

Measuring Lobster Hemolymph Proteins

Over the years, lobster total hemolymph (blood) protein (**THP**) levels have been used by scientists, researchers and by the industry itself to assess lobster health. Additionally, the industry will often make production decisions (holding time, processing, shipping, marketing, etc.) based on THP levels. Within the lobster industry, THP levels are usually measured indirectly by refractometry. The majority of the industry uses Brix refractometers. The Brix refractometers measure sugar contents in liquids by measuring the refractivity index, not THP levels. However, the Brix index is highly correlated to THP levels making Brix refractometers an inexpensive alternative to the traditional refractometers used in veterinary medicine.

Lobster THP concentration is influenced by the moulting cycle, water temperature and probably by many other factors including diet, size and gender¹. A hard-shell 'fully meated' lobster will normally have a high THP concentration, while a recently-moulted lobster will have a lower THP level. Additionally, healthy lobsters usually have higher THP concentrations than weak lobsters. Although each lobster company assessing THP concentrations will have their own guidelines, it is generally accepted that lobsters with THP concentration below 10 (on the Brix index scale) should not be used for long-term holding or long distance shipping.

The single most important factor influencing THP levels is the moult cycle. As lobsters get closer to moulting they will lose approximately 30 to 60% of tissue mass in the claws through muscle atrophy and dehydration². This process will

facilitate the withdrawal of the large portion of the claw through the smaller upper leg portion during the actual moult (**ecdysis**). As a consequence of dehydration, THP concentrations will increase. Following ecdysis, new-shelled lobsters immediately resume water uptake; body fluid volume can be approximately 50% greater than before ecdysis³. At this point, THP concentrations will be very low because of the dilution caused by the massive water uptake.

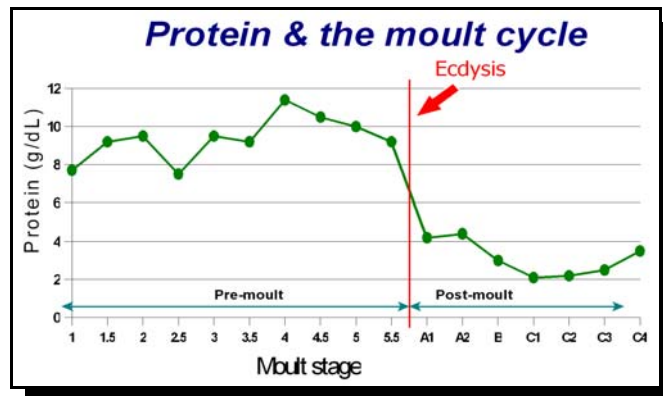


Figure 1 Relationship between lobster THP levels and the moult cycle. Adapted from Mercaldo-Allen, 1991. Changes in the blood chemistry of the American lobster *Homarus americanus*, H. Milne Edwards, 1837. J Shellfish Res, 10:147-156. Used with permission.

Figure 1 demonstrates the relationship between THP levels and the lobster moult cycle. Although lobsters will gain body weight due to water uptake after moulting, it may take several weeks before muscle mass increases to the maximum amount allowed by the new and larger shell. Lobster THP levels also increase over this period of tissue build-up.

Finally, there is evidence that lobsters kept out of the water for significant periods, especially if they are not kept in a cool and humid environment, will become dehydrated due to the loss of considerable amounts of body fluid. This results in higher THP concentration.

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¹ PATERSON & SPANOGHE. Stress indicators in marine decapod crustaceans, with particular reference to the grading of western rock lobsters (*Panulirus cygnus*) during commercial handling. Mar Freshwater Res. 1997; 48: 829-834.

² MYKLES. Getting out of a tight squeeze - enzymatic regulation of claw muscle atrophy in molting. Am Zool. 1992; 32: 485-494.

³ WADDY et al. Control of growth and reproduction. In: Factor JR, ed. Biology of the Lobster *Homarus americanus*. San Diego: Academic Press, 1995: 217-266.

⇨ **Lobster hemolymph protein levels are affected by several factors including the moult cycle, water temperature, diet, gender, size and health. These factors vary over time and therefore, variations in protein levels are expected throughout the year.**

