**Table 1[[1]](#footnote-1):** Overview of select key areas needing to be researched.

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| **Topic** | **Key Research Areas** | **Proposed Actions and Next Steps** |
| **Aging and Chronic Inflammation** | -Clarify the influence of relevant biomarkers, like CXCL9, on chronic disease and aging -Understand how current anti-aging interventions, like metformin, exert their influence on immune cells in the context of aging.  | -Involve better understanding of the impact of anti-aging therapies in large human cohorts, and to better understand mechanisms of immune system aging using naturally aged in vivo models assessed through multiple modern techniques, including multi-omic approaches such as single cell sequencing, metabolomics, and spatial genomic methods.-Quantify the impact of obesity and obese asthma on immune dysregulation via high dimensional immune profiling, transcriptional and epigenetic evaluations.-Focus on identifying key mechanisms of immune dysregulation to assess potentially targetable mechanisms.-Evaluate links between metabolic function and immune dysregulation.-Within food allergen immunotherapy, factors for durable oral tolerance in infancy and young childhood can include that the lowest age introduction is protective along with the minimum frequency and amount of ingestion. Methodological improvements to consider would be dose, route and format of food. While patient centered outcomes would include quality of life and psychosocial aspects, changes in severity, ability to eat the food freely vs accidental exposure protection. -Team science approach bringing together perspectives of basic scientists, clinicians, and public health experts to move research into concrete interventions and recommendations.-Systematic analyses of clinical materials from high-quality randomized control trials.-Biobanking of clinical samples from individuals with immune-related disorders. Such as collection of plasma/serum samples from all studies so these can be analyzed in future studies-Open science initiatives (e.g., global data sharing)-Clinical trial interventions considering dietary patterns or combinations of nutrients, such as dietary fiber and fat, with regards to immune responses along with development and progression of chronic diseases (like IBD, obesity, cancer).-Analysis of the gut microbiota in dietary pattern or multi-nutrient study designs via use of microbe compositional techniques, metagenomics, metatranscriptomics and metabolomics to clarify chronic disease susceptibility and treatment outcomes.-There is a need to increased availability of standards to help identify and quantify novel oxylipins. As well as dietary interventions examining effects during the inflammatory response and resolution. |
| **Immunometabolic status in obesity and obese asthma** | -Quantify the impact of obesity and obese asthma on immune dysregulation and identify potentially targetable mechanisms  |
| **How to induce immunotolerance: Lessons from food allergen immunotherapy** | -Understand the factors in infancy and young childhood which drive durable oral tolerance to food-Methodological improvements to food allergen immunotherapy to balance risk and benefit-Increased attention to the patient centered outcomes of reduction of severity of allergic reactions |
| **The implications of nutritional state for COVID-19** | -Characterize the relationship of frailty and obesity with micronutrient status and the combined effects on infection risk and vaccine response |
| **Vitamin D and Immune Health** | -Improve knowledge of the in vivo responses of immune cells to vitamin D -Clarify the impact of immune-related disorders on vitamin D metabolism -Establish personalized vitamin D interventions for immune health |
| **Dietary-related Inflammation and Cancer Risk** | -Reduce the translational gap between research and practice, by designing and implementing dietary pattern clinical trial interventions to reduce the inflammatory potential of the diet, for chronic disease prevention and improved survival.-In addition to inflammation and immune modulation, identify other potential biological mechanisms underlying the role of the dietary pattern in human health. |
| **Dietary patterns and Inflammatory Bowel Disease** | -Identify the synergistic effect of healthy fats and fibers on gut and metabolic health-Explore the role of the Mediterranean dietary pattern on the gut-brain axis-Understand the causal role of the gut microbiome on gut immunity and metabolic responses |
| **Diet, oxylipins, and inflammation** | -Clarify the relationships between dietary intake of polyunsaturated fatty acids and oxylipin profiles in immune responses-Identify novel oxylipins and temporal effects during the inflammatory response and resolution |

1. Section written by the following authors (in order of appearance): Dan Winer & Saad Khan; Sarah Henrickson; Julia Upton; Philip Calder; Geneviève Mailhot; Fred Tabung; Deanna Gibson; Harold Aukema [↑](#footnote-ref-1)