymers (charge, molecular weight, conformation, etc.) the overall protein-polysaccharide interaction may be attractive or repulsive. Repulsive interactions are non specific and the system will tend towards phase separation. Attractive interactions will result in associative phase separation by complex formation. Solutions and gels made of beta-lactoglobulin or whey protein isolate mixed with pectin or alginate have been studied using potentiometric frontal analysis continuous capillary electrophoresis, isothermal titration calorimetry, rheological small and large deformation techniques and confocal microscopy. The type of interactions involved in gel structure has been investigated using different temperatures, ionic strengths and dissociating solutions. Depending on the type of interactions and the nature of mixed gels (coupled or phase-separated gels), heating and cooling conditions were critical for gel structure and rheological properties. The relation between behaviors in diluted solutions and gels will be presented.

Key Words: whey proteins, gel properties, polysaccharides

312 Different molecular ways to form filamentous and random aggregate gels. Muriel Subirade*[1], Gabriel Remondetto[1], and Thierry Lefevre[1], [1]*Centre STELA/INAF/Universite Laval.*

Whey proteins are extensively used in food processing because of their high nutritional value and their contribution to food texture (i.e., particularly gel properties). As for many globular proteins, gels of varying physical properties can be formed by modifying environmental conditions, such as temperature, pH, ionic strength, etc. The differences in the physical characteristics are related to the type of gel formed. These structures are divided into two distinct types -i.e., linear and random aggregation. To optimize the use of whey proteins as functional ingredients in food, more insight into the gelling mechanisms is needed. The aim of this presentation is to provide information on the molecular mechanisms and forces involved in the formation of these different gels, in relation to the conditions used.

Key Words: filamentous and random aggregated gels, molecular mechanisms, FTIR spectroscopy