Call for a Government evaluation of the link between nutrition and the gut microbiome with respect to the COVID-19 pandemic

We call on the Secretary of State for Health and Social Care to evaluate and assess other approaches (and existing/emerging research) to dealing with COVID-19, specifically those related to nutrition, diet and the gut microbiome, all of which impact on inflammation and the immune system.

The race for a vaccine and pharmaceutical treatments for the current COVID-19 pandemic goes on. However, both are likely to be a long way from routine use. Here we make suggestions for what can be done now in order to help build defence against the world's biggest health crisis.

The approaches we suggest are safe, straightforward to implement, give the individual some control and have an existing but expanding scientific basis. Our evidence is summarised below and based upon 2 peer reviewed publications from us that are about to be published: Baud et al. (in press); Calder PC (in press).

Improved Gastrointestinal Health

There is emerging, but convincing, evidence that gut health may be compromised by COVID-19 and vice-versa (Gao et al. 2020; Ziriu Tay et al. 2020). The microbiome consists of the collection of microbes and their genetic material that is harboured by humans. The gut is easily the most colonised organ in the body, principally the large intestine. The gut microbiome is critical to health and wellbeing, impacting upon a variety of important disorders. Some constituents are pathogenic, others are neutral while some are health promoting. Probiotics (live microbes in the diet) and prebiotics (substrates selective for beneficial bacteria) are long standing approaches to improve gut mediated health, with many thousands of peer reviewed articles supporting their use.

Human trials have shown that specific probiotics, prebiotics and synbiotics (mixtures of the two) can reduce the incidence and duration of common upper respiratory tract infections. (Hao et al. 2015; King et al. 2014; Van Puyenbroeck et al. 2012; Wang et al. 2018; Shahramian et al. 2018; Arslanoglu et al. 2008; Chan et al. 2020).

It has also been suggested that gut microbiome status can influence health outcome in patients with COVID-19. Other studies have detected the virus in faeces of patients, further suggesting a gastrointestinal link. There is also growing evidence that people with metabolic risk factors linked to inflammation such as obesity, type 2 diabetes, high blood pressure and cardiovascular disease may have worse outcomes if they contract COVID-19 (Cheung et al. 2020; Tian et al. 2020; Han et al. 2020; Gou et al. 2020).

Some probiotics and prebiotics can regulate immunity, including anti-inflammatory properties. Other mechanisms of effect include enhancement of the intestinal epithelial barrier, competition with pathogens and adhesion to the intestinal epithelium. Baud et al. (in press) present a case for probiotics and prebiotics to be part of the management of COVID-19. At the present time, it is the case that no probiotics nor prebiotics have been shown to better manage the symptoms associated with COVID-19 – however research is ongoing. Having said that, given the safety profile of proven pro/prebiotics, their known ability to improve gut health and the influences upon respiratory effects cited above, we urge that due consideration now be given to their use. The chosen products should be confirmed pro/prebiotics with independent scientific underpinning and not just labelled as such (and not overpriced).

Nutritional Immunology

The immune system protects the host from pathogenic organisms including both bacteria and viruses. The immune system is always active, carrying out surveillance, but its activity is enhanced when an individual becomes infected. Obesity can impair the immune system (Milner JJ, Beck MA, 2012; Andersen et al. 2016) and the 2009 H1N1 influenza pandemic has identified that obese people were at greater risk than healthy weight (Honce R, Schultz-Cherry S, 2019). There are now reports that obese individuals are more likely to have severe COVID-19 and require ventilation (Simonnet et al. 2020).

A number of vitamins (A, B6, B12, folate, C, D, E and K) and trace elements (zinc, copper, selenium, iron) have been demonstrated to have key roles in supporting the human immune system and reducing risk of infections, including respiratory (Calder PC, 2013; Gombart et al. 2020; Alpert P, 2017; Wu et al. 2019). Low intakes and low levels of these essential nutrients result in immune impairment; this can be reversed by repletion. Each of the nutrients named here has multiple roles in supporting anti-bacterial and anti-viral defence, but zinc and selenium seem to be particularly important for the latter. Zinc has specific anti-viral roles: for example, it inhibits the RNA dependent RNA polymerase enzyme that single stranded RNA viruses such as coronavirus require for replication (Reid et al. 2019). Selenium deficiency has been demonstrated to allow viruses, including single stranded RNA viruses, to mutate and become more virulent (Beck et al. 2004) and there is a very recent report associating case fatality from COVID-19 to a marker of selenium status among Chinese (Zhang et al. 2020).

It would seem prudent for individuals to consume sufficient amounts of essential nutrients to support their immune system in order to help them deal with pathogens should they become infected. As mentioned above, the gut microbiota plays a role in educating and regulating the immune system. Gut dysbiosis is a feature of disease including many infectious diseases and has been described in COVID-19. Dietary approaches to achieve a healthy microbiota can also benefit the immune system.

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Here we will include a list of supporters from the scientific and research community, in alphabetical order of surname, giving name (and title), position and institution name.