Personalized Dosing for Cancer Prevention: Omega-3 Fatty Acids as an Example

Many bioactive food components have been identified to possess cancer preventive properties. Identifying the "preventive dose" that is optimized for each individual is, however, key in achieving cancer prevention. This will depend on many factors, including genetics, usual diet, other lifestyle factors and the intestinal microbiome. In the case of colon cancer prevention, anti-inflammatory compounds are of particular relevance, but the toxicity of anti-inflammatory pharmaceutical agents is a problem. We therefore developed a personalized dosing algorithm for omega-3 fatty acids using the pharmacodynamic relationship between blood fatty acids and production of prostaglandin E_2, a key pro-inflammatory mediator, in the colonic mucosa. This was tested in a phase Ib clinical trial that continuously updated the dosing algorithm as the trial progressed using a Bayesian design. The results of this trial show performance of the dosing algorithm for reducing colonic prostaglandin E_2 and how factors such as obesity and the microbiome can affect the outcomes. This trial demonstrated how experimental *in vivo* and*in vitro* data can be translated to the design of a personalized cancer prevention strategy in humans. The project was done using a team science approach within a Gastrointestinal Cancer Specialized Program for Research Excellence (GI-SPORE) funded by the NIH at the University of Michigan.