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# Brown muscle syndrome in shrimp

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By Tim Flegel, Ph.D.

## Letter: Condition presents no danger to consumers

*The following was adapted from a recent letter by the author in reply to an earlier message by Masao Shimomura, executive managing director of the Japan Fish Traders Association. Shimomura had requested assistance in identifying discoloration in shrimp tissue. The information is reprinted here with their kind permission.*

The pictures sent to me appear to show shrimp affected by idiopathic muscle necrosis or IMN. This has also been called "brown muscle syndrome." I have observed it on rare occasions in black tiger prawns in Thailand, but it has also been described in other penaeid shrimp and the freshwater prawn (*Macrobrachium rosenbergii*).

Usually, the affected shrimp represent a small portion of the total harvest. When examined under a light microscope, the muscle tissue is degraded and large numbers of shrimp blood cells (hemocytes) can be seen aggregating in the area. These hemocytes release enzymes that result in the formation of the brown pigment melanin, which is what causes the brown discoloration.



Although unattractive, spots caused by IMN do not pose a health risk.

## No health risk

This is a normal shrimp defense function that presents no human health danger, even though it is unsightly. In addition, it will become black on cooking and although more unsightly, it is still harmless if eaten. The situation might be likened to the brown discoloration that occurs in a bruise or on an apple after it has been cut with a knife and left exposed to the air. In other words, it indicates injured, but not rotten tissue.

In spite of the tissue damage, no bacteria, fungi, or parasites have been seen associated with the muscle degradation. It has been suggested the phenomenon might be caused by excessive stress leading to the accumulation of lactic acid (a product of muscle metabolism) to such an extent that the tissue is damaged. This is followed by the arrival of large numbers of hemocytes to clean up the damaged tissue, which causes the brown coloration.

In one of our investigations with the electron microscope, we did find what appeared to be spherical viral particles in the cytoplasm of some cells in the area of IMN, but no further work was done on this. The significance of these particles remains unknown. With *M. rosenbergii*, the problem appeared to be associated with stress related to overcrowding, and the problem was solved by reducing the stocking density.

## Limited problem

It is hard to say what caused the problem in the shrimp. However, the extent of the phenomenon can be seen at harvest, and shrimp exporters in Thailand usually inspect samples of cultivated shrimp to determine whether significant numbers show brown muscle discoloration before agreeing on the purchase price.

This brown muscle phenomenon is not a cause for alarm to importers, as long as the number of such shrimp represents an insignificant part of the total volume imported. The affected shrimp can simply be removed and discarded because they are unsightly. They present no danger to other shrimp in the group or consumers.

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