

*1<sup>st</sup> International Immunonutrition Workshop, Valencia, 3–5 October 2007, Valencia, Spain*

## Nutrition and inflammatory processes

P. C. Calder<sup>1</sup>, R. Albers<sup>2</sup>, J.-M. Antoine<sup>3</sup>, S. Blum<sup>4</sup>, R. Bourdet-Sicard<sup>3</sup>, G. A. Ferns<sup>5</sup>, G. Folkerts<sup>6</sup>,  
 P. S. Friedmann<sup>1</sup>, G. S. Frost<sup>5</sup>, F. Guarner<sup>7</sup>, M. Løvik<sup>8</sup>, S. Macfarlane<sup>9</sup>, P. D. Meyer<sup>10</sup>,  
 L. M'Rabet<sup>11</sup>, M. Serafini<sup>12</sup>, W. van Eden<sup>13</sup>, J. van Loo<sup>14</sup>, W. van Dias<sup>15</sup>, S. Vidry<sup>16</sup>,  
 B. M. Winklhofer-Roob<sup>17</sup> and J. Zhao<sup>18</sup>

<sup>1</sup>School of Medicine, University of Southampton, Southampton SO16 7PX, UK, <sup>2</sup>Unilever Health Institute, 3130 AC, Vlaardingen, The Netherlands, <sup>3</sup>Danone Vitapole, Palaiseau 91767, France, <sup>4</sup>Nestlé Research Centre, Lausanne 26, Switzerland, <sup>5</sup>School of Biomedical & Molecular Sciences, University of Surrey, Guildford GU2 7XH, UK, <sup>6</sup>Department of Pharmacology & Pathophysiology, University of Utrecht, 3508 TB, Utrecht, The Netherlands, <sup>7</sup>Digestive System Research Unit, Hospital General Vall d'Hebron, 08035 Barcelona, Spain, <sup>8</sup>Division of Environmental Medicine, Norwegian Institute of Public Health, Nydalen, 0403 Oslo, Norway, <sup>9</sup>Division of Pathology and Neuroscience, Dundee University, Dundee DD1 9SY, UK, <sup>10</sup>Sensus, 4804 RA, Roosendall, The Netherlands, <sup>11</sup>Numico-Research, 6700 CA, Wageningen, The Netherlands, <sup>12</sup>Unit of Human Nutrition, National Institute for Nutrition, 00178 Roma, Italy, <sup>13</sup>Faculty of Veterinary Medicine, University of Utrecht, 5384 CL, Utrecht, The Netherlands, <sup>14</sup>Raffinerie Tirlemontoise - Orafiti, 3300 Tienen, Belgium, <sup>15</sup>Seven Seas Ltd, Marfleet, Hull HU9 5NJ, UK, <sup>16</sup>ILSI Europe, 1200 Brussels, Belgium, <sup>17</sup>Institute of Molecular Biosciences, University of Graz, 8010 Graz, Austria and <sup>18</sup>Yakult Europe, 1332 EN, Almere, The Netherlands

The ILSI Europe Task Force on 'Nutrition and Immunity in Man' aims to better understand the effects of diet or nutrients on various aspects of immune function in essentially healthy individuals. In 2005 the Task Force commissioned an activity focusing on 'the impact of nutrition on inflammation'. The aim of this activity was to review current knowledge focusing on common mechanisms and markers of inflammation, the role of inflammation in various diseases and conditions, and the potential for modulation of inflammation by nutrition. The aim was addressed by establishing an Expert Group, drafting a document and holding a Workshop to discuss the draft document and to finalise the conclusions. The finalised document will be published.

The Workshop was held in 2006 and gathered together clinicians, immunologists, pharmacologists and nutritionists in order to consider: (a) the role of inflammation in a range of distinct pathological conditions (inflammatory bowel diseases, coeliac disease, asthma, chronic obstructive pulmonary disorder, atopic dermatitis, psoriasis, rheumatoid arthritis, atherosclerosis, obesity) including the identification of common and unique molecular and cellular responses and signalling pathway; (b) the mechanism of action of common anti-inflammatory drugs; (c) the potential pro- and anti-inflammatory roles of specific dietary components (PUFA, vitamins C and E, carotenoids, flavonoids, prebiotics, probiotics).

A number of conclusions were reached. Inflammation is a normal part of the host immune response to infection and to other insults; it initiates pathogen killing as well as tissue repair processes and helps to restore homeostasis at infected or damaged sites. Normally, the host is tolerant to microbes and other environmental components that do not pose a threat. This tolerance involves only a limited host response or an active response that is tightly controlled. Where an inflammatory response does occur it is normally well regulated in order that it does not cause excessive damage to the host, is self-limiting and resolves rapidly. Pathological inflammation involves a loss of tolerance and/or of regulatory processes, although the reasons for this loss are not clear. Whatever the site of inflammation or the nature of the trigger, common mediators of inflammation include certain cytokines (TNF $\alpha$ , IL-1 $\beta$ , IL-6, interferon- $\gamma$ ), chemokines (IL-8, monocyte chemoattractant peptide-1), eicosanoids (PGE<sub>2</sub>, 4-series leukotrienes), matrix metalloproteases and reactive oxygen species, and signalling pathways often involve the activation of NF- $\kappa$ B. Several nutritional strategies, including *n*-3 PUFA, antioxidants vitamins, plant flavonoids, prebiotics and probiotics may be able to ameliorate chronic inflammatory processes. However, nutritional studies rely heavily on cell culture and animal models, and more studies in human subjects are needed. Although nutritional studies have focused on therapy of inflammatory conditions, appropriate nutrition may lower the risk of such conditions occurring, but strong evidence of this effect is currently lacking.