The Tao of Antibiotic Resistance
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For over a couple of decades now medical researchers, doctors and public health activists have been warning the world of the looming threat of 'antibiotic resistance' – the phenomenon of pathogenic microbes developing the ability to 'resist' antibiotics used to cure the diseases they cause.

It was only about a year ago that I engaged seriously for the first time with this issue while attending a global meeting of health activists, doctors, pharmacists and microbiologists at Uppsala, Sweden. The lack of prior engagement was of course due to my own ignorance of a very serious and growing global medical problem.

What really intrigued me at that time – as a journalist- was the use of the word 'resistance'- a term I have usually encountered in non-medical contexts- in social and political ones. Resistance to me has always had a positive connotation and essentially evoked the image of an underdog defending territory or fighting for survival.

Even more puzzling was the use of 'resistance' along with the term 'antibiotic', which means – 'against life'. Resisting something that was 'against life' I thought should be the most normal thing to do- and that too for bacteria, which are the oldest known form of life on Earth. As a consequence I could not but begin to sympathise with the bacteria - for resistance to me is a virtue and not a problem even though such resistance may currently have negative implications for human beings.

The more I think about it there is something contradictory and deeply wrong with the very phrase 'antibiotic resistance', which does not even capture the scientific realities of what we are talking about. 'Anti-necrotic co-option' seems to me a better way of understanding the process of microbes adapting to the medicine we use to prevent them from killing us.

But before anybody gets me wrong let me clarify that I am in no way belittling the threat to human life by bacterial or viral epidemics. Human history is replete with too many terrible outbreaks of infectious disease causing millions of deaths for us to forget. After a brief respite in the first few decades after the discovery of antibiotics infectious diseases have once again emerged as the largest killers in our times. And given the way the human race is currently 'protecting itself to extinction' - the future will probably see further increase in such diseases.

All I am really questioning is the way we choose to tell the history of human interaction with microbes. A story that is written largely in terms of all the tragic encounters and rarely in terms of the positive role played by microbes in the sustenance of life on our planet. I am also asking how is it that in the popular memories of epidemics we have conveniently painted all microbes as 'villains' and all human beings as blameless 'victims'?

It is answers to these questions that hold the key to understanding why microbes and humans- once symbiotic in their relations- have turned hostile today to each other's existence.

For the past year through asking some very basic and even ignorant questions I am convinced of the need for a debate on a variety of issues that at first glance may even seem tangential to the urgent task of dealing with antibiotic resistance. Some of these debates are:

a) Antibiotics have been dubbed as the 'miracle drug' of our times and the 'magic bullet' of modern medicine. They are seen as a natural and integral part of the kind of urban civilizations we have in many parts of the world. Today it is hard to imagine a world without antibiotics or some other equivalent medicine that can quickly and effectively tackle the problem of bacterial infections.

   But the urban civilization we have constructed over time is itself a by-product of the human search for security and certainty against the unpredictable forces of nature. An artificial security that has been created by sacrificing our natural abilities to deal with disease or dangers of different kinds. There is some evidence to believe that most of the large-scale epidemics in human history have been driven by the process of urbanization, poor living conditions, changing lifestyles and the consequent lowering of natural human immune systems. Are not antibiotics then a mere quick fix – and now an increasingly 'slow-fix' solution to problems that arise from human modification of the globe's ecology? A desperate, last-ditch attempt to correct in a very short time what has gone wrong over several millennia?
b) Could antibiotic resistance be a metaphor for and even closely related to the imbalances we see in use of other valuable resources around the world today? . When we talk of resistant bacteria we also need to ask which area of human intervention on Earth is not producing its own resistance? Fossil fuels are an obvious example of how the abuse of another important resource is threatening life on Earth by accelerating global warming. In fact if we consider our planet to be a living, breathing creature then global warming can also be interpreted as the Earth developing resistance to us and running a high temperature in the process !
c) Why does the terminology of modern medicine draw so heavily from the dictionaries of war- with the use of terms such as 'magic bullets', 'invasion', 'elimination' or for that matter 'resistance'? How does this mentality of the 'battle field'- with its core values of aggression and fear- affect the very questions of medical research - let alone the solutions that are sought for them? Of course, today modern medicine in turn has become the source of new terms for warfare whereby 'terrorism' is compared to an 'infectious disease' with the 'terrorist' dubbed a 'virus' and the response consisting of carrying out 'surgical strikes' to create 'sterile zones'. It is an approach to which 'resistance' can be the only logical outcome and maybe it is time to change the way we look at both microbes and terrorists.

d) Given the fact that microbes are so clever and successfully resist the best of our efforts to eliminate them – is it possible we can actually learn something from them? And can we imagine a future situation where we can coexist with microbes without constantly trying to kill them or provoke them into killing us? Or at least find a way by which at least the 'good' bacteria can live and even help us moderate the ill effects of the 'bad' ones?

If all these concerns seem tangential to the issue of antibiotic resistance as a purely medical problem let me say that their strength lies precisely in their tangential character- that takes us away from the closed confines of the indoor research lab and out there into the wide open world with all its complex diversity.

For we know from the history of science, when a particular paradigm loses the ability to convince no amount of pottering along the same path can restore its powers of explanation. At some stage you need to pack your bags and leave on a long journey away from dead certainties and established method into the unpredictable but very alive realm of the unknown. It is only then that there can finally occur a shift in paradigms to capture the new truth about old realities.

For every act of true discovery is as much about unlearning what you know as about learning what you don't. The word 'discover' essentially means to take off the cover- not just from what you observe out there but also your own mind.

To give a specific example of this process let me refer to the great Scottish scientist Alexander Fleming who in 1928, after years of trying to find an anti-bacterial drug- accidentally discovered penicillin on coming back to his lab from a long holiday. As the famous story goes he noticed that mold growing on one of the experimental dishes he forgot to clean up and lock away displayed anti-bacterial properties.

I would tend to believe that the holiday and the careless, absent-minded way in which Fleming carried out his experimental work played a critical role in this 'accidental' discovery. A more methodical scientist obsessed with following the rules could not have done this because what all new discoveries essentially involve are a breaking of old rules. Fleming was – thanks to his sloppiness- naturally a good rule breaker. But for many others who are more rigorously trained in the scientific method – breaking rules and discovering the new is a very difficult and painful affair.

It is this process of searching for answers to problems by apparently running away from them that the phrase the 'Tao of Antibiotic Resistance'- an otherwise fancy concept- takes on real meaning. This is the method of the ancient Chinese concept of Tao- which means the 'way' or 'path' and based on the understanding that the only constant in the universe is change.

And how does one find the 'path' in a constantly changing and meandering universe? I would suggest- only through an identification of the extremes can one find the middle of the Tao or 'path', which leads to true discovery. The search for the extreme edges of the

road you want to walk on, and arriving at a balance between the two extremes is the surest way of making sure you reach your destination safely.

In the context of antibiotic resistance I believe that the two extremes we need to look at to find our middle path are: a) A study of microbes as social, economic and political creatures- in other words organisms with as much life as we human beings think we have- with a sense of humor to boot and b) The dramatic changes underway at the macro level due to global warming- which will have grave implications for spread of infectious diseases in the not too distant future.

All this talk of Tao, paradigm shift, finding a balance, searching for extremes may all seem a distraction to anyone in a hurry or impatient to find solutions to the problems of the world- many of which are often described as involving a 'race against time'. It may also sound obscurantist and needlessly mysterious at a time when various pressing issues we face – including antibiotic resistance-require what are called 'straightforward' analysis and 'clear-cut' solutions.

To answer the first question I would refer to the old cliché that says 'haste makes waste'. It is cliché eminently true in the context of medicine or anything to do with living organisms - where organic processes cannot be accelerated without damaging them in one way or the other. So you can have your 'race against time' and reach some imaginary deadline too but then what we want in human health is a 'living line' not a 'deadline'. Why on Earth would anybody, anywhere want to meet a 'deadline'?

On the second point about the search for a paradigm shift being a diversion from the real tasks involved – I can only say that if there were indeed clear, straightforward answers to the issue of antibiotic resistance we would not be discussing the subject at all today.

Before I wind up my talk I would like to address two obvious questions that arises from whatever I have said so far. Do I really believe the microbes can be equated morally, in importance or otherwise to human beings? And what choices would I personally make if someone very close to me required the use of antibiotics?

Well, I would certainly equate the life of microbes to the lives of the human beings for in terms of evolutionary history- without the former the latter could not even be born.

But I would qualify that by saying - while for the tiny microbes each one of us human beings is like an entire galaxy on our own - in the larger universe we inhabit we ourselves are also microbes of some sort. And as microbes we have every right to resist our own extinction and I will use antibiotics personally and recommend their appropriate use to everyone who needs them.

The billion Kroner question really is – can we find alternative approaches to antibiotics that deal with bacterial disease more intelligently? Can the restoration of balance in all aspects of human life be the way forward towards a future of peaceful co-existence with

all other creatures on Earth? Can we come up with a model of human survival that does not depend on the constant wiping out of other species on our increasingly lonely planet?

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