

# Talking about histamines



In this regular contribution to *Feed Tech*, Dr Joachim Hertrampf comments on issues that affect shrimp farming and feeding. Dr Hertrampf regularly writes 'hands-on' articles as a consultant for the monthly newsletter *Shrimp Matters*, of *The Waterbase* in Chennai, India. This column focuses on the effect of histidine as a precursor for fish spoilage.

By Dr Joachim Hertrampf

**H**istamines belong to the biogenic amines. They are heterocyclic compounds. While histidine is present in almost all animal and human tissues, it can also be found in ergot and certain plants.

Histamines are most commonly formed from histidine by decarboxylation, i.e. the carboxyl group (COOH) is removed from the chemical formula. Histidine is one of the so-called 'essential' amino acids. It is, therefore, present in all tissues in lower or higher quantities. The process of decarboxylation occurs if animal and vegetable protein decomposes. For converting histidine into histamine, certain specific enzymes are required. They are produced by bacteria, particularly by *Clostridium perfringens*, *Escherichia coli*, but also by Enteric bacteria and certain species of luminous bacteria. In general, histamine is toxic.

### Scombroid fish

Scombroid fish belong to the zoological family of *Scombridae*, such as tuna (*Thunnus spp.*), mackerel (*Scomber spp.*), bonito (*Sarda spp.*). They have large amounts of free histidine in their muscle tissues. This can serve as a substrate for bacterial histidine decarboxylation. As a result, histamine can accumulate in the fish. Normally, the histamine level of fish is 1.0 ppm. However, histamine levels as high as 430 ppm have been reported. Histamines have been found even in non-scombroid species like yellowtail (*Seriola spp.*) and dolphin (*Delphinus spp.*).

### Effect of histamines

Histamines can be found mainly in processed fish products and cheeses. The inherent histamines in food-stuff have generally no negative effect on consumers. But larger amounts can show serious poisoning symptoms, occurring within 10-90 minutes after consumption. Symptoms are similar to an allergic reaction and include facial flush, body rash, severe headache, shortness of breath, dizziness, thirst, vomiting and diarrhoea (particularly in children). Shock can occur in any situation where excessive histamine was produced.

### Fish meal and histamines

The major concern in aquaculture feed production is the freshness of the fish meal. Fish meal and other products of marine origin are prone to conversion of the amino acid histidine into histamine. This occurs particularly when the raw material 'fish' is not processed immediately into fish meal. This means the handling of the raw fish is very important for achieving a high quality fish meal. Today's fish meal of the highest quality is the one which is processed on sea.

It has been reported that the toxic histamine can be produced in just three to four hours with the fish at room temperature. During the processing of fish to fish meal the material is minced and heated. However, since histamine is heat stable, it will not be destroyed by heat. This means that the toxicity of histamine survives the production process of fish meal.

European fish meals have the lowest histamine content while the South American products can be higher. Today's trading of fish meal is done in accordance with histamine content of the products. There are three different qualities in the market with a given histamine level: Super prime (<500 ppm histamine), Prime (<1,000 ppm) and Standard (>1,000 ppm).

### Effects of histamines in aquatic animals

The negative effects of histamines in human beings are well documented; however, similar results are missing for cultured aquatic animals. It, therefore, only can be speculated that certain symptoms are related to extremely high histamine levels. Two points should be stressed:

- histamines may contribute to an inflammatory response by the animals
- histamines may cause constriction of soft muscle tissue. ●