Beating Coronavirus with Vitamin D3

- a simple solution is hiding in plain sight

David C Anderson MD, MSc, FRCP, FRCPE, FRCPath,
A retired physician and endocrinologist, and former Professor of Medicine and Endocrinology at the University of Manchester, and of Medicine at the Chinese University of Hong Kong. He now lives in Umbria, Italy.
anderson.drdavid@gmail.com

Foreword by Prof Parag Singhal

"At the time when there is a desperate battle to contain the spread of the deadly Coronavirus taking place in the world, the simple aid like replacing Vitamin D3 as described by Pro. David C Anderson is worth noticing. I share his warning to address the global Vitamin D3 deficiency and the potential impact on this pandemic. Therefore, I like to commend his article". Prof Parag Singhal is Consultant endocrinology and diabetes mellitus, General (internal) Medicine.

To understand the need for urgent and clear thinking on the matter of Vitamin D3 and coronavirus, the reader needs to understand a little biology and some related science. I believe that the current facile approach can only lead to more unnecessary deaths, and ultimately to global economic ruin. Skim-reading this article will not be enough to understand why Vitamin D3 has to be brought into the centre of any solution.

The endocrine role of vitamin D3 in its different forms

I start here, because I am a retired Endocrinologist, and endocrinology forms a central part of the history of Vitamin D3, and continues to dominate and distort clear medical thinking. The simpler steroids are such hormones as testosterone, cortisol, estradiol and progesterone; these travel in the blood and act as messengers to unlock specific effects on distant, 'target' tissues. They have a chicken-wire structure with four linked carbon rings. Vitamin D3 is a steroid with a difference, in whose production the Sun plays an essential part. It was first recognised because it is part of a hormone system that controls circulating calcium. In the 18th and 19th centuries in Britain, industrialisation, pollution and city-living, by blocking out sunlight, led to an epidemic of rickets and its adult form, osteomalacia. In the 1950's this was repeated among dark-skinned Asian immigrants in Northern Britain. The cause was lack of exposure to sunlight of 7-dehydrocholesterol in the skin, whose B-ring can only be broken by ultraviolet light. The molecule then unfolds to form cholecalciferol, Vitamin D3, which travels in the blood to the liver, where it is converted to the storage form, 25 -hydroxyvitamin D3 (25(OH)D3). Plants, especially wild mushrooms, exposed to UVB light, make a similar sterol called Vitamin D2 (ercocalciferol).

In complex vertebrates all tissues need calcium, and tight control of its ionised levels in blood; this includes muscles and nerves. This hormonal system works as follows. The parathyroid glands in the neck secrete their hormone, PTH, in response to a fall in blood ionised calcium. PTH circulates to the kidneys, binds to cells and activates an enzyme, 1-alpha-hydroxylase, that converts 25(OH)D3 to the biologically active form, 1,25(OH)2D3. As well as acting locally this travels via the blood to the small intestine to promote absorption of calcium and phosphate from the gut. It enters the cells, binds to the Vitamin D receptor (VDR) which then combines with a Vitamin A receptor called RXR; and the couple together bind to relevant sites on the DNA, to promote calcium transport into the bloodstream. The rise in blood calcium eventually switches off PTH secretion in a classical endocrine feedback loop. And this is how we came to learn about 1,25(OH)2D3, back in the 1960's. But regarding the immune system this is a misleading part of the story.

Other, more basic, non-endocrine functions of activated Vitamin D3

Our bodies often use specific complex molecules, that evolved in much simpler organisms, as general body hormones. In the case of the immune system this includes 1,25(OH)2D3, and the above-mentioned VDR receptor, which are produced and act locally as a crucial part of our defense system against foreign agents, including viruses. So how can this work without being in conflict with the whole-body endocrine control of calcium? Well, it depends on the Law of Mass Action, whereby the rate of any chemical reaction is directly proportional to the product of the concentrations of the two reactants. Immune cells can control the level of one of the reactants, the enzyme 1-alpha-hydroxylase; but the system will only work if there are adequate levels of the other reactant, 25(OH)D3, over which it has no control. So the immune system, can only function if blood levels of the storage form, 25(OH)D3, are high enough. If not, the endocrine system will take all the 25(OH)D3 for systemic hormone use. In the presence of Vitamin D-deficiency the immune system will always fail first.

How might the corona- and other viruses exploit Vitamin D deficiency?

Viruses are incomplete life forms that use our body cells to become whole, and let them reproduce, multiply and export their own genetic material proteins. In the case of

coronaviruses such as COVID-19, SARS, influenza, measles or rhino- (common cold) viruses, this is ribonucleic acid (RNA). Viruses can always evolve much faster than the more complex hosts that they invade. So there has evolved a complex but basic system involving 1,25(OH)2D3, that forms a multi-purpose front line anti-invasion mechanism against all foreign organisms including viruses. A late stage of this response involves antibodies, which completes the process and can provide a quick response if the same virus comes round again.

Having adapted to co-exist in one species in relative harmony, a virus may become extremely dangerous if it crosses to another species. This same generalisation must also apply to the same species if there are individuals within it who are particularly vulnerable by virtue of geography, genetic makeup or behaviour. Thus, as men and women moved northwards out of Africa, a paler skin allowed more UVB to act on 7-dehydrocholesterol to form Vitamin D3; light skin was an advantage over dark regarding seasonal Vitamin D-deficiency. Bigger body stores of 25(OH)D3 could build up over the summer to cover next winter. So as long as he didn't cover his skin with clothes all summer, such a light-skinned man would be at a selective advantage over his dark-skinned brother when the next winter virus came along. Back in Africa his other darker-skinned sun-exposed brother had the advantage of a natural melanin sun-block, which protected against sunburn and skin cancer. In the present epidemic it comes as no surprise that in the USA, Blacks in Chicago and elsewhere (whose forebears were cruelly wrenched from Africa in the slave trade) have a disproportionately higher death rate from coronavirus than their White brothers. And now we hear of a dramatic excess mortality among NHS health care workers of Asian and African origin; they are certain to include the most vitamin D-deficient.

What are the lessons of this for fighting the Coronavirus?
A darker skin colour is of course not the only risk factor for low post-winter levels of circulating 25(OH)D3. There is an enormous variation in clothing cover in summer, including the use of the Burka; in avoidance of the sun for fear of skin cancer; and in the use of sunblocks. Factor 50 sunblock, which anyone can buy, shuts out 98% of the sun's rays! Plants (especially mushrooms) are rich in Vitamnin D2, but this is a poor substitute for D3; and we would need to eat a lot of fish like salmon, who of course have made D3 for themselves, to compensate for lack of UVB radiation. This means that the extent of Vitamin D3 deficiency down to its extreme form, gross depletion, vary enormously and unpredictably in all populations, as does the consumption of Vitamin D3 supplements, which have anyway been set too low, by the amounts needed to prevent and treat rickets.

With coronavirus the severely ill patients are the visible tip of the iceberg, as they present a massive burden to the emergency services. They are therefore receiving all the attention. Those of us with, or destined to get a mild but highly contagious infection are held to blame, so as a response, our politicians and their advisers impose restrictions in moving out of doors to follow the sun around, thus stopping us from restoring our paltry post-winter levels of Vitamin D3 to something more reasonable. They are insisting that we cover our faces with masks, and our hands with gloves, and in some places impose fines if we don't do so. Instead of turning all of us into healthy people with plentiful vitamin D3, for whom Coronavirus merely gives a severe cold, they are making us all vulnerable to death from a disease that selects for Vitamin D deficiency.

What are the implications, and what would be a simple solution?
First, those in positions of power to start to use their brains in the war against this global pandemic. I am very proud of my father, Major William Faithfull Anderson, a Royal Engineer, who on May 20th 1940 used his brain to slow the advance of the German army past Arras. He went to the library and examined the maps. That night he and his 60 men moved by hand all the rolling stock from the marshaling yards to three lines where they would most effectively block the path of advancing Panzer tanks. And the following morning, when the Germans saw what had happened, the Luftwaffe was called in to bomb them, so the rolling stock could no longer be rolled. Dad was captured south of Dunkirk and spent the rest of the war as a prisoner, finally in Colditz castle. I have no idea how many British lives his action saved on the beaches, but he was awarded an MC for this work, and using his brain to impede a brainless but powerful enemy. That is surely what we are now called upon to do in this pandemic.

We all need to wake up to the need to address global Vitamin D3 deficiency, and how this virus, new to humans, is exploiting it. I am of course not denying the need for Intensive Care beds, and ventilators, and even social distancing as a short-term measure. But that is not a reason for making things worse, by failing to consider the epidemic of global vitamin D-deficiency. Vitamin D3, when bought in tiny doses in health pills is actually more expensive than gold. Yet surprisingly in much-derided Italy, 100,000 Units of Vitamin D3 can be bought across the pharmacy counter by anyone. I have been able to purchase vials of 100,000 units in boxes of six and give 100 vials for staff use in the local hospital, for just 70 Euros. To make the whole 60-million population of Italy Vitamin D-replete for a few months, and break this vicious cycle, would cost a mere 40 million Euros. And the same applies to Britain, Spain, the USA, and the whole world.

Conclusion
Urgent attention must be given to boosting the body's natural immune system by addressing widespread seasonal deficiency of Vitamin D. This can be achieved most simply by providing the whole population with vitamin D3 supplements, for purchase in doses up to 100,000 Units monthly without prescription, and made free for those who cannot afford it. I submit that without such a policy, the pandemic will not come under control. Mindless restrictions to individuals who for whatever reasons have started with better D reserves, instead of providing safe supplements for all, runs the grave risk of increasing death, global economic misery, anarchy and civil strife. And as a strategy it won't work. ❑

VITAMIN D3

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4128480/