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## PLANT-MADE ANTIMICROBIAL PROTEINS FOR CONTROL OF FOOD-BORNE PATHOGENS

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**F**oodborne 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 Nomadic™. 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 aids for control of foodborne *E. coli* infections.

### Biography

Anatoli Giritch serves as Research Director in a private company Nomad Bioscience GmbH, Halle (Saale), Germany. He has over 20 years of research and development experience in Plant Biology and Biotechnology. During last 18 years he is mainly active in the field of production of recombinant proteins in green plants, what was reflected in peer-reviewed publications (*PNAS*, *Plant Biotechnology Journal*, *Journal of Virology* etc.) and numerous patent applications. He has participated in the development of magnICON® and Nomadic™ systems for plant-based production of recombinant proteins using viral vectors. Nomad Bioscience GmbH is a plant biotechnology company developing transient expression systems with application to a broad range of agricultural, anti-microbial and pharmaceutical products. Nomad is led by Professor Doctor Yuri Gleba. Nomad Bioscience GmbH has two subsidiary companies: Nambawan Biotech GmbH (Halle, Germany) and UAB Nomads (Vilnius, Lithuania).

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