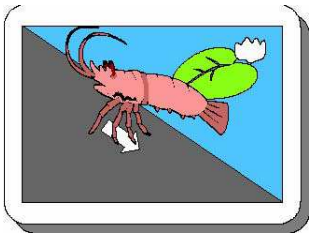
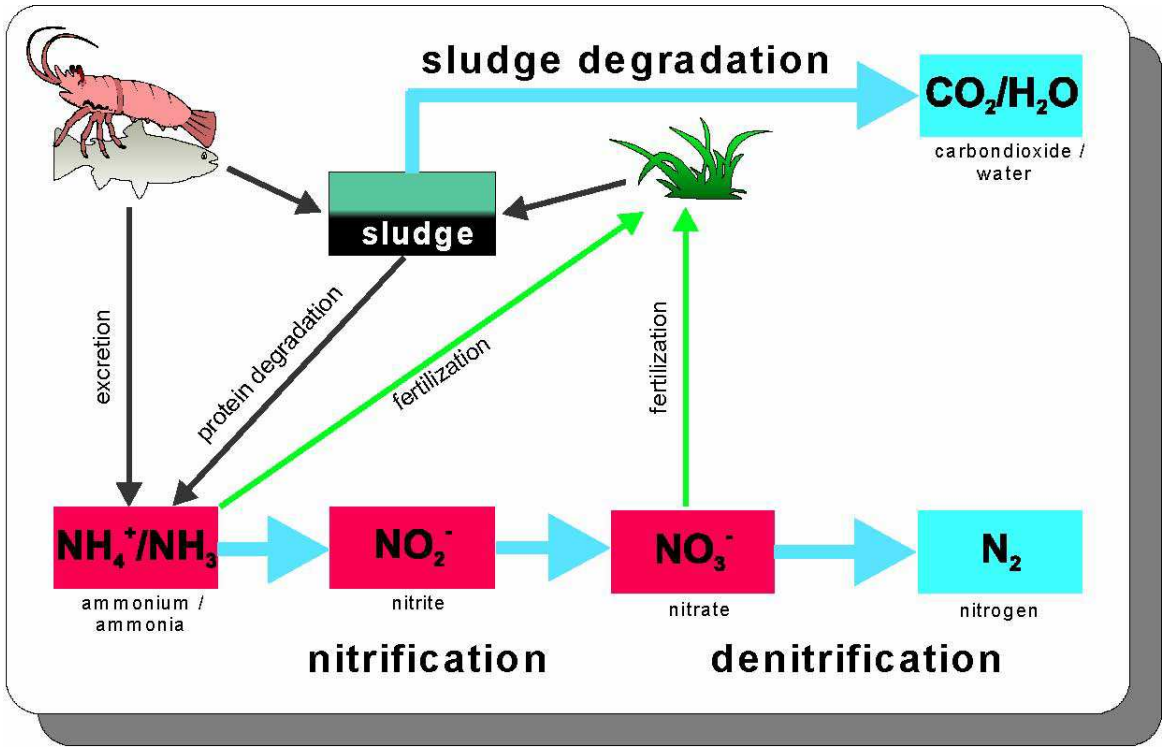


The way ASA T works in aquaculture

In the open nature there are fish, plants, small living organisms and microorganisms which live together in an aquatic system. Dead plants and animals are completely mineralized by the microorganisms. The end products of the biodegradation process, e. g. nitrates are taken up again by the plants as nutrients. There is an ecological balance. The water remain clean due to its biological self-purifying ability.



Dramatical deterioration of water quality caused by shrimp farming

In prawn farming an excessive amount of inorganic substances (fertilizer) and organic waste (plant remains, animal excretion, left over feed-stuffs) find their way into the system then the self-purifying ability is not able to cope and the ecological balance is upset.
This leads to an increase in concentration of ammonia and nitrite, which are toxic to shrimps.. The increased formation of ammonium and nitrate stimulate the growth of filamentary and free-floating algae, which increase the water turbidity. The dying algae cause an additional load of the water by organic waste.

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Use of antibiotics in the shrimp aquaculture industry: far reaching ecological and economical risks and consequences

The organic material (starch, protein, fat, cellulose) are not completely degraded by the microbes and form an organic layer at the bottom of the pond. This sludge sediment is responsible for a further reduction of water quality and decrease of oxygen concentration. Furthermore it represents an ideal nutrient medium for pathogenic bacteria, f.e. *Vibrio spp.* . Especially *Vibrio harveyi* has been implicated as the main bacterial pathogen of shrimps [1].
In the Philippines the „luminous Vibrio disease" caused the loss of the main part of the shrimp production in 1996. The responsible *Vibrio spec.* showed resistence to all antibiotics used including chloramphenicol, furazolidon, oxytetracyclin and streptomycin, and obviously, it was more virulent than in the previous years.
In order to protect shrimps against bacterial diseases precautionary antibiotics as chloramphenicoll are often added to the ponds. However, in many cases they are not effective and lead to the development of resistant bacterial strains as well as to the transfer of resistance genes to other species as human pathogens. (partially with dramatical consequences for the control of human infection diseases) [2, 3].
Additionally antibiotics damage the gut flora of the shrimps and, consequently, their digestion . This weakens the animals and they become sensitive to viral infections, f.e. „White spot desease" or „Yellow head disease". Because virus are not influenced by antibiotics this led in some regions to viral epidemics and to high shrimp mortalities.
Since antibiotics can be detected in shrimps after the harvest, in the last years an increasing number of importing firms from USA, Europe and Japan decline lots with high contents of antibiotics, which leads to clear losses of income for the shrimp farmers.

Furthermore antibiotics and other bactericides are not effective in every case: experiences, made in Thailand in 1999, showed, that high dosages of norfloxacin in combination with colloidal silver in shrimp feeds were able to control bacterial infections. However, when the addition of bactericides was stopped all shrimps died within a few days. Obviously a high virulent strain of *Vibrio* had developed in response to the bactericides.
Also the use of chlorine seems to have negative influences, as it was observed, that the development of resistance genes was stimulated. Farmers from Thailand reported, that in ponds treated with chlorine a rapid increase of *Vibrio harveyi* occurred after removal of the chlorine [4].

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How does ASA T work ?

The microorganisms in **ASA T** improve the water quality and solve all these problems in a **natural way**:

- ☑ "sludge degrading" microorganisms form the hydrolytic enzymes necessary for the degradation of the organic waste
- ☑ the microorganisms in **ASA T** repress pathogenic bacteria species by competing with them about the same nutrients
- ☑ nitrifying microorganisms convert ammonium, toxic ammonia and nitrite to nitrate
- ☑ denitrifying microorganisms change nitrate to gaseous nitrogen thus removing it from the body of water
- ☑ different species of green algae often associated with *Vibrio species* will be repressed

The positive effects of the use of beneficial microorganisms (as they are contained in **ASA T**) for the displacement of pathogenic bacteria was already made in the animal industry [5].

Literature

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Economical calculations

All data were calculated based on the results of our test ponds in India and Vietnam from the cultivation of *Penaeus monodon* (Black Tiger Prawn).
The sales prices for the shrimps were between 3,50 und 7,00 € per kg shrimps and dependent of the quality and region of production. Following from that for these calculations a sales price of 5,-00 € per kg Shrimps was estimated. However, for shrimps free of antibiotcs higher prices should be achieved..

Pond Size	7.500	m^2
Number of Shrimps	30	animals / m^2
Weight of Shrimps	34	g/animal
Survival Rate	70	%
Total Yield of Shrimps	5.350	Kg
Income per Pond	26.750,-	€
Income per tons of Shrimps	5.000,-	€ / t shrimps
Costs of ASA T	145,-	€ / t shrimps
Calcul. Costs of Antibiotics	50,-	€ / t shrimps

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