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# Energy Field as a Novel Approach to Challenge Viruses

S. Amirhassan Monadjemi

*Department of Computer Engineering,  
Faculty of Engineering, University of Isfahan,  
Isfahan, 81746, Iran*

## 1. Introduction

The serious harmful effects of viruses and viral infections to the human life, have been one of the greatest challenges of the health industry in recent years. Virus' mutation could create worldwide epidemic and the virus will evolve into a pathogen deadly for humans; such as a bird flu virus that may mutate to become as deadly and infectious as viruses that killed millions during three influenza pandemics of the 20th century. The influenza pandemics was so severe that killed more people than the Great War, known today as the World War 1, at somewhere between 20 and 40 million people. It has been cited as the most devastating epidemic in recorded world history.

HIV/AIDS has become one of the great fears of our time, a disease so virulent and widespread that its victims are counted in the millions. It has killed at least 28 million people since 1982 . The number of HIV/AIDS infected now surpasses 50 million. In the 25 years since the first reported cases of HIV/AIDS in 1981, the disease has become a global pandemic. Unfortunately, the epidemic's history is a story of largely unfulfilled hopes for various treatments. The history of drug treatment regimens for HIV/AIDS is complex. It is complicated by problems with toxicity, compliance, side effects, and cost. Therefore it's possible that AIDS is more than another disease that nature has thrown our way, so this calamitous virus, which could potentially wipe out the entire human species, may be slipped out of a man-made experience. Was this again another program to keep us in a constant state of fear or it was a new conspiracy to control the world population by introducing some secret viruses. It does not really matter which of the above is true or if both are false. What matters is that viruses in general are a yearly problem planet wide and it would be great if we had a solution for this once and for all.

In both detecting and fighting viral diseases ordinary methods have come across some basic and important difficulties. Vaccination is by a sense introduction of the virus to the immune system before the occurrence of the real case infection. It is very successful against some viruses (e.g. Poliomyelitis), while totally ineffective against some others (e.g. HIV or Hepatitis-C). On the other hand, anti-virus drugs are mostly some tools to control and not to cure a viral disease. This could be a good motivation to try alternative treatments. In this study, some key features of possible physical-based alternative treatments for viral diseases

are presented. Electrification of body parts or fluids (especially blood) with micro electric signals with adjusted current or frequency is also studied. The main approach of this study is to find a suitable energy field, with appropriate parameters that are able to kill or deactivate viruses. This would be a lengthy, multi-disciplinary research which needs the contribution of virology, physics, and signal processing experts.

There is no doubt that the Bird Flu factually does exist, and there is no question that in the past the World has been badly hit by Flu pandemics. The Spanish Flu of 1918 was a result of such a bird flu. Initially it only killed birds, but it mutated and became a virus that could then be spread from human to human and ended up killing over 40 million people in just a few months time. It was very quick, and its victims usually lasted a couple of days at the most. This flu was not selective, in that it attacked all age groups equally but mostly young males. There was no protection from it and two people have become infected from person-to-person contact.

Currently, there are three times as many people on the planet, and if a similar pandemic were to hit in the same way, we could expect a minimum of 150 million up to as many as half a billion human deaths throughout the World. To top it off, modern anti-viral drugs and antibiotics have a little effect on this modern bird flu strain whatsoever. All attempts to find an effective vaccination for this have proven to be unsuccessful.

A couple of years ago, it was SARS, and a year before that it was the Anthrax scare. A viral pneumonia like illness that becomes the first pandemic of the twenty century and spreads quickly to more than 30 countries and killed at least 10 per cent of those who caught it. Many scientists believe that SARS is manmade and the virus could only be produced in laboratory conditions, maybe by an accidental leak in a laboratory is blame.

Persian Gulf War Syndrome, since the first Persian Gulf War ended in 1991, still affects hundreds of thousands of American veterans from the "toxic soup" that cut some 30 years off many of their life-spans.

Hundreds of thousands of people sent into the Gulf War zone and others that never entered the war zone who also became sick from only the vaccines. The question becomes what is the common factor that connects all these persons leading to this similar illness pattern. This common factor is not a mystery and is a well known effect. The common mechanism is the loss of enzymes in the human body. It is estimated there are now more than 80,000 veterans continually surfacing from Gulf War Syndrome.

HIV/AIDS has become one of the great fears of our time, a disease so virulent and widespread that its victims are counted in the millions. It has killed at least 28 million people since 1982 (Broder, et al. 1990, WHO, 2003). The number of HIV/AIDS infected now surpasses 50 million. In the 25 years since the first reported cases of HIV/AIDS in 1981, the disease has become a global pandemic. Unfortunately, the epidemic's history is a story of largely unfulfilled hopes for various treatments. The history of drug treatment regimens for HIV/AIDS is complex. It is complicated by problems with toxicity, compliance, side effects and cost. Therefore it's possible that AIDS is more than another disease that nature has thrown our way, so this calamitous virus, which could potentially wipe out the entire human species, may be slipped out of a man-made experience. Was this again another program to keep us in a constant state of fear or it was a new conspiracy to control the world population by introducing some secret viruses It doesn't really matter which of the above is true or if both are false. What matters is that viruses in general are a yearly problem planet wide and it would be great if we had a solution for this once and for all.

In this article, we are going to describe the problem in hand and the proposed energy field-based cures firstly. The historical background of the alternative –physical- treatments would be represented as well. Different energy fields and their possible effects on viruses will be discussed next. The layout of a rational approach to build up a multi-agent model of the body, immune system, and infection would conclude the article.

## 2. A Review of Alternative Cures

A quick, much abbreviated historical overview of the work of these notable pioneers is in order. Nickola Tesla in the 1890's noted curative effects on various conditions when using high frequency electrical oscillation circuits. Georges Lakhovsky during the early to middle part of the last century produced various broad band multiple wave oscillator circuits that similarly to Tesla's circuits produced broad band (wide spectrum of frequencies) ultrasound in human tissue. Also in the first part of the last century A. Abrams, , developed various electrical oscillation circuits that supplied electrodes connected to the human body with complex voltage oscillation patterns that produced broad band ultrasound in human tissue. Despite claims of success of multiple wave oscillators in curing many microbial diseases and cancers, all alternative electro-medicine technologies was suppressed and outlawed by the FDA in the US. After succeeding in suppressing electro-medicine, one of the most notable persons in popularizing electro-medical devices was John Crane. He popularized the use of electrodes applying a voltage square wave to the human body. Crane's voltage square wave generator when tuned to specific frequencies was able to achieve many of the curative results as Rife frequency instrument.

### 2.1. Royal Rife Machines

During the 1920's and 30's, Royal Raymond Rife developed two new technologies. One was the Rife microscope and the other was Rife frequency instrument. He invented a new kind of optical microscope. This microscope could be used to observe viruses in live cells and tissue culture. Rife was able to see viruses with visible light because he had found an optical assembly to overcome diffraction phenomena which stops the best currently available optical microscopes from seeing anywhere near the virus level. Rife's second great accomplishment was to invent a variable frequency flashing light ultrasound source which could kill bacteria, protozoa, fungi, and viruses. While observing these various microbes with his microscope Rife used his frequency instrument to produce specific frequencies of ultrasound which would destroy these micro organs. Rife found that every micro organ he encountered had at least one frequency of ultrasound (i.e. mechanical shaking and resonance) that destroyed it very easily. By 1939 Rife had found the lethal ultrasound frequencies for the microbes associated with 52 major diseases (Morse, 1997, WHO, 2003). One of the main reasons each specific micro organs type is apparently susceptible to destruction by a specific ultrasound frequency is the existence of the periodically spaced, often closed on themselves, and elastically coupled together protein clump structures in them. These structures play a vital part in the functioning and life cycle of the micro organ and if they are destroyed and or significantly damaged the micro organ can not survive or propagate itself. By the very nature of their construction, these periodic protein clump structures are very susceptible to destruction by specific ultrasound frequencies (i.e. mechanical shaking rates). These structures can support and go into resonance with specific

frequencies of mechanical vibration. Figure 1 A, shows the center of each protein molecule laid out in a linear fashion for ease of graphing some of the wave motions (resonate oscillation modes) that it can support (resonate with). Figures 1 B, C & D, illustrate some of the Resonate oscillation modes. Figure 1 B is the most stressful and potentially damaging oscillation mode; the reason being that all adjacent protein molecules are always moving in the opposite direction to each other which puts maximum stress on where these molecules are connected (bonded) together. These bonding regions are usually made up of mostly weak hydrogen bonds with occasional covalent chemical bonds. The bonding between clumps is weak and if the oscillation amplitude builds high enough the bonds will rip apart and the structure will be destroyed (Morse, 1997, WHO, 2003).

There are various kinds of so called Rife machines available. The varying success of these machines is based on Rife's first discovery that every micro organ always had at least one frequency of mechanical vibration that destroyed it easily and quickly. The best type of "Rife Machine" for anti aging purposes is a broad band low intensity ultrasound machine. This type of machine scans through a frequency range from zero to several tens of mega hertz of mechanical vibration (ultrasound). With regular use this type of machine goes after all microbes and almost all virus types to keep the viral and microbe load in the body at a minimum and therefore a minimum of cell death rate occurring and minimum cell replacement rate is needed (Bureau International Programs, 2005, WHO, 2003).

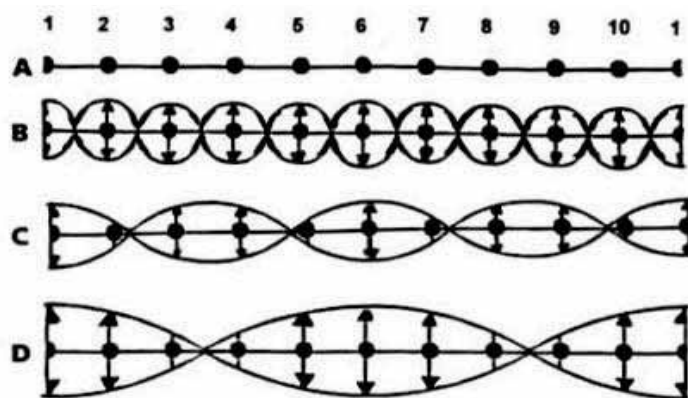


Fig. 1. Resonant oscillation modes

### 3. Effects of Micro Electric Current on HIV

Years after that in the fall of 1990, two medical researchers, Drs. W. Lyman and S. Kaali, working at Albert Einstein College of Medicine in NYC made an important discovery to help deal with disease including AIDS, cancer, Gulf War Syndrome and so on. They found that they could inactivate the HIV virus by applying a low voltage direct current electrical potential with an extremely small current flow to AIDS infected blood in a test tube. Initially, they discovered this in the lab by inserting two platinum electrodes into a glass tube filled with HIV-1 (type 1) infected blood. They applied a direct current to the electrodes and found that a current flow in the range of 50-100 microamperes ( $\mu\text{A}$ ) produced the most effective results. Practically all of the HIV viral particles were adversely affected while normal blood cells remained unharmed. The viral particles were not directly destroyed by the electric current, but rather the outer protein coating of the virus was affected in such a

way as to prevent the virus from producing reverse transcriptase, a necessary enzyme needed by the virus to invade human cells. This is reminiscent of a well proven cure for snakebite by application of electric current that instantly neutralizes the venom's toxicity. And there may be several other diseases as yet undiscovered or untested viruses neutralize able with this discovery; such as Epstein Barr (chronic fatigue syndrome), hepatitis, Lupus, cancer and many others (Wysock, etal. 2001, Beck, 2001).

This very simple and valid blood clearing treatment proved of great promise as a positive method for immobilizing known strains of HIV still present and contaminating some European and US blood bank reserve supplies. It was further suggested that infected human HIV carriers could be cured by removing their blood, treating it electrically, and returning it by methods similar to dialysis, or by surgically implanting electrode arrays with miniature batteries sewn inside blood vessels.

Kaali then worked out a design of a small battery with two tiny electrodes that could be sewn directly into an artery in the arm or leg. By maintaining the current flow between the two electrodes within the 50-100 micro ampere range, the HIV particles were gradually disabled within the bloodstream and the AIDS victim would gradually recover his health (Beck, 2001, Hamadani, 2005).

Kaali outlined two methods for treating an AIDS patient with this new therapy: One method involved removing a small amount of blood, electrifying it and then returning it to the patient's body, in a process similar to dialysis. The second method involved sewing a miniature electrifying power supply along with two tiny electrodes directly into the lumen of an artery (Hamadani, 2005).

### 3.1. Beck's Protocol

Dr Robert (Bob) Beck paid attention to the above-mentioned discovery in Albert Einstein College of medicine. Beck looked up the patent and decided to try and duplicate the therapy but he wanted to do it non-invasively; that is by applying the electric current from outside the body (Broder, etal. 1990, Hamadani, 2005).

W. Lyman and S. Kaali used DC current to deactivate the AIDS virus, Beck found that he could get the same results using the 3.92HZ square wave. He tried to apply the electrodes to the skin directly over those arteries that were close enough to the skin surface.

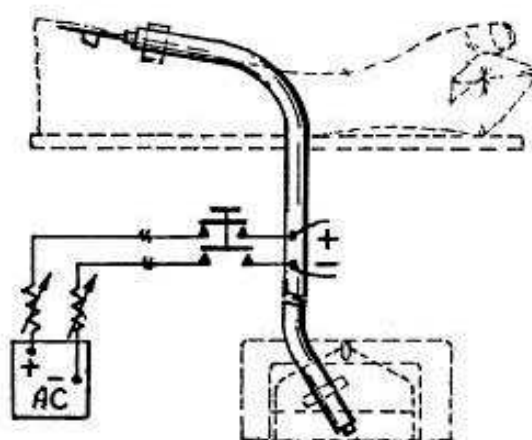


Fig. 2. Blood electrifying

The 50-100 micro amperes current could be created within the artery by electromagnetic induction allowing the entire therapy to be applied externally, without the need for implanting electrodes into the arteries. The device he put together to accomplish this is today called a blood electrifier. Beck designed a circuit that varied the voltage with an alternating current (AC) at a very low frequency and avoided the electrolysis problem. The waveform that Beck chose is not the typical sine wave seen in AC household outlets, but rather is a bi-phasic square wave, meaning that the waveform voltage has a positive half and a negative half, allowing the current to reverse direction each half cycle (Broder, et al. 1990, Hamadani, 2005).

The Bob Beck's Protocol suggests apparatus and simple techniques which have the potential to safely eliminate pathogens, bacteria, virus, parasites, fungus and germs which devastate health and are immune system destroyers. The protocol includes four synergistic and essential elements.

1. Building or acquiring a functioning battery-powered blood electro-purifier that attaches externally to the Radial and Ulnar artery pulse points on one wrist. Suggested use is for a minimum of four to twelve weeks with daily electrification of two hour.
2. A very simple and inexpensive instrument for making a quantity of Ionic Silver Colloids for pennies ensuring help with the immune system.
3. A high-intensity magnetic pulser which destroys any residual germinating or incubating pathogens in lymph and other organs in tissue consequently preventing self re-infection.
4. An ozone generator easily made with tropical fish store components to charge drinking water with O<sub>3</sub>. Ozone comfortably detoxifies by oxidation any wastes which the body must eliminate to regain health.

### 3.2. Magnetic Fields

There are many pulsed magnetic field type devices but we are only interested in those that produce very intense ringing magnetic fields; like machines that have a wire coil of 8 inches internal diameter or larger that produce a transient magnetic field of several tens of thousands of gauss and the magnetic field polarity changes many tens of thousands of time per second, each time power is pulsed into the coil, In other words an intense pulsed ringing magnetic field (Tomas, et al. 2000).

In an experimental work on pulsed ringing magnetic fields of the type just mentioned, we can find several very useful and beneficial effects; Namely, the production of in the body tissue of broad band ultrasound, charge density waves, and oscillating electric currents from a ringing electric field. All of these effects are anti microbial. The broad band (wide frequency range) ultrasound generated can disrupt and kill many microbe types. The charge density waves, which are moving compactions and ramifications of the normal positive and or negative ion densities found in the body's interstitial fluids which are salt water like. These charge density waves can have a very strong electric field at the front of the moving wave. This charge density wave front electric field can interact with the delicate protein structures on viruses that are used to bind the virus with target cell surface proteins. If the electric field is strong enough it can interact with the various charged structures on these binding proteins and rearrange their structure so that they can not bind to their target protein. If the virus can not attach to the target cell surface, then the virus can not infect the cell. The virus is effectively destroyed. This electric field can also interact with bacteria surfaces and denature delicate protein structures on them or reorganize their structure so

that these vital surface protein structures are non operational and the bacteria can not function normally and in some cases probably starves to death.

Another very important discovery made with intense pulsed ringing magnetic fields was their ability to make certain types of cells converts over into embryonic looking and acting cells. For example, it's demonstrated that fibroblast cells and certain epithelial precursor cell types could, with exposure to ringing magnetic fields of various field strength and pulsing rate, be made to convert over into embryonic looking cells. . Furthermore, in field trials on horses and humans we were able to apparently undo the effects of traumatic physical injuries where scar tissue had or was forming. Empirically, it looks as though scar tissue which is formed by and maintained by mainly fibroblast cells, was having the surface layer of fibroblast cells on the scar surface converted to embryonic like cells that then in turn converted over into the adjacent normal cell type the scar tissue is butted up against (Broder, etal. 1990, Tomas, etal. 2000).

The other method for releasing telomerase is an electromagnetic method namely, exposing the body to specific frequencies of microwaves in the multi Giga hertz frequency range at low power levels for a brief time (a minute or less). Experiments that indicated this method of producing telomerase were observed in a set of experiments designed to regenerate animal tissue carried out in 1977.

### 3.3. The Magnetic Pulser

As a Diagnostic Tool - The intense ringing magnetic field that the coil produces can induce voltages across and currents through electrically conductive media or material. The scar tissue resultant from traumatic physical injuries has relatively large concentrations of an electrically conductive protein filament material called collagen. These collagen filaments form an overlapping intertwined mesh holding the scar tissue together. When this collagen rich scar tissue is exposed to the pulsed ringing magnetic field of the coil, electric currents are induced in and throughout the scar tissue. Nerve sensor fibers in this region sense this induced current flow and the person experiences a sharp stabbing sort of sensation at the damaged site each time the coil rings. By slowly moving the coil over the entire body surface most tissue damaged regions or areas can be easily located and then appropriately treated. However, not all damaged sites can always be located this way, due to poor nervation in the damaged area or just nerve damage associated with an injury. A good example of this is with knee cartilage damage, where the patient often does not feel much from the coil, but still gets very good treatment results (Tomas, etal. 2000, Halford, 2006, Guo, 2005).

Many phenomena occur when animal tissue is exposed to rapidly changing magnetic fields. Which phenomenon is most observed depends on the strength, rate of change of, and duration of change of the magnetic field. For example, if a magnetic field changes by several thousand gauss in a microsecond, broadband ultrasound and charge density waves can be expected to be generated in the tissue. Also, electrical eddy currents will be produced in the interstitial body fluids. As discussed below these charge density waves and broad band ultrasound can be expected to disrupt and destroy microbe functions. The electrical eddy currents, when they enter the range of 100 microamperes per square centimeter to 200,000 microamperes per square centimeter, begin to biologically deactivate all manors of viruses and microbes (Tomas, etal. 2000, Halford, 2006, Guo, 2005).



### 3.4. Ionic Silver/Colloidal Silver

Ionic silver is recognized as an accepted treatment for viral conditions; a new form of ionic silver may already be providing us with a remarkably effective treatment for not only a bird flu pandemic that may or may not occur but also an enormous range of infectious diseases that are a very real part of our world today and It's a rapidly growing phenomenon taking place that ionic silver is emerging as the new antimicrobial wonder in dealing with viral conditions as well as bacterial (Wade, 1994, Rife-Tech, 2006).

Ionic silver was actually a commonly-used antimicrobial 100 years ago, before the advent of modern antibiotics, which only address bacteria and are becoming largely obsolete while posing risks related to resistant super-germs. It is increasingly being recognized for its broad-spectrum antimicrobial qualities and the fact that it presents virtually none of the side-effects related to antibiotics. Ionic silver is also entirely non-toxic to the body. Research has shown that some resistant strains of disease cannot develop with ionic silver the way that they will with antibiotics. Some reports indicate that it even kills drug-resistant strains of germs.

Back 100 years ago, major pharmaceutical firms made ionic silver products for systemic human use in the form of what is loosely referred to as "colloidal" silver, a very crude and archaic substance that did the job of delivering silver ions decently for its time. In recent decades, colloidal silver has seen a resurgence in popularity, but primarily in the alternative medicine field.

In this regard, there are two pivotal questions to be considered: (1) whether silver ions kill viral pathogens; and (2) the method of delivery for systemic human use. Even if silver ions are effective against viral pathogens, the delivery mechanism for use in the human body becomes the key issue. This need for a delivery mechanism to maximize availability is all the more demanding when attempting delivery of ionic silver in the human body, due to the aggressive and fluctuating electrochemical environment the human organism presents (Rife-Tech, 2006, Houston Post, 1991, Wade, 2005).

### 3.5. Ozonized Water

Ozonized water is made from oxygen in ambient air.  $O_3$  unlike other forms of oxygen carries negative electrical charges that specifically counteract free radical damages and recharge deplete cells. Ionic silver colloids also greatly assist this rejuvenation process by restoring free electrons. By drinking ozone-charged water, you can gain some of the benefits of ozone use such as providing rapid, safe, totally natural cell oxidation free of radical damage.  $O_3$  rapidly converts (oxidizes) all known toxins and wastes long present in the body cells to  $H_2O$  and  $CO_2$  which flush out easily and rapidly without utilizing colonics, lymph, spleen, liver or kidney detoxing or any other treatment (Broder, etal. 1990, Sato, 1989).

Another potential benefit of the ozone's reaction with water is the destruction of organic toxins; ozone's reaction with organic molecules involves fairly specific types of reactions, and it does not remove all organic materials from the water passing through the contact chamber. However, many toxins have very specific structures, being toxic specifically because they fit exactly into or onto some important bio-molecule in a living organism, thereby interfering with its normal activity. Even a small chemical change will likely reduce the toxicity of even a very potent natural toxin (Broder, etal. 1990, Sato, 1989).

#### 4. New Evidences and Applied Methods

Sadighi-Bonabi and Ghadiri have studied the effects of excimer UV laser on the artemia cysts hatching characteristic. They observed that while the laser irradiation decreases the hatching rate of low quality de capsulated cysts, it on the other hand clearly increases the hatching rate and efficiency of capsulated cysts by a few percent. They had also reported the same effects, of chicken and quail eggs hatching. It is suggested that it could be due to disinfective side effects of the laser radiation on the cysts surface. The laser used on Ar/F ultra violet excimer with 193m wavelength. (Sadighi-Bonabi & Ghadiri, 2008)

Rajaei et al have reported that electro magnetic field (EMF) exposure has got some detrimental effects on the male reproductive system by decreasing the diameter of reproductive ducts, the length of epithelial cells, and weight of testes. Their experiments included a few tens BALB/C mice, which were exposed to a 50hz, 0/5 mT EMF for two months. The same effects can be expected in other mammals. (Rajaei, et al. 2008)

Again, Sadeghzadeh et al. study the effects of electromagnetic field (EMF) on the mice heart tissue. After exposing a 3Mt EMF for two months, four hours per day to mice, the microscopic observations show the inflammation and leucocyte filtering in the cardiac tissue, which along with some other side effects would result in decreasing of the cardiac function. (Sadeghzadeh, et al. 2008)

Mousavi et al investigate the effects of mobiles electromagnetic fields on the oxygen affinity and tertiary structure of the human hemoglobin. Their results indicated that oxygen affinity decreases in the radiated samples, proportionally with the EMF intensity, buffer concentration, and the exposure period. (Mousavi, et al. 2008)

Recently several reports have been made on the alternative electrical and electromagnetic-based cares for diverse types of cancer. Namely, Bio- electric and bio-electromagnetic balance of cells (Alishahi, 2008), and the bio-resonance therapy (Hijazi, 2009)

Alishahi introduces a new theory of cells electro and electromagnetic balance(Alishahi, 2008) and claims that affected under threat cells firstly suffer from a drastic unbalancing of those two factors which may result in an abnormal status(i.e. having a cancerous cell). Again, he claims that to diagnose and kill those cancerous cells, measuring and using the BEB and BEMB phenomenon would be useful. There are some practical treatments of cancers carried out in their research centre in Austria. Meanwhile, more studies are reported on bio-resonance therapy of cancer, as well as bio resonance detoxification against infections. (Hijazi, 2009)

Biological warfare is the third side, of the triangle of weapons of mass destruction (WMDS), where the first two sides are chemical and new clear warfare. In contrary of two others, thanks god, biological warfare never has been practically employed in warfronts or against the civilians: however, it sadly could be a matter f when instead of if, that a wicked leader or a terrorist group use them for real with devastating, long standing effects.

A biological warfare is any organic material used to make ill or kill different animates, in particular human. Biological agents are typically live organisms, and can be different viruses, Fungi, Rickettsiae, and so on.

It is claimed that scientists in the former USSR had developed a rich bank of biological weapons, including Ebola, Marburg, and Lassa fever viruses. It also was claimed that an accident in one of the biological warfare complexes in Novosibirsk in Siberia killed thousands of people in the mid 70s. Those claims were strongly rejected by soviet authorities. However some researchers believe that the deadly Spanish flu virus was

produced or at least modified and deliberately mutated in hostile countries laboratory during the first world war. The virus which by a sense is the cousin of the nowadays bird flu and swine flu viruses. (Aslaheh, 1981)

## 5. Computer Simulation: a Necessary Step

Today, researchers of HIV-1 are still unable to determine the exact biological mechanisms that cause AIDS. Various mechanisms have been hypothesized and their existences have been experimentally verified, but whether they are sufficient to account for the observed disease progression is still in question. In order to understand the phenomena better, HIV-1 researchers turn to the construction of scientific models to verify these hypotheses. One of the earlier approaches of HIV-1 modeling uses ordinary differential equation (or ODE) models. For low levels of granularity, they can be inexpensive to construct and allow the prediction of macroscopic dynamics in time dimension. However, to increase model granularity to cover spatial and topological dimension that may contain crucial information with regards to realistic disease progression partial differential equations (PDEs) are usually required (Guo, 2005, Perrin, 2006).

### 5.1. The Multi-Agent Approach

Multi-Agent simulation models (or simply MA models) as a new approach, conveniently enable the modeling of different entity types through the specification of interaction rules between agents and their environment. With an explicitly constructed computational model, we can further quantitatively study many types of entities and interactions simultaneously, which would be too complex for simple rationalization. Therefore modeling has great value in assisting in the verification of infection hypotheses. MA models treat cells and molecules as 'agents' and allow autonomous interactions in a virtual environment. Such a model explores the level of cell-to-cell and cell-to-molecule interactions, from which the macroscopic behaviors emerge. By doing so, we avoid directly making intuition-driven assumptions on macroscopic properties. Implementation of MA Models can be based on CAFISS. In CAFISS, agents are implemented in a multi-threaded fashion; hence the sequence of interaction events is unpredictable. Such a design is intended to eliminate possible artifacts resulting from the implementation itself. First we begin by specifying the agent interaction rules; some of which are specific to the virus progression hypotheses, while others are common knowledge specific to the immune system (Seidel & Winter, 1944, Bird, 1976).

We first specify a *null model* as a common basis for modeling an adaptive immune response for all four HIV hypotheses.

### 5.2. A Null Infection Model

The MA model design methodology and the preliminary simulation results are based on a "null model plus hypothesis" framework of sufficiency verification. Figure 3 is a simplified schematic representation of the null model, which contains only the key elements of the agent interaction network. It can be seen that the null model simply captures common knowledge about the adaptive immune system, for example, TH cell sending activation signals, B cell producing antibodies, and humoral elimination of HIV virion and so on (Guo,

2005, Wade, 2005, Perrin, 2006).

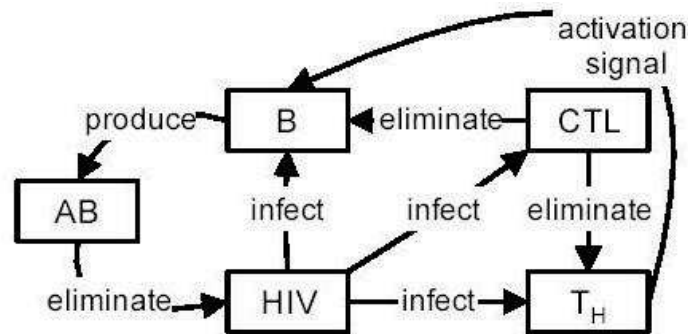


Fig. 3. Schematic diagram of the null model

**5.3. Rapid Viral Mutation**

The immune cells are able to attack the virus only upon recognition. As HIV replication is error prone during reverse transcription which results in mutant strains, the immune system is put at disadvantage since it needs to detect each mutant strain before it is able to activate the specific antibodies. It is postulated that mutation reduces the chance of virus detection and hence allows HIV to persist (Seidel & Winter, 1944, Guo, 2005).

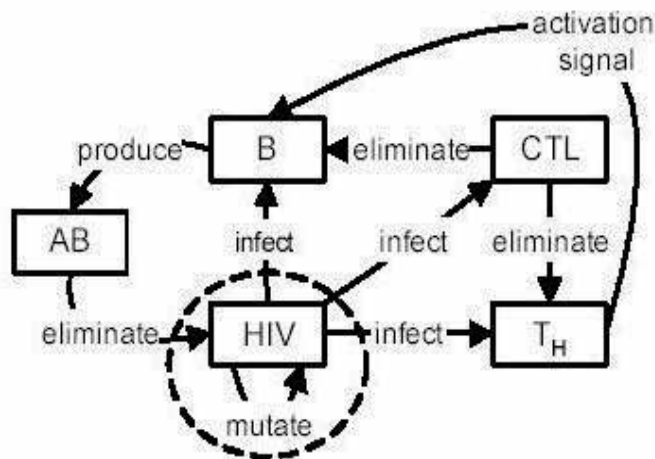


Fig. 4. Rapid viral mutation (Guo, 2005)

The mutation mechanism is added to the null model by altering the shape from time to time, computationally implemented by toggling a series of binary bits. As such, multiple strains of HIV can coexist in the environment.

**5.4. Agents and Their Transactions**

As a biological system, human body has been facilitated with a very plausible and robust guard: the immune system. In a given scenario of conducting with a virus, Table 1 below shows a flow diagram of possible transactions amongst the agents in a

simulated infected body regarding a particular procedure. That particular procedure attempts to model the diminishing of B and T-helper cells and the concurrent increment of the viral load within an infected body. Many other events during the illness period can be modeled and analyzed too.

## 6. The Complex System Approach to the Problem

System generally is a set which performs something on the input and provides some outputs. A system might have an internal state too. Although started in the electrical and control engineering, the system theory has spread widely in other studies and applications, from human science, to economy and biotechnology.

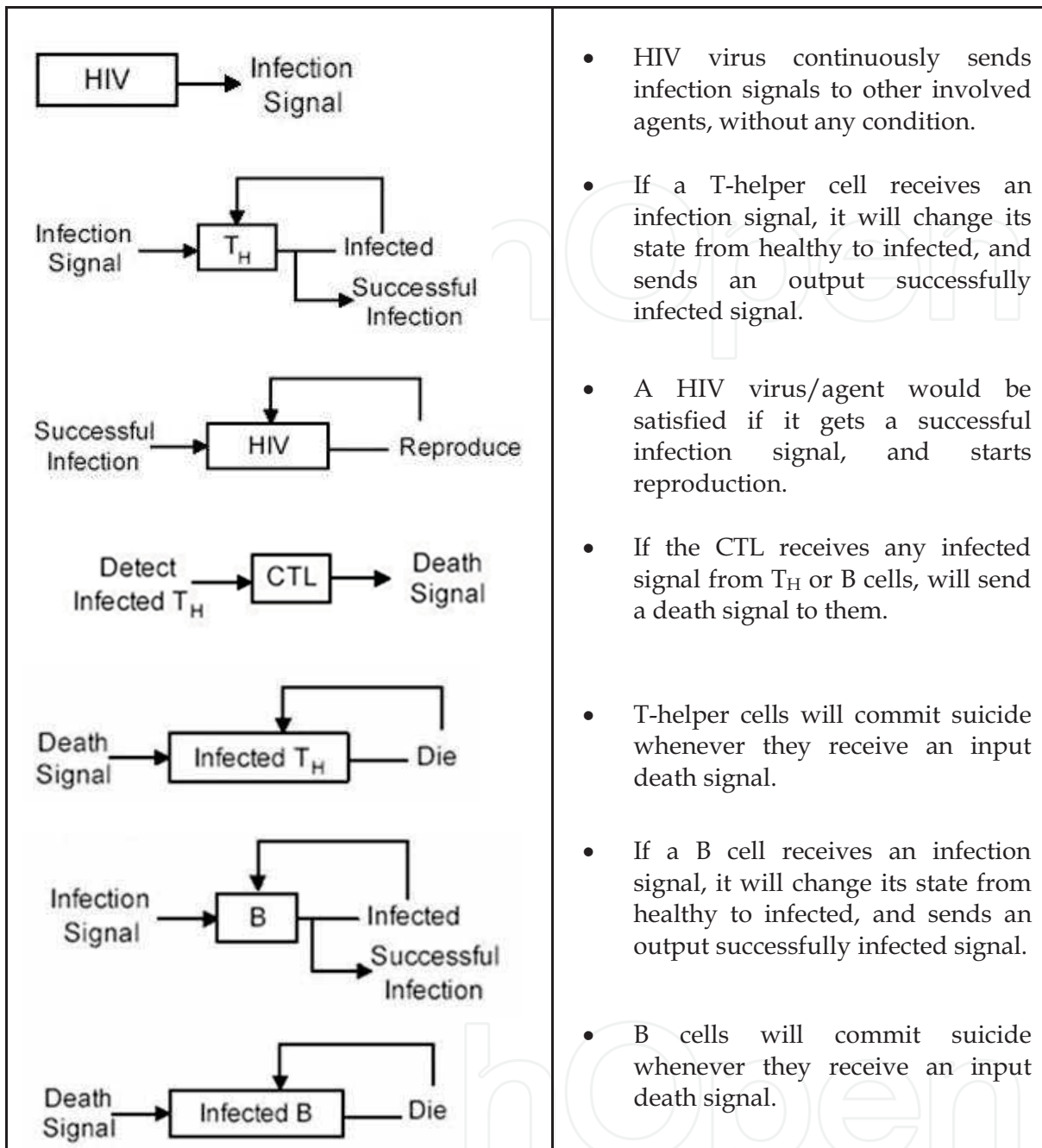
A complex system is a system composed of interconnected parts that as a whole exhibit one or more properties, not obvious from the properties of the individual parts. This definition well matches the biological immune system, which many believe is the most complicated part of our body after the nervous system. Although one can argue that humans have been studying complex systems for thousands of years, the modern scientific study of complex systems is relatively young when compared to areas of science such as physics and chemistry. The history of the scientific study of these systems follows several different strands. In the area of mathematics, arguably the largest contribution to the study of complex systems was the discovery of chaos in deterministic systems, a feature of certain dynamical systems that is strongly related to nonlinearity. The study of neural networks also has appeared to have strong links with the study of complex systems due to referring to the similar connectionist mathematical models (Flake, 1998, Deisboeck & Kresh, 2006).

During an infection, the behavior of the immune system, its sub systems or agents, and virus itself, can be considered as a good and clear example of a complex system. Therefore, study of complex systems and modeling of the biological phenomenon as a complex system, could shed a huge amount of light to our problem.

## 7. Conclusion

It should be clear that the human kind is under the serious threat to viruses. While, apart from the vaccination, the main stream of the medical science has not been successful in tackling the viral diseases so far. So why should not we think about some alternative therapies? Some older and new research suggest that physical therapy and energy fields can be potent candidates.

Since the computer-based models resulted in a valid and reliable simulation can not be ignored, the multi agent model design methodology would be the most reasonable approach, and the preliminary simulation results based on a "null model plus hypothesis" framework can be justified. Such a methodology is shown to be based on the logic of contradiction proofs; directing us also towards an accurate model of the real biological system. Complex system theory also can be advised as the best fitting hypothesis to fully uncover the immune system and viruses transactions and behaviors.



- HIV virus continuously sends infection signals to other involved agents, without any condition.
- If a T-helper cell receives an infection signal, it will change its state from healthy to infected, and sends an output successfully infected signal.
- A HIV virus/agent would be satisfied if it gets a successful infection signal, and starts reproduction.
- If the CTL receives any infected signal from T<sub>H</sub> or B cells, will send a death signal to them.
- T-helper cells will commit suicide whenever they receive an input death signal.
- If a B cell receives an infection signal, it will change its state from healthy to infected, and sends an output successfully infected signal.
- B cells will commit suicide whenever they receive an input death signal.

Table 1. Procedure of diminishing of B and T<sub>H</sub> cells and increasing of HIV viruses in a multi agent simulated system (Guo, 2005).

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University Campus STeP Ri  
Slavka Krautzeka 83/A  
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Phone: +385 (51) 770 447  
Fax: +385 (51) 686 166  
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### **InTech China**

Unit 405, Office Block, Hotel Equatorial Shanghai  
No.65, Yan An Road (West), Shanghai, 200040, China  
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元  
Phone: +86-21-62489820  
Fax: +86-21-62489821

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