

## Application possibilities of Humic Acids in Veterinary

### 2. Pharmacological effects and way of action

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#### **Introduction:**

Humic acids are possible alternatives of several antibiotics and chemotherapy products in case of many disease groups. In this article we give a short summary of the possible areas where humic acids may open new ways, but without the aim of a complete picture. One of the most important consequence of the experiments and results is the importance of prophylaxis and the improvement of the feed utilisation index.

#### **Antiviral effect**

The systematic research for the antiviral effect of humic acids started when it turned out by chance that some peat preparations showed a healing effect against the foot-and-moth disease. Further studies proved the virus adsorption and synthesis blocking effect in case of several RNA and DNA viruses as well. Humic acids showed selective blocking effect against the following viruses studied: *Herpes simplex*, *Coxsackie A9*, *Influenza A*, *Rhinovirus 1B*, *Cytomegalovirus*, *HIV-1*, *HIV-2*. The applied dose of humates was in all cases below 1000 ppm. To clear the interaction mechanism between humates and viruses the adsorption, penetration and synthesis phases were studied separately (8). TABLE 1.

**TABLE 1.** Effect of HN<sub>4</sub>-humate (300 ppm) on Herpes simplex virus (lung tissue)

Phase	Virus concentration (log <sub>10</sub> TCLD50/ml)	
	with humate	without humate
Adsorption	0	6,33
Penetration	1,50	3,43
Synthesis	4,00	7,50

The virus adsorption is completely blocked while the penetration is less blocked and the synthesis is hardly blocked. The reason of the adsorption blocking effect is probably the interaction of humates with the positive sites of the virus protein cover. The humate virus complex cannot be adsorbed on the tissues.

#### **Antibacterial and fungicide effects**

The antiseptic effect of the peat preparations is known for thousand years, there are references still from the ancient Egypt times. During the first world war for the healing of the wounds the best method was the peat bandage. Further studies proved that the real antibacterial and fungicide effect is related to the humic acids (5.). Many of the microbes were studied to consider their humic acid resistance. The following microbes proved to be sensitive against humates: *Staphylococcus epidermidis* and *aureus*, *Streptococcus pyrogenes*, *salmonella typhimurium*, *Proteus vulgaris*, *Enterobacter cloacae*, *Pseudomonas aeruginosa*. In cases of *Streptococcus faecalis* and *Escherichia coli* there was no blocking effect (6.).

The antibacterial effect is rather dose dependent comparing to the antiviral effect. The effective doses in case of the above mentioned studies were below 2000 ppm. It is a considerably fact that the effective dose of humates are far below that of the antibiotics. The effect of humates on microbes can be derived from several reasons according to the experiments, first of all they can affect the catalysis of the metabolic reactions, but a definite blocking effect on the bacteria and virus bodies was also realized.

At the same time humic acids show a direct protective effect against harmful microbes forming ionic bonds with the cell-protein toxins so blocking the uptake of these molecules through the mucous membrane (4.).

The fungicide effect was studied on the pathogenic fungus of the skin (*Candida albicans*) and the results showed a definite blocking effect even at several ppm dose (1.).

#### **Immune system intensification**

The intensification of the immune system is the result of several effects. It consist of some indirect effects that are: because of the antibacterial and antiviral effects the body save some energy which can be used in the defending system, on the other hand humic acids improve the uptake of the micronutrients that have basic importance in the immune reactions. Furthermore there is a direct effect of humates on the immune system because humates can take part in the biochemical reactions of the immune system. In the studies of radioactive humic acids applied on rats a direct effect of humates on the biochemical reactions of the immune system was proved. At the same time animal tests proved the improvement of the general immune system status after the oral and also intramuscular applications (7.).

#### **Detoxifying effect**

Humic acids have a definite detoxifying effect against different cell toxins. The uptake of the toxins depends on the dose on the time and on the chemical adsorption circumstances of the stomach and intestine tract. Humic acids as strong chemical adsorbents are able to inactivate the toxins. Many toxic molecules was studied in animal tests where humic acids proved to be a very effective inactivating factor. For example the liver damaging effect of carbon-tetra-chloride was effectively blocked by humic acid. Surprisingly good

liver protecting effect was detected in case of *Amanita phalloides* mushroom intoxication. The post-mortem liver examination showed that humic acids had better liver protecting effect than any other compounds (1.). The toxicity test of parathion-methyl (PM) carried out with laboratory rats showed that the toxicity effect is the function of humic acid dose. In acute oral test the LD<sub>50</sub> value increased from 7,35 ppm up to 12,08 ppm thank to humic acid. The dermal LD<sub>50</sub> value decreased by 75 % after the intake of humic acid. The PM is blocking the acetyl-coline-esterase (ACE) activity of the cells. Further studies showed that humic acid has a direct effect on ACE. During the continuous intake of PM for 14 days the ACE completely was inactivated and animals died. If the intake of PM was stopped on the 7<sup>th</sup> day and humic acid was added instead, the ACE completely was reactivated and all the symptoms disappeared. If the PM and humic acid was added together the ACE was partly reactivated and the symptoms also disappeared. To compare the detoxication effect of humic acid and active carbon in the same test the active carbon did not cause the reactivation of ACE and was not able to stop the symptoms (9.).

The results obtained allow us to conclude that humic acids as anionic macro-colloids beside their strong chemisorptive ability are able to fasten the toxin metabolism. This effect was realised against toxins forming during the infections of the intestine system (external) and also that existing in the feed (internal, fusarium).

#### **Uptake of micronutrients and removal (detoxication) of toxic heavy metals**

Humic acids are natural ion exchangers and complex forming molecules. The specific complex forming capacity of humic acids is higher than the synthetic ion exchangers. This ability of humic acids is well known in the practice of plant nutrition.

Humic acids form meta-stabile complexes with the metals and have importance in the plant and animal nutrition. The metals from these meta-stabile complexes can be adsorbed easily in the intestinal system and at the same time the positive biological effects of humic acids can also be detected. Furthermore humic acids have an exceptional ability that cannot be observed at any other organic chelating molecules namely they form stronger complexes with the heavier molecular weight metals. The metals from these strong complexes cannot be taken up in the intestinal tract.

It means that humic acids carry and help to take up the useful metals (micronutrients) while block and extract the toxic metals (heavy metals) and micotoxines from the system. This effect was proved in several animal tests (2, 10). The application of humic acids in the production of the micronutrient premixes may open a new chapter. The fourfold positive effects of humic acids (effective uptake, biologically active, detoxifying effect, natural substance) are against the conventional complex forming molecules that help the effective uptake only.

#### **Complex physiological effects in the intestine tract**

Studies and experiments have been carried out with humic acids proved a surprisingly good effect to the digestive system. The detailed description of these studies is over the limit of this article so we give a short summary of the results.

The oral application of humic acids increase the appetite and stop the desire of vomiting. In case of acute gastro enteritis humic acid stops the diarrhoea in some hours. The prophylactic application prevent the animals from the diarrhoea syndroms. In case of hyper acidity humic acid decrease while in case of hypo acidity increase the production of gastric acid. Affect the water and salt balance of the body. In case of chronic hepatitis humic acid start the diuresis. Extremely good results were registered against diarrhoea at dogs based on aliment reasons (1,8.).

#### **Oestrogen effect**

The oestrogen effect of different peat preparations is well known and studied for decades. The experiments proved that the oestrogen effect is related to the humic acid content of the peat (3.). Our experience in Hungarian farms also proved these results. The number of live-births and the effectiveness of insemination could be increased.

#### **Antiphlogistic effect**

This phenomenon was registered in case of external and also in per os applications. In the veterinary practice good results were published in case of some tumours, swellings and skin injuries, eczema and stomach ulcer. Humic acids have an inhibitor effect on the lipoxygenase enzyme which play an important role in the phlogistic processes (11.).

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