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**Advanced Microbiology 2018: Plant-made antimicrobial proteins for control of foodborne pathogens- Anatoli Giritch- Nomad Bioscience GmbH**

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Foodborne pathogenic bacteria such as enterohemorrhagic Escherichia coli (EHEC), Salmonella, Listeria, Clostridium and Campylobacter cause annually over 1.1 billion illnesses and result in approximately 400,000 deaths. Currently, there are very few interventions for the inactivation of bacteria on food. Use of traditional antibiotics for the treatment of food is inappropriate, particularly because of increased antibiotic resistance found in almost all foodborne pathogenic bacteria. We propose using antimicrobial proteins like bacteriocins and phage endolysins as food additives or food processing aids. It looks promising because of the magnitude of current food safety issues and because these product candidates can be approved relatively quickly using. GRAS (Generally Recognized as Safe) regulatory approval procedure in USA. Bacteriocins are natural non-antibiotic antimicrobial proteins produced by certain bacterial strains that kill or inhibit the growth of other strains of the same or related species. Similarly, phage endolysins are natural non-antibiotic antimicrobial proteins used by bacteriophages to lyse host bacteria. We demonstrated that most bacteriocins and endolysins active against E. coli, Salmonella, Listeria and Clostridium can be manufactured efficiently in green plants. For manufacturing of recombinant proteins we used our proprietary production systems magnICON® and NomadicTM. Most antimicrobial proteins are well expressed in planta and are expected to command low commercially viable manufacturing costs. Nomad colicin cocktails show high activity against all major EHEC serotypes defined by USDA/FDA. Plant-made salmocins, bacteriocins from Salmonella enterica, efficiently eliminate numerous Salmonella pathovars. Proposed cocktails of antibacterial proteins efficiently reduce the titers of pathogenic bacteria in contaminated meats, fruits and vegetables. The FDA twice granted our plant-produced colicins GRAS status as antimicrobials for application to fruits and vegetables (GRN 593) and meat products (GRN 676), thus paving the way to commercialization of colicins as food additives or food processing aides for control of foodborne E. coli infections.

Antimicrobial peptides (AMP), legally called host defense peptides (HDP), are part of the innate immune response of all classes of life. Fundamental differences exist between prokaryotic and eukaryotic cells which may represent antimicrobial peptides. These peptides are potent, broad spectrum antibiotics which are novel potential therapeutic agents. Antimicrobial peptides have been shown to kill Gram-negative and

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Gram-positive bacteria, enveloped viruses, fungi, and even transformed or cancerous cells. Unlike most conventional antibiotics, it appears that antimicrobial peptides frequently destabilize biological membranes,

Plant antimicrobial peptides have been isolated from roots, seeds, flowers, stems and leaves of a wide variety of species and have been shown to be active against plant pathogens, as well as bacteria, fungi, protozoa, parasites and cells. neoplastic. The repertoire of AMPs synthesized by plants is extremely large with different AMPs in certain plant species. The significant groups of AMP incorporate defensins, thionins, lipid move proteins, cyclotides, snakins and hevein-like proteins, depending on amino acid sequence homology. Most known AMPs act by forming membrane pores, causing leakage of ions and metabolites, depolarization, disruption of respiratory processes and cell death. The amphipathic structure and positive charge at physiological pH may be important membrane lipids interacting with amps. Cationic residues are electrostatically attracting negatively charged molecules (eg, anionic phospholipids, lipopolysaccharides, or teichoic acids) to the peptide to accumulate on the membrane surface. When the concentration reaches a threshold value, collapse begins. Three main models have been proposed: the barrel-scope model, the wormhole (or toroidal pore) model and the carpet model. In the barrel-bearing mechanism,

Foodborne illness (referred to as food poisoning) is often caused by foodborne contaminated bacteria and / or their toxins, parasites, viruses, chemicals or other agents. While the US food supply is among the safest in the world, the federal government estimates that there are approximately 48 years of cases of foodborne illness each year. This estimate equates to 1 in 6 Americans who become ill with contaminated food, resulting in approximately 128,000 hospitalizations and 3,000 deaths. Foodborne illness survives when people eat or drink food or drink contaminated with pathogens, chemicals or toxins. Several factors can contribute to the symptoms and severity of food poisoning, including a weakened immune system and age. When the FDA learns of an outbreak, the agency '

Bacteria are the most common cause of foodborne illness and exist in a variety of forms, types and properties. Some pathogenic bacteria are capable of spore formation and are therefore highly resistant to heat (eg Clostridium botulinum, C. perfringens, Bacillus subtilus, Bacillus cereus). Some are capable of producing heat resistant toxins (eg Staphylococcus aureus, Clostridium botulinum). Most pathogens are mesophilic with an optimum growth temperature of between 20 ° C and 45 ° C. However, some foodborne pathogens (ie psychrotrophs),

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