Viral infections belong to the main causes of diseases treated in general practice. From the homotoxicologic point of view most of the viral infections have to be taken very seriously as by definition they are intra-cellular homotoxins leading often to cell death due to the cellular defense focusing on viral infected cells. On the Disease Evolution Table viral infections belong initially to the impregnation phase but might cause degeneration and even dedifferentiation phases within a relatively short delay of time. Beside the viral infection itself often complications are seen. These might be bacterial para-infections but also more severe complications known as a post viral syndrome (like in EBV-infections).

Conventional medicine only has a few answers in treating common viral infections and are more advanced when it comes to the inhibition of serious viral infections (e.g. triple therapy in AIDS treatment). This means that for the general practitioner, common viral infections can only be approached in a symptomatic way such as reducing feverish conditions and inflammation control.
A virus is an extremely small, microscopic particle that for reproduction will infect specific cells of a living being. Viruses can only replicate themselves by infecting a host cell and therefore cannot reproduce on their own, like bacteria do. Viruses consist mainly of genetic material, encapsulated in a protein container, called a capsid. Depending to the class, they are capable of infecting a wide variety of organisms: both eukaryotes (animals, yeasts, fungi and plants) and prokaryotes (bacteria).

The word virus comes from the Latin ad means *poison* (syn. *venenum*).

Discussion is still going on whether a virus is a living organism or not as it has not all the peculiarities of a living organism (like proper reproduction). Most scientist consider them as non-living.
Viruses belong to the class of the micro-organisms which are in fact under whether they are living organisms or not. The same can be said about the viroids and prions. But a clear separation and differentiation between the types must be made to avoid any confusion in this matter.

The main difference between bacteria and viruses is their modality of proliferation or self reproduction. Viruses cannot reproduce themselves (as they need a host cell to do so), bacteria can.

We could state that a virus looks more like one of the simplest micro-organisms, like viroids or prions, than a bacteria or a fungi.

The size of viruses range between $10^{-6}$ and $10^{-8}$ meter, thus between a micrometer and 10 nanometers.
Viruses have a few specific characteristics. First of all, they are specific which calls for a specific defense to fight them. Whereas neutrophiles can kill a lot of different bacteria, viruses first need to be 'bound' to a very specific antibody to trigger an antibody response.

Viruses also have an affinity, a cell-tropism, as they will only seek specific organ or tissue cells to use as a host cell and leave the other type of body cells 'untouched'. From this affinity comes the specific symptomatology we see in different viral infections, as every virus will only produce cell pathology in well defined tissues.

Their autonomy refers to their ability to remain in 'competent state', even for years, when not able to reproduce. In contrast to almost all living organism, they do not need nutrition nor respiration. Even completely isolated, they may maintain their toxic state and become active whenever a right-type-cell is in the environment. On the other hand, they fully depend on cells to reproduce giving them less autonomy than the bacteria that will divide when the right environment is present.

Viruses defend themselves in many ways against environmental conditions and even the organism’s own defense against their presence. This self defense is one of the main problems to maintain immunity against them. Known defense systems of viruses include:

- MHC inhibition: the virus gets into the cell without creating elimination of the host cell by cT cells due to inhibition of the MHC-marking of that cell.
- Antibody clipping: the right antibodies are produced once connected the virus 'plugs it off'
- Mutation: the virus mutates with time so that synthesized antibodies are no longer useful.
- Defence cell infection: the virus uses a defense cell as a host cell and by this create a defense problem against itself in the organism

They proliferate by ‘reprogramming’ the genetic material of the host cell to reproduce themselves.
The virus defends itself

- Mutation
- MHC-inhibition
- Capping
- The use of a defense cell as host cell

The virus also defends itself against defense mechanisms of the host organism. Four main strategies are seen here:

1. Mutation: with time the virus changes in such a way that acquired immunity with specific antibody formation does neutralize it anymore. Thus another contact with (almost) the same virus is not recognized by an effective immunity and the patient gets infected and ill again.

2. MHC-inhibition: some viruses are able to intrude into the organ cell, inhibiting the MHC presentation of their characteristics. This means that an infected cell will not present the infected state in his MHC and is NOT detected by a cytotoxic cell. In this way the tissue cell will continue reproducing the virus without being eliminated by proper defense cells.

3. “Capping” is the phenomenon in which a virus rejects the antibody it has just been bound with. By doing this the virus can still intrude the cell and is not ‘marked’ for final elimination through phagocytosis

4. To use a defense cell as host cell is a very dangerous protection strategy of the virus because the body defense is weakened in many ways. The infected defense host cell will be eliminated by other defense cells and the release of defense mediators is reduced due to a decrease in number.
As mentioned in the former slide, a self defense of the virus can be to choose a defense cell as a host cell. This is a quite dangerous and complex situation for the organism, as the defense cells are crucial for the body’s defense. When viruses have affinity for defense cells, and use them as their host cell, the defense is twice weakened. Once because the infected defense cell has to be eliminated, and second because of self reduction of the defense cells themselves.

Mononucleosis (EBV infection) is a strong example of how a virus might undermine a whole system in the post viral EBV infection. HIV certainly is the most classic one, and many other severe viral infections are recorded.

All these type of viral infections have one thing in common: the sooner a therapy is started to inhibit the viral proliferation, the better the chances are to establish a cure without severe long term consequences for the patient. Again, it has to do with the number of infected cells within a time frame and the weakening defense system, day after day.
Some diseases caused by viruses

- AIDS
- Burkitt's lymphoma
- chicken pox
- colds
- Colorado tick fever
- dengue
- encephalitis
- fever blisters
- genital warts
- gastroenteritis
- genital herpes
- German measles
- hepatitis
- influenza
- leukaemia
- liver cancer
- measles
- mononucleosis
- mumps
- polio
- rabies
- shingles
- smallpox
- viral hemorrhagic fever
- warts
- yellow fever
- etc...

This is a far from complete list of diseases caused by viruses. Depending on the type of virus and the type of cells used as a host cell, the disease becomes more or less life threatening. In fact, none of the viral infections should be neglected, even if they do not cause severe symptoms, as intra-cellular damage is always severe from the point of view of homotoxicology, and a damaged cell is unpredictable in its possible evolution when not eliminated by the proper defense system.
Viral species classification (Baltimore classification)

- DNA viruses
  - dsDNA viruses (herpes, variola, …)
  - ssDNA viruses (parovirus B19, …)
- RNA viruses
  - dsRNA viruses
  - +ssRNA viruses (Hepatitis C, SARS, …)
  - -ssRNA viruses (measles, Mumps, …)
- DNA-RNA reverse transcribing viruses
  - RNA-RT viruses (HIV-1, …)
  - DNA-RT viruses (Hepatitis B, …)

DNA viruses

- Group I: viruses possess double-stranded DNA and include such virus families as Herpesviridae (examples like HSV1 (oral herpes), HSV2 (genital herpes), VZV (chickenpox), EBV (Epstein-Barr virus), CMV (Cytomegalovirus)), Poxviridae (smallpox) and many tailed bacteriophages. The mimivirus was also placed into this group.

- Group II: viruses possess single-stranded DNA and include such virus families as Paroviridae and the important bacteriophage M13.

RNA viruses

- Group III: viruses possess double-stranded RNA genomes, e.g. rotavirus. These genomes are always segmented.

- Group IV: viruses possess positive-sense single-stranded RNA genomes. Many well known viruses are found in this group, including the picornaviruses (which is a family of viruses that includes well-known viruses like Hepatitis A virus, enteroviruses, rhinoviruses and foot-and-mouth virus), SARS virus, hepatitis C virus, yellow fever virus, and rubella virus.

- Group V: viruses possess negative-sense single-stranded RNA genomes. The deadly Ebola and Marburg viruses are well known members of this group, along with influenza virus, measles, mumps and rabies.

Reverse transcribing viruses

- Group VI: viruses possess single-stranded RNA genomes and replicate using reverse transcriptase. The retroviruses are included in this group, of which HIV is a member.

- Group VII: viruses possess double-stranded DNA genomes and replicate using reverse transcriptase. The hepatitis B virus can be found in this group.
Animal DNA viruses, such as herpesviruses, enter the host via endocytosis, the process by which cells take in material from the external environment. Frequently after a chance collision with an appropriate surface receptor on a cell, the virus penetrates the cell, the viral genome is released from the capsid and host polymerases begin transcribing viral mRNA. New virions are assembled and released either by cell lysis or by budding off the cell membrane.

Animal RNA viruses can be placed into about four different groups depending on their mode of replication. The polarity of the RNA largely determines the replicative mechanism, as well as whether the genetic material is single-stranded or double-stranded. Some RNA viruses are actually DNA based but use a RNA-intermediate to replicate. RNA viruses are heavily dependent upon virally encoded RNA replicase to create copies of their genomes.

Reverse transcribing viruses are viruses that replicate using reverse transcription, which is the formation of DNA from an RNA template. Those viruses containing RNA genomes use a DNA intermediate to replicate, whereas those containing DNA genomes use an RNA intermediate during genome replication. Both types of reverse transcribing viruses use the reverse transcriptase enzyme to carry out the nucleic acid conversion.

At the end the results remains the same:

- The virus is reproduced by the cell and the multiplication of viruses will infect other similar cells
- The infected cell has lost its useful characteristic for the organism and must be eliminated
- Reproduced viruses will trigger the humoral defense to create specific antibodies to avoid cell penetration and enhance virus elimination
- There will be functional loss of the affected tissue due to improper functioning of cells.
The progress of a viral proliferation proceeds by stages. After contamination there is a stage of incubation in which the virus proliferates.

From the first moment body cells get infected cytotoxic cells, attracted by MHC class I viral epitope, start destroying the damaged cell. It is not known precisely how natural killer cells are also able to detect infected cells without any MHC change (in infection by viruses that induce MHC-inhibition as self protection).

By eliminating infected cells, the proliferation or replication of the virus is strongly inhibited. Free viruses, that move around in the body liquids can not be eliminated by unspecific defense activities and needs the production of specific antibodies. That is what humoral defense is all about in viral infections. B-lymphocytes will start producing specific immunoglobulins that binds on the viruses and make them inoffensive and “marked” and “prepared” to be eliminated by the defense system. So, after the antibody response, elimination of the ‘free’ viruses is possible. The only problem is that it will takes days or even longer to produce the antibodies, time for the virus thus to seek for another host cell for which it has affinity.

After infection, the memory for the specific antibody remains and immunity is acquired against the virus. If the virus does not mutate, the immunity could last for a lifetime.
Protection of the organism at 2 levels

- Destruction of the affected cells
  - MHC-class I
  - IFN
  - NK-cells
  - cT cells

- Destruction of the virus
  - MHC-class II
  - Specific defense
  - Production of (mostly) IgG
  - Attachment of Ig to virus
  - Phagocytosis (non specific defense)

We may conclude that the defense against viruses occurs at two levels, the cellular and humoral level.

The **cellular defense** is concentrated on the affected cells, inhibit viral proliferation mainly by destroying the reproduction centres for viruses. Changed MHC-class I on the tissue cells will trigger cT-cells (cytotoxic cells) and even NK-cells (Natural Killer cells) to intervene. As this is done almost from the beginning of the viral infection, the efficiency of both types of defense cells is crucial in inhibiting the proliferation. Beside the cT- and NK-cells, also the secretion of interferon by T-lymphocytes plays a crucial role in inhibiting the virus. Interferon has anti-viral peculiarities, cell protective characteristics and enhances in general the defense against the virus. The cellular defense is TH-1 mediated.

On the other hand, in parallel to the cellular defense, a TH-2 mediated defense is triggered. Due to MHC-class II marking on defense cells (e.g. antigen presenting cells, APCs) an antigen specific, in this case a virus specific, defense is set up, mainly by the production of antibodies. This **humoral defense** will result in an antibody response between the immunoglobulin and the antigen to an inoffensive virus, ready to be destructed by the non specific defense system.

Both types of defenses, the humoral and cellular, fade or merge into each other. If either one is missing or deficient, no efficient defense is possible anymore. This is the case in the AIDS state of an HIV infection, where too many T-cells are infected and an appropriate reaction of the body defense is no longer possible. At the end, the AIDS patient can not even protect himself anymore against a banal bacterial, viral or mycotic infection, and may die from it.
As mentioned already, interferon plays a crucial role in anti-viral defense. Three main groups of interferon are known: IFN-α, IFN-β and IFN-γ. Formerly the term Type I was used for IFN-α, and IFN-β and IFN-γ was referred to as Type II interferon. In older literature even the terminology “leukocyte interferon”, “fibroblast interferon” and “immune interferon” was used respectively.

Double stranded RNA viruses (ds RNA) will induce the secretion of interferon alpha and beta. This is also the case with most other viruses. Other antigens (including other classes of viruses) and mitogens will induce the secretion mainly of interferon gamma.

Interferon is secreted by different types of cells, mainly by defense cells. Interferon alpha is predominantly secreted by epithelial cells and a large group of leukocytes. Interferon beta is secreted by fibroblasts in the ECM and epithelial cells. T-lymphocytes and NK-cells both secrete interferon gamma.
Interferon gamma should attract our special attention as it is induced by all viral infections. Interferon gamma enhances defense at different levels at the same time.

IFN-γ produces MHC-class I induction by presenting virus specific proteins to T-lymphocytes, generating TH-1 and TH-2 pathway defenses against the antigen. Indirectly over TH-1 induction, the defense cell activity of macrophages is enhanced. IFN-γ creates an anti-viral state and favors TH-1 pathway by inhibiting TH-2 pathway in the TH-1/TH-2 balance. As a consequence, in the beginning of a viral infection, cT-cells are very active in eliminating infected tissue cells. IFN-γ also 'closes' the cell to viral intrusion.
A large number of mediators regulate an immune response in a viral infection. Although both sides of the TH-1/TH-2 balance induce different actions, they both are able to ‘control’ and inhibit reciprocally their own actions. A TH-1 mediated pathway will inhibit, by the release of interferon gamma, the TH-2 pathway and the other way around the TH-2 cell can release interleukin 10, inhibiting the TH-1 pathway. By reciprocal inhibition on the one hand and selective stimulation on the other (agonist/antagonist), a balance in TH-1/TH-2 activity in viral infection is created.

In function of the cellular or humoral defenses, different immunocytes are activated. In both pathways, the activity of the ending cell in the cascade influences the input of the pathway. Macrophages stimulate TH-1 activity for the release of IL-12, but are activated themselves by the release of IFN-γ and TNF-β, both released by the TH-1 cells. In this way a loop is created which is the essence in feed-back systems seen in auto-regulating processes, like the inflammation process.

A similar loop is seen in the TH-2 pathway. Mast cells induce TH-2 activity produces the release of Interleukin 3, 4 and 10, which in turn will activate the mast cell.

To conclude, we can state that both the TH-1 and TH-2 pathways, through positive feedback, stimulate their own loop which is only inhibited by the reciprocal inhibition between TH-1 and TH-2 and the supervising regulating effect of the Treg cells (release of TGF-beta).
The blocking of a cell for viral intrusion and reproduction is caused by gene-activation, following the specific IFN-receptor triggering. By activating these genes the cell produces proteins that avoid or block reproduction of the virus in that cell. This protected state can last for days after receptor triggering, which means that the cell is 'out of order' for viral proliferation.

With good reasons we can state that interferon works as a cell protector and inhibits, in many indirect ways, the viral proliferation or reproduction.
In conventional medicine interferon is used in the treatment of many diseases. The list above is not complete, but gives an idea about the applications.

**Clinical Uses of Interferons**

<table>
<thead>
<tr>
<th>Interferon</th>
<th>Therapeutic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFN-alpha, IFN-beta</td>
<td>Hepatitis B (chronic)</td>
</tr>
<tr>
<td></td>
<td>Hepatitis C</td>
</tr>
<tr>
<td></td>
<td>Herpes zoster</td>
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<tr>
<td></td>
<td>Papilloma virus</td>
</tr>
<tr>
<td></td>
<td>Rhino virus (prophylactic only)</td>
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<tr>
<td></td>
<td>Warts</td>
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<tr>
<td></td>
<td>Lepromatous leprosy</td>
</tr>
<tr>
<td>IFN-gamma</td>
<td>Leshmaniasis</td>
</tr>
<tr>
<td></td>
<td>Toxoplasmosis</td>
</tr>
<tr>
<td></td>
<td>Chronic granulomatous disease (CGD)</td>
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</tbody>
</table>
The use of the cytokine interferon in conventional medicine (as a medication) is not without risks and side-effects. Due to its strong impact on regulation mechanism steering defenses we see numerous side-effects making this type of medication second choice. Patients taking interferon as a medication will often complain about sudden and intermittent fevers. A general feeling of malaise and fatigue often occurs resulting in a therapy that is rejected by the patient. Also myalgia is a major complaint in interferon medication.

Interferon, and certainly after long term use, might cause severe problems. It is known to be toxic to the liver, kidneys, heart and even bone marrow. This is one of the reasons why interferon is medically used for a short period, at least as short as possible.
The main characteristic of specific defense and immunity is the generation of immunoglobulines. Immunoglobulines or antibodies are antigen specific.

An antibody has the form of a large Y-shaped protein and is used by the immune system to identify and neutralize foreign objects (antigens) like bacteria and viruses. Each antibody recognizes a specific antigen unique to its target. This is because the two tips of the "Y" of the antibody contain a "paratope" (a structure analogous to a lock) that is specific for one particular "epitope" (analogous to a key) on an antigen, allowing these two structures to precisely bind together, like a lock and a key. This precise binding mechanism allows an antibody to tag a microbe or an infected cell for attack by other parts of the immune system, or to directly neutralize its target (i.e. by blocking a part of a microbe that is essential for its invasion and survival). The production of antibodies is the main function of the humoral immune system.

An antibody is made up of a constant heavy chain and a variable light chain, with a specific "paratope"-site, on which the binding sites occurs.

Membrane-bound immunoglobulins are only found on the surface of B-lymphocytes and facilitate the activation of these cells following binding of their specific antigen, and their subsequently differentiating into plasma cells for antibody generation, or memory cells that will remember the foreign antigen during future exposures. In most cases, interaction of the B-cell with a T-helper cell is necessary to produce full activation of the B-cell and, therefore, antibody synthesis follows antigen binding.
We can divide the host defenses into 3 strategies that are followed by the immune system. Each strategy will inhibit one or more aspects of the viral proliferation.

1. The early nonspecific defense response is mainly TH-1 mediated and is responsible for phagocytosis, inflammation, natural killer cell activity, enhanced cytotoxic cell activity, production of interferon (especially IFN-gamma) and body temperature increase (fever has a virus inhibiting effect).

2. The second level is a cellular immune competent reaction. From this we see a further activation of macrophages and an increased phagocytosis activity, lymphokines are released and increased cytotoxicity versus antibody marked sites.

3. At the third level, a TH-2 mediated response will enhance the humoral defense, mainly by production and release of antibodies. Also, the complement system will enhance cytolysis, induce inflammatory mediators, and finally create opsonisation of antigens.

The main purpose is to eliminate infected cells and/or to bind antigens to antibodies so that further elimination of them can occur.
Problems with viral infections

• Although conventional medicine has several medications to fight bacterial infections, few effective strategies are available to fight viral proliferation.

• Symptomatic treatment of viral infections often favors the virus, not the organism (e.g. fever has a viral inhibiting effect). Antipyretic drugs lower the fever and thus inhibit the efficacy of the body’s purposeful defense against the virus.

• The steering mechanisms against any infection are very subtle, dosed mediators related. Intervention with any high dosed blocking substance will disturb auto-regulation of that system for a long time and even increase the risk towards a regulation rigidity.

Although symptomatic treatment seems to have a high therapeutic effect on a short term, the reality is that often the viruses take advantage of the suppression of regulation systems and remains longer in the body, affecting more cells. Only a therapeutic approach, in full respect for the auto-regulating processes in the human body can enhance, by subtle corrections, the efficacy of the body’s own defense. To do so, antihomotoxic medications intervene at the level of secretion of crucial mediators in the steering process of anti-viral activity of the defense system.

In no way, the blocking of a virus induced inflammation process can be seen as curative as the inflammation on its own is meant to eliminate the antigen. Fever indeed can be dangerous, if extremely high, but should be seen as a purposeful defense because it attempts to inhibit the proliferation of the virus.

The cascade-like effect of viral inhibition is almost logarithmic. Every cell that has not been infected is a spared cell, one that is less likely to replicate the virus, involves less cytotoxic and NK-cells activities, less antibodies to be produced, less phagocytos is needed to clear the matrix, less symptoms,…
At the moment only a few viruses are known that damage the host cells in such a way that the cell division is disturbed and the cells transform to cancer cells. Again this list is unlimited and probably new research will point out that more viruses are able to do so. From this point of view, we should not be surprised because a viral infection is an intra-cellular intoxication, even intra-nuclear. Once gene-function is disturbed or changed, the outcome is unpredictable. If a weakened defense system does not react appropriately to destroy and eliminate the infected cell, a “time-bomb” is installed.
The best medication against viruses is acquired immunity

Vaccination versus life experience

Some vaccinations are available against certain viruses and it seems very logic to use them at all means. But vaccination has become very controversial issue in the lately due to the apparent benefits on a short term, but the immense possible consequences for humanity on long term basis.

Beside the effectiveness of a vaccination in building up immunity other parameters can have an influence here like the age of the patient. Older patients will have to deal with immune senescence which makes the chances for a full covering immunity after vaccination very low (see IAH AC The ageing immune system).

It is known in conventional medicine that less TH-1 mediated micro-organisms contact (due to vaccinations, antibiotics, NSAIDs,...) will result in a more expressed TH-2 mediated reaction in a later stage of life (e.g. allergies). Only true lived-through infections will result in an appropriate TH-1/TH-2 balance and effective built up immunity.

Therefore, from the point of view of homotoxicology, except for a few absolute life threatening viruses and geographic or climate related conditions (main nutrition, race,...), the best immunity is to be built up by real contact with the virus. Therapy should concentrate on well steered immune reactions. Regulation therapy again seems to be the only reasonable alternative.

The dialogue on the safety of many vaccinations is not finished and regularly articles and studies are published both on the danger and the safety of the vaccination therapy. It is an almost ethical issue and the question of whether to advise a whole population about getting vaccinated with an antigen to protect a few individuals, not knowing what the effect of the vaccination might be in this or the future generations for... this whole population, or whether it is safer for the whole population to try to treat only the few infected ones. Again we see a short-term thinking in conventional medical approach.
<table>
<thead>
<tr>
<th>Drug</th>
<th>Common Uses</th>
<th>Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acyclovir</td>
<td>Genital herpes, herpes zoster, and chickenpox</td>
<td>Side effects are few</td>
</tr>
<tr>
<td>Amantadine</td>
<td>Influenza A</td>
<td>• Nausea or loss of appetite</td>
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<tr>
<td></td>
<td></td>
<td>• Nervousness</td>
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<tr>
<td></td>
<td></td>
<td>• Light-headedness</td>
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<tr>
<td></td>
<td></td>
<td>• Slurred speech</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Unsteadiness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sleeplessness</td>
</tr>
<tr>
<td>Cidofovir</td>
<td>Cytomegalovirus infections</td>
<td>• Kidney damage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low white blood cell count</td>
</tr>
<tr>
<td>Famciclovir</td>
<td>Genital herpes, herpes zoster, and chickenpox</td>
<td>Side effects are few</td>
</tr>
</tbody>
</table>

Beside the “prophylactic” treatment to avoid viral infections, there still is the antiviral treatment when an infection occurs. In the next slides we see the common molecules used in conventional medical approach for diverse viral infections. Only a few have very minor side effects.
<table>
<thead>
<tr>
<th>Medicine</th>
<th>Virus Infections</th>
<th>Side Effects/Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fomivirsen</td>
<td>Cytomegalovirus retinitis</td>
<td>Mild eye inflammation</td>
</tr>
<tr>
<td>Foscarnet</td>
<td>Cytomegalovirus and herpes simplex virus infections</td>
<td>• Kidney damage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Seizures</td>
</tr>
<tr>
<td>Ganciclovir</td>
<td>Cytomegalovirus infections</td>
<td>Low white blood cell count</td>
</tr>
<tr>
<td>Interferon-alpha</td>
<td>Hepatitis B and C</td>
<td>• Flu-like symptoms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bone marrow suppression</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Depression or anxiety</td>
</tr>
<tr>
<td>Oseltamivir</td>
<td>Influenza A and B</td>
<td>Nausea and vomiting</td>
</tr>
<tr>
<td>Penciclovir</td>
<td>Cold sores</td>
<td>Side effects are few</td>
</tr>
<tr>
<td>Ribavirin</td>
<td>• Respiratory syncytial virus</td>
<td>Breakdown of red blood cells, causing anemia</td>
</tr>
<tr>
<td></td>
<td>• Hepatitis C</td>
<td></td>
</tr>
<tr>
<td>Drug</td>
<td>Condition</td>
<td>Side Effects</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Rimantadine</td>
<td>Influenza A</td>
<td>Similar to amantadine, but milder nervous system problems</td>
</tr>
</tbody>
</table>
| Trifluridine | Herpes simplex keratitis         | • Stinging of eyes  
|           |                                  | • Swelling of eyelids                                                        |
| Valacyclovir | Genital herpes, herpes zoster, and chickenpox | Side effects are few                                                          |
| Valganciclovir | Cytomegalovirus infections      | Low white blood cell count                                                   |
| Vidarabine  | Herpes simplex keratitis         | Side effects are few                                                          |
| Zanamivir   | Influenza A and B (inhaled powder) | Irritation of the airways                                                     |
The approach will be immunomodulating, as an isolated approach in acute viral infections, as the second part of the 3 pillars of antihomotoxic treatment in chronic recurrent infections or post viral syndrome. As a master example of immunomodulating effects induced by an antihomotoxic drug in viral infections it is worth studying the immunostimulator Engystol.
As time is not in favor of the cell as it comes to a viral infection or viral “intoxication”, the sooner the detoxification and drainage of homotoxines take place, the better it is for the cell. That is why the first pillar of homotoxicological treatment, drainage and detoxification, is the essential step.

The second pillar is immunomodulation. As the fastest cleansing of the extra cellular matrix is an active and efficient defense system, immunomodulation is very important in a homotoxicological treatment protocol, especially if we have to deal with chronic recurrent infections or post viral syndromes. To activate or regulate immune reactions it means, not only to put the defense system on the right purposeful level of action, it also keeps the clinical symptoms of inflammation within for the patient acceptable levels, or stimulate a non-reactive immune system.

Cell death by eliminating cT-cells means weakening of the tissue. To ameliorate the life quality of the patient, we will need the 3rd pillar of antihomotoxic treatment which is cell- and organ support. In this way we optimize the cell functions of the healthy cells, compensating the functional loss by the viral infected cells.
Within antihomotoxic treatments the main immunomodulator being effective in inhibiting the proliferation of specific viruses is Engystol. It mainly intervenes in the secretion of steering mediators set free during a viral infection. Research showed it being active on different parameters of the body’s defense and it is more than worth looking closer to the different aspects of it.
Recent basic research as mentioned above proved Engystol to be effective in inhibiting the viral proliferation of different viruses.
Compared to placebo Engystol inhibited in cell cultures (in vitro study) the viral proliferation of different viruses. Herpes simplex virus (HSV-1) was inhibited by almost 80%. The adeno-5-virus (A5V) was inhibited by almost 60% and the respiratory syncytial virus (RSV) almost by 40%. Less inhibition occurred with the rhinovirus V14 and the flu virus (influenza A).

Although the study did not mention a pharmacodynamic for the effects measured, the results are clear enough to state an (indirect) antiviral effect of Engystol.
Very recent basic research showed one of the probably multiple pharmacodynamic effects of Engystol. As mentioned before, Engystol intervenes at the level of mediators, steering the defense reaction against viral infections.
On cultures of human T-lymphocytes Engystol showed an increased interferon gamma secretion by T lymphocytes. In former slides we explained already the antiviral and cell protective effect of this cytokine. In comparison to placebo Engystol increased the secretion of interferon gamma up to 24%. As stated before this higher secretion will result in:

- MHC-class I (organ cells) induction
- Activation of macrophages with increased phagocytosis activity
- Antiviral activity due to limited cell access
- Inhibition of the viral proliferation by direct cell protection against viral intrusion
- Inhibits the TH-2 mediated defense and favors the TH-1 mediated pathway (infected cell elimination)

The inhibition of TH-2 mediated pathway by increased secretion of interferon gamma probably also explains the therapeutic effect of Engystol in corticoid dependent asthma patients(1)

Important research was already done 20 years ago by Prof. Wagner from the university of Münich in Germany. He measured the effect of Engystol and other immunomodulators on granulocytosis and came to the conclusion that this effect was dose and time depended.

The medications he tested were:

Engystol
Gripp-Heel
Engystol + Gripp-Heel
An Echinacea-preparation with a low dose of Vit C
The following conclusions were obvious (1):

- Gripp-Heel increases granulocytosis by 30.8%.
- Engystol N increases granulocytosis by 33.5%
- Gripp-Heel and Engystol N, used together in a 1:1 ratio, increase granulocytosis by 41%
- The Echinacea preparation causes granulocytosis to decrease in a high concentration and increases by 28.2% if diluted in a one on a million concentration.
- The highest granulocytosis for Engystol N + Gripp-Heel on the one hand and the Echinacea preparation on the other was measured after 4 to 5 days. Subsequently a speedy reduction of activity was seen.

Within 5 days of successive administration, Engystol increased the activity of granulocytes by 33.5%. For another antihomotoxic immunomudulator named Gripp-Heel this was 30.8%. Remarkable is the synergic effect of both as the increase reached was 41%.

Echinacea, a well known immunostimulator only gives positive results in a 1/10,000 dilution. Undiluted the medication (in combination with ascorbic acid) gives a strong inhibition of granulocytosis (-63%).
The following conclusions were obvious (2):

• The study provides reason to assume that repeated short stimulation of the defense system is better than long-lasting stimulation. The study shows that the defense system exhibits ‘exhaustion’ after five days of stimulation (demonstrated by the fast reduction in granulocytosis).
From this table we can deduce that the effect on the granulocytosis is dose dependent. For each immunomodulator there is an optimal molecular concentration. The most unexpected is the fact that for Echinacea only a positive effect on the granulocytosis was reached in a D4 concentration. Higher concentrations had less effect, higher dilutions partly an upgoing effect but even higher dilutions again a down going effect.

Also, Wagner showed that a prolonged administration of the drug, after more than 5 successive days, suddenly gave a reduced effect.

Even so low concentrated, antihomotoxic immunomodulators are dose and time dependent in their therapeutic effects.
Another study from the beginning of the 1990’s showed remarkable changes in the immune competence after prophylactic administration of Engystol to healthy volunteers.
The study was a double blind randomized placebo-controlled trial on 102 healthy male test subjects. The concept was to test the prophylactic value of Engystol on influenza and on the common cold. Although there were no significant differences in prevalence of infections between the verum and placebo group, other clear differences were observed.
The following conclusions may be drawn from this study (1):

• Engystol did not influence the frequency with which influenza occurred in the test and control groups.

• In the Engystol group the average latent period between the last injection and the appearance of influenza was 34 days; in the control group it was only 19 days.

• The symptoms had manifested for only 11 days in the Engystol group and 16 days in the control group.

Without differences in prevalence, there was a significant difference between both groups in the latent period between the last administration of Engystol and the appearance of the symptoms. The latent period was 34 days in the Engystol group and only 19 days in the placebo group.

Even more interesting was the fact that the symptoms only appeared for 11 days in the verum group and continued for 16 days in the placebo group. That means that Engystol reduced the time of illness with about 35%.
The following conclusions may be drawn from this study (2):

• The severity of the symptoms was considerably lower in the test group than in the control group.

• In the Engystol N group the increase in specific antibodies was in proportion to the length and severity of the symptoms and was therefore considerably less than in the placebo group. This meant that the preceding points were reconfirmed by an objective parameter.

The most remarkable aspect however was that the number of antibodies in the verum group was also about 35% less than in the placebo group. As the number of antibodies are created in function of the severity of the infection that means that less viral proliferation was possible in the verum group.

Hypothetically we can state that Engystol indirectly or directly stimulates the activity of the cT-cells so that infected cells are eliminated earlier, thereby less viruses require antibodies. By the antibody count an objective parameter confirmed the immune enhancing effect of Engystol.
Engystol inhibits the viral proliferation: to conclude

- Hypotheses
  - NK-cell activation
  - cT-cell activation
  - Interferon
  - Combination of factors

- Studies
  - Less antibodies in prophylaxis means more efficient destruction of contaminated cells
  - IFN-gamma secretion increased by 24%
  - 33% increase of the granulocytosis
  - Efficacy proven in inhibiting the proliferation of different viruses

From the research we may postulate that Engystol enhances the activity of cT-cells and probably also NK-cells in the first days of a viral infection. Proven is that Engystol increases the Interferon gamma secretion by TH-1 lymphocytes and by this favors the TH-1 mediated cellular defense (which is in viral infections mainly the activity of the cT-cell !!!!). Effects on other defense-cells is shown in different studies.
The indication of Engystol is quite obvious: to be useful in viral infections. From research we know that Engystol enhances parameters of the non-specific defenses (IFN-gamma, increased granulocytosis, activated cT-cells). On the other hand we also see consequences in the TH-2 mediated pathway which is marked by a lower antibody production result.

Engystol is within the antihomotoxic immunomodulators an immunostimulator. It boosts the defense, especially in viral infections.
Engystol indication: application

- Common acute viral infections (flu-like conditions) like HSV, RSV and Adenovirus
- Acute and post viral syndrome in mononucleosis (in combination with Lymphomyosot)
- General boost of the defense system in ‘weak’ people

In concreto this means that Engystol can be used in most common viral infections in general practice like herpes labialis infections (herpes simplex virus, HSV-1), respiratory syncytial virus and adeno virus 5 infections. Especially in the recurrent herpes simplex infections and the very common RSV infections, during wintertime in children it has proven to be very effective.

Engystol is often used in combination therapy with other antihomotoxic drugs to cover a patient related individual approach. In Ebstein Barr infections it is very effective in combination with Lymphomyosot. EBV infects B-lymphocytes and can cause liver damage but shows main clinical symptoms in lymph nodes, especially at the level of the throat. The lymph involvement is approached with Lymphomyosot, the viral infection by EBV with Engystol.

Patients that show a weak state of their immune system, one infection after the other, will show benefit from a prolonged intake of Engystol as their defense level to antigen, especially viruses, will be increased.
Benefits of Engystol

• No immunosuppressant
• Excellent tolerance
• For all ages
• Interactionless
• No contra-indications or side-effects
• SAFE and EFFICIENT

In contrast to all immunosuppressive or immunostabilizing or even immunenhancing medications of conventional medicine and often with numerous side effects (think about the therapeutic use of interferons), Engystol shows to be effective and in the meantime safe. No side effects on Engystol were reported till now. It creates no interactions with other drugs or substances, has an excellent tolerance and can be used for viral pathologies in all ages. Engystol has no side effects.

Any substance can be the subject of intolerance or allergy, even in very subtle dosages. In very rare cases this also occurred with the components of Engystol giving skin reactions. If this is the case, an alternative therapy should be started.