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BIOGRAPHICAL DATA

Dr. Sandford is recognized worldwide as an authority on polysaccharides of commercial interest and is Editor of the international peer reviewed journal, CARBOHYDRATE POLYMERS. In January '99, he formed a consulting group, Paul A. Sandford & Affiliates, to make use of his 30 years of experience in the successful development of several key commercial polysaccharides. Several major industries (e.g. pharmaceuticals, nutraceuticals, cosmetics, food, oilfield, paint, and industrial) use polysaccharides to thicken and to gel solutions, form fibers and films, etc. Now the biological properties (anti-arthritic, immuno-stimulating, functional foods, biocontrol, wound healing, cholesterol/weight control, anti-microbial) of polysaccharides and related carbohydrates can be of equal importance. Dr. Sandford was instrumental in developing commercially useful products based on Chondroitin Sulfate/Glucosamine, Chitin, Chitosan, Xanthan, Gellan, Wellan, Biozan, and Alginate.

In the late 1980's, Protan, Inc., was the sole US manufacturer of the chitosan (poly-glucosamine), a polysaccharide made from chitin (world's 2nd most plentiful natural polymer) that was extracted from byproduct shrimp & crab shells. At Protan Dr. Sandford designed novel filtration and spray drying techniques to manufacture new purified grades of chitosan. The availability of superior quality chitosan resulted in new sales to cosmetic (shampoos & lotions) and biomedical customers (e.g., 3M's TegaSorb wound dressing). Currently chitosan is a >\$50 million product and is sold as a dietary supplement for weight loss and cholesterol reduction. Glucosamine, the building block of chitosan, is now a \$350+/year product in the US and is sold as a dietary supplement for the treatment of arthritis.

Dr. Sandford's expertise in alginate, a gelling biopolymer useful in microencapsulation led to the first report of successful reversal of spontaneous diabetes. Dr. Sandford, as Vice President, Technology Development of VivoRx, Inc., directed the scientific team that developed new patented methods for isolation, purification, culturing and encapsulation of Islets of Langerhans (insulin producing cells) in alginate microcapsules that were immunoprotective allowing human transplantation studies to begin in 1993.

One of Dr. Sandford's early accomplishments was the development of the biopolymer, Xanthan, first at USDA's Northern Regional Research Laboratory and then at Merck's Kelco Division. Dr. Sandford's Xanthan research and development work led to the first commercial production of Xanthan by the Kelco Division of Merck (now part of CP Kelco). Xanthan sales are now >\$250 million. Also at Kelco, Dr. Sandford developed new microbial polysaccharides (Gellan, Wellan, & Biozan. Dr. Sandford became Kelco's 1st Research Fellow and its 1st New Ventures Manager. At Kelco, Dr. Sandford also worked on various alginates, which are extracted from seaweed along the California coast. Kelco (see ISP Alginates) is the major producer of alginates.

Dr. Sandford is active in many professional societies such as the American Chemical Society, Society for Biomaterials, Institute of Food Technologists, the Controlled Released Society, and American Society of American Association of Pharmaceutical Scientists (AAPS). Dr. Sandford is a Co-Founder of the American ChitoScience Society. He is Past Chairman of the Carbohydrate Division and the San Diego Section of the American Chemical Society as well as Past Chairman of the Gordon Research Conference on the Chemistry of Carbohydrates. He is the author of over 117 publications and presentations at professional society meetings and has several patents (27 issued U.S. Patents) on the use of polysaccharides in a variety of biomedical applications. He has organized two international Chitin/Chitosan meetings (Trondheim, Norway & Princeton, NJ) and is the Editor of four books (2 on chitin & chitosan; 2 on microbial polysaccharides). He on ASTM's Committee F04 on Medical & Surgical Materials and Devices and Division IV on Tissue Engineered Medical Products. Dr. Sandford has developed new drug delivery systems using biopolymers such as chitosan and alginate.

Dr. Sandford received an A.B. in Chemistry & Math from Albion College, Albion, MI. and a Ph.D. in Biochemistry from the University of Illinois at Champaign-Urbana, IL. Dr. Sandford received the Distinguished Alumni Award from Albion College, Oct.13, 2002.

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