

A multifactorial approach to improving immunity

To stay alive and well, especially in these current testing times, a well-functioning immune system is key. The immune system uses two main response pathways: the cellular immune response and the humoral extracellular (antibody-related) immune response, which are intricately linked. Many different cells (B and T lymphocytes, natural killer cells, and macrophages) and cell subtypes, cytokines, hormones, and cell surface antigens are involved in the process, which make the immune system one of the most complex systems in our body. In a system as complex and interlinked as this, you can understand how things can go wrong if only one small part of the system is failing.

WHAT ARE THE REQUIREMENTS FOR A HEALTHY FUNCTIONING IMMUNE SYSTEM?

We all know people who hardly ever get ill no matter what they get exposed to and others pick up every cold that goes round. What is the difference between these two groups of people? Is it just genetic or could it also be lifestyle? There are a lot of clinical studies out there showing how lifestyle can improve the function of the immune system but also how certain behaviours can impair it. There is also recent evidence about chronic systemic inflammation harming the overall health and impairing the function of the immune system.

MULTIPLE LIFESTYLE FACTORS AFFECT THE IMMUNE SYSTEM

Scientific studies mostly investigate a single variable factor and assess the outcome once this one factor has been changed. This approach is well established and allows researchers to evaluate the impact of the changes made. In reality, the complex physiology of the human body is impacted by countless influences from the environment and from the lifestyle choices made, voluntarily or involuntarily, every single day. Therefore, when attempting to improve the health and immunity of the general population, a

multifactorial approach should be chosen. To address a small number of factors only and exclude others is unlikely to provide the best outcome. In this article I will focus on lifestyle changes shown to improve immunity. Most of them should be fairly easy to integrate into daily life, which hopefully will allow more people to adopt them.

DIET

Having a healthy diet has been shown to have a huge impact on the immune system and on health in general. Hippocrates famously stated: *'Let food be thy medicine and medicine be thy food.'* In modern times, nutrition for a healthy immune system has been labelled as immunonutrition. According to the NHS website, following a healthy diet is described as *'eating a wide variety of foods in the right proportions, and consuming the right amount of food and drink to achieve and maintain a healthy body weight.'* The basic principles of a healthy diet, especially the right proportion of carbohydrates, proteins, fats, fibres, fruit, and vegetables are explained in an easy way. The Eatwell Guide by the British Nutrition Foundation is also helpful, with colour schemes, drawings and explanations, which can be followed by anyone without any previous knowledge about nutrition. An important part of having a healthy diet also means that the food should be as fresh and unprocessed as possible, allowing nutrients to remain intact. This means that ready meals should be avoided and food cooked from scratch. If possible, organic food should be chosen as the soil on organic farms is less nutrient depleted than on conventional farms and contains less harmful pesticide residues. Organic food could also be grown in allotments and community gardens, giving people control over where their food is coming from.

SUPPLEMENTS

Taking vitamin and mineral supplements shouldn't be necessary for healthy people when following a good diet, except in stages



of life with high demand on the body like childhood, pregnancy, lactation, older age, and stress. There are however two exceptions: vitamin D and omega-3 fatty acids. In both cases getting a sufficient amount through food to prevent deficiency can be challenging.

VITAMIN D

The body can produce its own vitamin D through sunlight but in the winter months where sun exposure is low in the northern hemisphere, many people have low vitamin D levels.

When it comes to food, vitamin D is mainly available through oily fish and egg yolks. Covering vitamin D demand with this small selection of food items can be difficult, so in such cases supplements are a good option. There is overwhelming evidence that preventing vitamin D deficiency improves immunity and reduces the number and severity of respiratory tract infections.

OMEGA-3 FATTY ACIDS

Omega-3 fatty acids are available only through a small number of food items like oily fish (sardines, salmon, and mackerel) and white fish, and to a smaller extent, flaxseeds and walnuts. A conscious effort to consume these food items every week needs to be made, otherwise supplements are advisable.

PROBIOTICS

In the last few years a lot of research has been done about a different kind of supplement: probiotics. Probiotics have been shown to improve the function of the immune system through changing the composition of the gut microbiome. However, it has also been shown that the gut microbiome can be balanced with a varied healthy diet. So one could argue

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that having a healthy diet makes the intake of probiotics unnecessary.

PHYTOCHEMICALS

Phytochemicals are a somewhat neglected part of our diet. Phytochemicals are produced by plants to help them resist infection and prevent them from getting eaten by parasites and animals. The effects of phytochemicals have been used over millennia in medical systems all over the world and have recently been rediscovered by modern science. Phytochemicals can have anti-inflammatory, antiviral, and antibacterial properties and can support the function of the immune system. Some of the best known phytochemicals are carotenoids (in orange fruit and vegetables), anthocyanins (in dark-coloured fruits like blueberries, cranberries, grapes, and elderberries), isothiocyanates in cruciferous (mostly green) vegetables, polyphenols in tea, and sulphides in garlic and onions, to name just a few. The colour of fruit and vegetables can give us an idea about the type of phytochemicals they contain. So to get a good variety of phytochemicals through diet, it is important to choose different coloured fruit and vegetables every day.

Herbs and spices are also packed full of phytochemicals and can be used to flavour food or to make teas. Medicinal and immune strengthening properties of herbs have been described when used regularly or during an infectious illness. Like fruit and vegetables, herbs could be grown in any garden, allotment, or in a plant pot indoors. Even in the cooler climate of the UK, herbs like rosemary, sage, camomile, basil, thyme, and mint can grow in abundance and should be used for cooking and teas to harness their beneficial qualities.

EXERCISE

The health benefits of exercise are widely accepted. Generally, 75 minutes of vigorous aerobic exercise or 150 min of moderate aerobic exercise per week are recommended to stay healthy. In addition to helping to maintain a healthy body weight, improve muscle strength, and prevent the occurrence of metabolic syndrome, exercise relieves stress, improves mood, and has also been shown to improve immunity.

PSYCHONEUROIMMUNOLOGY

Human physiology is very complex. Psychoneuroimmunology, a relatively novel area of research, looks at the interactions between the central nervous system, the endocrine system, and the immune system. It shows that processes affecting our central nervous system (emotions and stress) can affect our immune response. It could be

argued that exercise affects immunity by reducing stress levels. Fat tissue has recently been discovered to be an endocrine organ on its own, able to produce inflammatory cytokines. When chronic low grade inflammation is present, with upregulation of the inflammatory response pathways, the immune system tends to react with excessive inflammation when exposed to pathogens. Excessive inflammatory responses have been found to be a problem in severe courses of COVID-19 infection. Exercise, by preventing the occurrence of metabolic syndrome with its excess of fat tissue, reduces the chance of the immune system producing an excessive inflammatory response.

SLEEP AND SHIFT WORK

Good restful sleep helps us to face the demands of daily life, improves concentration and mood, and has also been shown to help with regulation of calorie intake and weight control. Poor sleep quality and shift work have been shown to reduce immunity and increase susceptibility to infections. The ways in which poor sleep and shift work affect immunity are multifactorial. Sleep affects mental as well as physical health, and both of them are closely linked. Sleep quality can be improved by exercise, especially outdoors, and relaxation techniques/stress management. Trying to go to bed roughly at the same time every day can help. Our bodies are subjected to daily fluctuations of melatonin and cortisol, which makes us sleepy and tired when it gets dark, and wakes us in the morning when it gets light. It is helpful to make use of this and sleep when it is dark and when we feel tired rather than staying awake until early morning.

Shift work at night is a situation where these physiological signals have to be forcefully ignored, leading to deranged sleeping patterns long term and metabolic consequences. There are lots of jobs where shift work is mandatory, but ideally night shifts should be undertaken by younger workers whereas older age groups, where physical resilience tends to decline, are relieved from this duty.

STRESS MANAGEMENT

Earlier in the article I touched on the effect of stress on the immune system. During stress the sympathetic nervous system starts to take over at the expense of the parasympathetic nervous system. Cortisol levels can be higher than normal during the day. Stress can lead to a state of high alert ready for 'fight or flight'. Breaking this pattern can be hard, especially when it has been going on for months or even years. What is experienced as stressful varies highly between individuals. But experiences such as job loss, acute illness and accidents,

loss of loved ones, and experiencing violence and abuse will affect even the most resilient of personalities. Such situations are hard to control but having an easily accessible network of sympathetic support groups and organisations that assist individuals can make up somewhat for the lack of funding of public mental health and social security services. Healthcare professionals should update themselves about charitable organisations in the area they work in to be able to advise patients where to go. Also, any healthcare professional, even when not specifically trained in mental health, can take the time to listen to somebody in a difficult situation. With milder forms of stress, simple and easily accessible measures such as seeking out nature or the nearby park, or engaging in enjoyable activities such as yoga, meditation, hobbies, crafts, and social activities have all been shown to help ease stress.

CONCLUSION

A lot of studies have looked at different ways to improve the immune system. In this article I have attempted to combine the information available to us, and to also raise awareness about the need for a multifactorial approach involving all aspects of health. Being healthy doesn't just mean having a body that functions well. It also means being happy and leading a fulfilling life. The environment we live in, the people we meet, and the opportunities we get all have an important influence on our health and immune system. The measures described in this article help a person to take responsibility for their own health. It is important to see them as a long-term investment. These measures are not a quick fix but rather something that needs to be integrated and maintained throughout a person's life.

Regina Ford,

Regina was born and raised in Switzerland where she trained in medicine, graduating from the University of Bern and completing her specialist training in general internal medicine in 2008. Although enthusiastic about medicine she recognises the many limitations that modern medicine is unable to overcome. She completed a MSc in Ayurveda at Middlesex University in London and now practices as a consultant in acute medicine in the UK, and as a general medical physician in an Ayurvedic clinic in Germany.

Email: reginamaier@myself.com

This article (with reference list) was first posted on *BJGP Life* on 6 Oct 2021; <https://bjgplife.com/immunity>

DOI: <https://doi.org/10.3399/bjgp21X717893>