

Thesis Title Kinetics of the Enzyme *N*-Acetyltransferase in
the Optic Lobe of the Black Tiger Shrimp,
Penaeus monodon

Name Pattira Pongtippatee

Degree Master of Science (Anatomy)

Thesis Supervisory Committee

 Boonsirm Withyachumnarnkul, M.D., Ph.D.
 Reon Somana, M.D., Ph.D.
 Prasert Sobhon, Ph.D.

Date of Graduation

 6 July B.E. 2537 (1994)

ABSTRACT

N-acetyltransferase (NAT) is a rate-limiting enzyme playing role in the biosynthetic pathway of melatonin in mammalian pineal gland. The giant freshwater prawn *Macrobrachium rosenbergii* contains high level of NAT in the optic lobe. Its kinetics and light-dependent changes have been studied. Male *M. rosenbergii* has also been found to contain higher level of the enzyme than the female. Another crustacean species, black tiger shrimp *Penaeus monodon*, also contains high level of NAT in its optic lobe. The purpose of this study is to determine the enzyme kinetics and biochemistry of NAT in *P. monodon* and compare to those of *M. rosenbergii*, and also, to determine hydroxyindole-O-methyltransferase (HIOMT) activity. The latter enzyme is responsible for melatonin synthesis in the final-step reaction. The NAT activity was determined in the optic lobe with different tryptamine concentrations while

acetyl-CoA concentration was kept constant. Lineweaver-Burke plots reveal that the K_m and V_{max} of enzyme NAT were $21.45 \pm 6.64 \mu M$ and $112.43 \pm 17.20 \text{ pmol/hr/ug protein}$, respectively. The effects of temperature and pH on NAT activity had been studied. The enzyme activities were determined at $0^\circ C$, $28^\circ C$, $37^\circ C$, $50^\circ C$ and $60^\circ C$ when the pH was kept constant at 7. The activity rose from $0^\circ C$ to the maximum level at $50^\circ C$ and declined rapidly at $60^\circ C$. For pH variation, the activity was determined at pH 5.5, 6, 6.5, 7, 7.5 and 8 when the temperature was fixed at $28^\circ C$. Two peaks of activity occurred; one at pH 7 and the other at pH 6. The activity decreased markedly at pH 7.5-8 and pH 5.5. The level of NAT of the male and female, determined at pH 7, did not differ statistically. HIOMT activity could be detected in *P. monodon*'s optic lobes and the level in the male and female shrimp did not differ.