THE VIRUSES AND MICROBES WITHIN OUR BODIES:

WHY WE NEED THEM AND HOW THEY CONTROL OUR LIVES

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PREFACE

Why did I write this book, why do I think I'm qualified to do so, and what do I hope that you the reader will get out of it?

When I was an undergraduate student many decades ago I was taught that microbes and viruses (sometimes referred to colloquially as "germs"; I'll explain the diiferences between them in chapter 1) were agents of disease that we had to avoid and, if we did catch one occasionally, then we had to try to find ways of getting rid of it. That was the way most scientists thought in those days. Fortunately times and attitudes are changing, even among some professors.

As a result of recent research it has become clear that each one of us individually is a fascinating world of cells, microbes and viruses in continuous communication with each other in a kind of tenuous co-existence. In fact many of these microbes are essential to our existence as living beings. In addition our gut microbes can affect our brains through the enteric nervous system and its numerous neurotransmitters such as serotonin, conceivably influencing our behaviour and producing or alleviating stress.

We have also learned recently that each one of us has a very sophisticated—but not foolproof—system of surveillance and defense, which includes the immune system, that guards against unwanted microbial intruders, and which in response can activate and unleash a barrage of antimicrobial cells and molecules directed against the intruder. But this system has to be able to discriminate between our own beneficial microbes and those that we don't want. We are beginning to understand how this is accomplished.

When we are in a good state of health the components of this defense

system work in apparent harmony. However, significant disturbances in this “harmony” can result in a situation we refer to as “disease”.

In view of all the recent research that has led to this novel concept of the human body and its place in the microbial world (rather than the traditional viewpoint of microbes being part of “our world”), I decided to write a book and put things in perspective, but not in a technical manner. Accordingly this book is intended for the general reader—it is definitely not a textbook—and to this end I have tried to ensure that it does not read like one! I have also included occasional light-hearted elements and anecdotes, some taken from familiar TV series or movies, in an attempt to soften the more mundane and academic parts, and to indicate how the media tend to portray microbes and viruses. If some parts of the text appear too technical or daunting, or perhaps too philosophical, don’t worry, just bypass a section or two and continue on from there. I have also included at the end a “glossary of terms” for handy reminders of what the various technical words mean.

So who am I? I have spent my entire career as a scientist studying how certain viruses and microbes (bacteria, fungi and parasites) occasionally appear to cause disease. During this time I have seen many remarkable developments and false leads, including many that were hyped up by the media, and I have disparagingly witnessed numerous scientists wasting time and money trying to find ways of “controlling” or eliminating microbes by means of “magic bullets” and other commercially profitable endeavors. However, this is a futile and unreasonable task, as I try to explain.

New research, making use of rapid gene sequencing technology, combined with improved laboratory cultivation techniques, has revealed that each one of us carries at least ten times as many bacterial cells in our bodies as the total number of human cells. In other words, we are out-numbered by our own bacteria. Most of these bacteria are in our

guts, in our mouths, and on our skin, in addition to every other external body site you can think of. Nevertheless they are there, and they are part of us (at one point I thought of using the book title: “GERMS ‘R US”, which would be appropriate but rather trite—definitely not something a scientist is supposed to do).

So how did these microbes get there, what do they do, are they necessary, and how can we keep them under control if and when we need to? Are they beneficial to us?

How did scientists find out these facts? I will try to answer all these questions.

What about viruses? Do we carry them around as well?

Current evidence indicates that we do. In fact our viruses even outnumber our bacteria, and recent gene sequencing of our own genome (our own DNA) has revealed the presence of hundreds or thousands of ancestral viral genes, which raises the fascinating specter that we, the alleged pinnacle of evolutionary success, may be nothing more than complex collections of “viral genes”.

However, in spite of all the fascinating scientific research in progress, I have become disenchanted with the increasingly militaristic terminology that is used, in the media and even in academic literature, to describe our resident microbes and those we encounter daily in our food, air and water. Contrary to this trend, we are not in a “state of war” with microbes; we are not on the verge of being “taken over” by an army of hostile bugs; and it is not a question of “them or us”. We don’t need weapons of microbial destruction. We all co-inhabit the same planet, and we should refrain from the idea that we need to eradicate anything that we don’t like or we don’t understand.

Unfortunately we live in an age of global paranoia. The Media, including books and innumerable web sites, have been caught up in the hype that warns us of the continuous threats of epidemics/pandemics that we have to protect ourselves against. Pharmaceutical and biotech corporations inform us that we need to vaccinate ourselves against every microbe that might come our way, including normal inhabitants of our bodies. Of course this would be a very profitable enterprise, but is it really necessary?

Nevertheless, in spite of an elaborate system of defense, we do sometimes suffer symptoms of disease due to “foreign” microbes and viruses, and occasionally from our own microbes. How does this happen, and is there some way of helping or augmenting our defense system?

Or, to look at it another way, how do we actually “catch a cold” or “come down with the ‘flu”, “get a sore throat”, and how does our body react to this successfully, as it usually does?

Your medical and health-care practitioners may not be able to answer these questions; but scientists are beginning to understand the processes involved.

On the other hand, purveyors of herbal medicines encourage us to protect ourselves with their “alternative”, “natural” (and sometimes “organic”) products that can kill viruses and microbes and “boost the immune system”, although we’ll discuss later why this last statement is meaningless. Some products have been advocated as natural alternatives to antibiotics. But how many of these herbal poducts have really been tested to see if they live up to their claims?

Scientific evidence has shown that certain herbal preparations can be effective (I have spent years studying some of these in my laboratory),

and some appear to “restore” an unbalanced defense system, although we don’t fully understand how. But, in the absence of satisfactory standards, how can we distinguish between the useful products and the fraudulent or untested versions, and how are these products supposed to discriminate between our useful microbes and the unwanted ones? I discuss this further in a later chapter.

On a more optimistic note, current research seeks to provide clues to a better understanding of where we belong in the world of microbes and viruses. They were on the planet long before we appeared; we are the real intruders, not them, and we need to learn how to live in harmony with them.

Notes About References And Further Reading

You may notice that I refrain from attributing research findings to specific individuals and groups. The main reason for this is that I do not want to be seen as favoring certain individual scientists to the exclusion of other equally important contributors who would not be mentioned. Every discovery that I refer to is actually the product of many individual contributors.

A few words about references are appropriate. I do not use them in the text. I know it is customary in academic works to quote hundreds of journal references and books, partly in case a reader wants to look up an original technical source, and also to impress the reader with the author’s “knowledge”. However I have deliberately avoided doing this, for several reasons. Firstly I am not interested in impressing readers with my ability to read the academic journals, although I admit that I sometimes have difficulty understanding and remembering the myriads of acronyms used in contemporary biomedical science. Consequently I would not recommend that you try reading too many original papers.

Secondly, most of the original papers are not readily accessible, except through institutional digital libraries. Instead I have made occasional references (in the “further reading” section) to suitable review—type articles or books that are generally easier to read and access. And of course you can try googling Wiki for any of the terms that I describe, bearing in mind that the articles you turn up are not always objective or inclusive; they are usually written by one person, and every scientist has a bias.

In addition I am trying to encourage the use of open-access publications, and in fact many of my own recent papers and reviews can be found via Google or PubMed etc because they include open access publishers.

Even rich Universities are finding it increasingly difficult to keep up with the escalating costs of purchasing print and digital journals. Scientific publishing is a very profitable business, but it should not be so, since many of our research results (certainly most of mine over the last few decades) come from funds provided by government sources, ie. our taxes. So why should the major publishers get away with such exorbitant prices!

That’s the end of my rant.

Please enjoy the book.