

## Applying the Exponential Growth of Information Technology to Biology

Today is an historic time when it comes to your well-being and longevity. You now have the ability to take control of your health and the rate at which your body ages to a far greater degree than ever before. This wasn't always the case. Until quite recently, progress in health and medicine was hit or miss. We would find something without having a good understanding of how it worked. – *oh, here is a substance that lowers blood pressure, we have no idea why it works.* We “discovered” drugs to perform desirable functions, often with many severe side effects, but we lacked the means to *design* medical interventions for a carefully targeted purpose.

But now this situation is changing - and very rapidly. With the completion of the human genome project just a few years ago, and with newly discovered means of modifying how our adult genes function, we have moved from the old paradigm in which the progress in health and medicine has been unpredictable to enter a new era in which healthcare has now become an information technology. A key characteristic of information technology is exponential growth, essentially doubling its powers every year.

The fruits of this new knowledge have started to be available. We already have the means to dramatically reduce the risks of our biggest killers, heart disease and cancer, and to dramatically slow down the aging process itself. Unfortunately, most conventional healthcare practitioners are still caught up in the old paradigm and still don't practice medicine as an information technology. So, in order to make maximal use of the latest medical knowledge that is already available today, you'll need to take control of your own healthcare, become your own doctor in a sense. You can't rely on anyone else – not even your physicians, although they can still be a big help. The physicians at Vitallife will help take full advantage of the information

that is already available to help you eliminate your chance of disease and to drastically slow down the aging process – starting right now.

When our international medical director, Dr. Terry Grossman, started college at Brandeis University in the U.S. in 1964, there was no computer available for student use. The situation was different a few miles down the road at The Massachusetts Institute of Technology in Cambridge. MIT was so advanced that in 1964, it actually had its own computer. That computer (an IBM 7094) cost \$11 million (in today's dollars), took up a substantial portion of a building, and was shared by thousands of students and professors. Today, the computer in your cell phone is a million times smaller, a million times less expensive, and a thousand times *more* powerful. That's a billion-fold increase in price-performance. As powerful and influential as information technology is already, we will experience another billion-fold increase in capability for the same cost in the next 25 years (rather than the approximately 40 years it took for the most recent billion-fold increase) because the rate of exponential growth is itself getting faster.

The other important point to make is that this remarkable exponential growth is not just limited to computer and communication devices. **It is now applicable to our own biology!** Consider, for example, the Human Genome Project itself. It was controversial when it was announced in 1990 because mainstream skeptics pointed out that with our best experts and most advanced equipment we had only managed to complete one ten-thousandth of the genome in 1989. The skeptics were still going strong half-way through the fifteen year project as they pointed out that with half of the time having gone by, only one percent of the genome had been completed!

But this was right on schedule for an exponential progression. If you double one percent seven more times – which is exactly what happened – you get 100 percent, and the project was completed not only on time – but ahead of schedule.

We have exactly doubled the amount of the genetic data collected each year since 1990 and this pace has continued since the completion of the Human Genome Project in 2003. The cost of sequencing a base pair of DNA – the building blocks of our genes – has dropped by half each year from \$10 per base pair in 1990 to a small fraction of a penny today. Deciphering the first human genome cost a billion dollars. In 1999, anyone could have it done for \$350,000. It is now available for little more than \$1,000. Almost every other aspect of our ability to understand biology in information terms is similarly doubling every year.

We also have the means of simulating biology on computers so that we can try out new drugs and interventions on simulators which is dramatically faster than animal and human testing. These new simulators are doubling in power every year. We can also look inside the body and brain with unprecedented clarity and precision. The resolution of scanning technology is also doubling each year, which is providing dramatic new insights into how disease processes (such as heart disease) actually work. All of these are new developments.

Drug development used to be called “drug discovery,” basically just looking for substances that had an apparently positive effect. This is analogous to how primitive man and woman created tools by just finding them on the ground -- *Oh, here's a useful stone, this will make a good hammer.* They lacked the means to actually shape tools for a task, whereas later on we learned to actually design and craft technology for precise missions. Now for the first time we can do that with our medical interventions. We are starting to develop new drugs in a rational manner, rather than relying on luck. We can now design molecules to do very specific

assignments, for example, to turn off an enzyme that promotes a disease process or creates proteins that directly fight a disease.

The point is that health and medicine is now an information technology, and that represents a new frontier. As a result, our health technologies are subject to the “law of accelerating returns,” a doubling of capability each year. This means that the ability to understand, model, simulate, and reprogram the information processes underlying disease and aging processes will be a thousand times more powerful in one decade, and a million times more powerful in two decades

We are also shrinking technology at an exponential pace - about 100-fold per decade. So these technologies will also be 10,000 times smaller just 20 years from now.

The most exciting development is that the first set of insights from this biotechnology revolution is now available to us. Based on the latest findings from the fields of genetics, medical scanning and biological simulation, many of the ideas of how disease processes work have turned out to be dead wrong.

## **Your Personalized Path to Dramatically Improved Health and Longevity**

Aging is not a single process. It consists of a dozen or so processes, each of which leads over time to the loss of our physical, sensory, and mental capabilities. It is possible to dramatically slow down these processes and in many cases how to stop or even reverse them. In this way, you can stay young until we have even more knowledge to become even younger. Some of these aging processes are also disease processes. Consider atherosclerosis, which results in our arteries filling up with both soft and hard plaque. This is a disease process that leads to both heart attacks and strokes, but it is also an aging process because not just the coronary and

cerebral arteries are affected. This process can lead to impotence in men, claudication of the legs, dementia and many other aging-related conditions.

We'll mention one aging process that you can reverse right now. A vital substance with a complicated name – phosphatidylcholine (PC) – is a vital constituent of the cell membranes of all ten trillion cells that make up our bodies. PC is a remarkable substance that gives the cell its flexible structural integrity, allows nutrients into the cell, and facilitates the removal of toxins. In a ten-year old child, about 90 percent of the cell membrane is made up of PC. The body makes PC very slowly so it is gradually depleted from the cell membranes over our lifetimes. PC is typically down to about 10 percent of the cell membrane in the elderly. The cell membrane then gets filled in with hard fats and cholesterol which do not work nearly as well. This is a key reason that the skin of an elderly person is not supple and why their organs do not work as well.

You can reverse this aging process right now by supplementing with PC. For one thing, it is excellent for maintaining youthful skin, but the performance of your organs will improve as well. There are many other ways to slow down, and in some cases to stop and reverse, the processes that underlie aging.

Key to our recommendations is to assess your own personal health profile. What are your key health issues? Do you have a high risk of heart disease? Are you at increased risk of cancer? Does your body process glucose efficiently? Do you have an overly active immune system? The answers to these questions have a profound effect on what your optimal program needs to be. At Vitallife, we can perform tests, many of which are now available for home testing, that will enable you to answer these questions. And we will show you how you can immediately fashion a personalized program based on your personal assessment.

Keep in mind that we will not jump into the future world we describe in one big leap. Rather, it will come in a thousand small steps. Now that health technology is an information technology and subject to the exponential progress that underlies all information technology, these steps will come faster and faster.