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APPENDICES

APPENDIX A

1. LB Broth (per Liter)

10 g of NaCl

10 g of tryptone

5 g of yeast extract

Add deionized H_2O to a final volume of 1 liter. Adjust to pH 7.0 with 5 N NaOH and autoclave.

2. LB Agar (per Liter)

- 10 g of NaCl
- 10 g of tryptone
- 5 g of yeast extract
- 20 g of agar

Add deionized H_2O to a final volume of 1 liter. Adjust to pH 7.0 with 5 N NaOH and autoclave. After, pour into petri dishes (~25 ml/100-mm plate)

3. LB-Ampicillin Agar (per Liter)

- Prepare 1 liter of LB agar. Autoclave and cool to 55 °C
- Add 50 ml of filter-sterilized ampicillin
- Pour into petri dishes (~25 ml/100-mm plate)

4. 1x TAE Buffer

- 40 mM Tris-acetate
- 1 mM EDTA

5. SOB Medium (Per liter) :

- Bacto-tryptone 20 g
- Yeast extract 5 g
- NaCl 0.5 g

6. Ampicillin

Stock solution. 25 mg/ml of the sodium salt of ampicillin in water. Sterilize by filtration and store in aliquots at –20 °C

7. 5 M NaCl

Dissolve 292.2 g of NaCl in 800 ml of H_2O. Adjust volume to 1 liter. Dispense into aliquots and sterilize by autoclaving.

8. 1 M $MgCl_2$

Dissolve 203.3 g of $MgCl_2 \cdot 6H_2O$ in 800 ml of H_2O. Adjust volume to 1 liter. Dispense into aliquots and sterilize by autoclaving.

9. 3 M Sodium acetate (pH 5.2)

Dissolve 408.1 g of sodium acetate $\cdot$ $3H_2O$ in 800 ml of H_2O. Adjust pH to 5.2 with glacial acetic acid. Adjust volume to 1 liter. Dispense into aliquots and sterilize by autoclaving.

10. 10% Sodium dodecyl sulfate (SDS) (also called sodium lauryl sulfate)

Dissolve 100 g of electrophoresis-grade SDS in 900 ml of H_2O. Heat to 68 °C to assist dissolution. Adjust the pH to 7.2 by adding a few drops of concentrated HCl. Adjust volume to 1 liter. Dispense into aliquots.

11. Ethidium bromide 10 mg/ml

Add 1 g of ethidium bromide to 100 ml of H_2O. Stir on a magnetic stirrer for several hours to ensure that the dye has dissolved. Wrap the container in aluminum foil or transfer to a dark bottle and store at 4 °C.

12. TE pH 7.4

- 10 mM Tris · Cl (pH 7.4)
- 1 mM EDTA (pH 8.0)

13. TE pH 7.6

- 10 mM Tris · Cl (pH 7.6)
- 1 mM EDTA (pH 8.0)

14. TE pH 8.0

- 10 mM Tris · Cl (pH 8.0)
- 1 mM EDTA (pH 8.0)

15. Tris-Borate (TBE)

-Working solution

- 0.089 M Tris-borate
- 0.089 M boric acid
- 0.002 M EDTA

- Concentrated stock solution (5x)

Per liter:

- Tris base 54 g
- Boric acid 27.5 g
- 0.5 M EDTA (pH 8.0) 20 ml

16. Gel-Loading Buffer Type II

- 10x buffer

- 0.25% bromophenol blue

- 0.25% xylene cyanol

- 25% Ficoll (type 400) in H_2O

- Store at room temperature.

17. 10x TEN buffer

- 0.1 M Tris-Cl (pH 8.0)

- 0.01 M EDTA (pH 8.0)

- 0.1 M NaCl

18. Equilibration of Phenol

Before use, phenol must be equilibrated to a pH of > 7.8 because the DNA partitions into the organic phase at acid pH. Wear gloves, full face protection, and a lab coat when carrying out this procedure.

1. Store liquefied phenol at –20°C. As needed, remove the phenol from the freezer, allow it to warm to room temperature, and the then melt it at 68°C. Add hydroxyquinoline to a final concentration of 0.1 %. This compound is an antioxidant, a partial inhibitor of RNase, and a weak chelator of metal ions (Kirby 1956). In addition, its yellow color provides a convenient way to identify the organic phase.

2. To the melted phenol, add an equal volume of buffer (usually 0.5 M Tris-Cl [pH 8.0] at room temperature). Stir the mixture on a magnetic stirrer for 15 minutes. Turn off the stirrer, and when the phases have separated, aspirate as much as possible of the upper (aqueous) phase using a glass pipette attached to a vacuum line equipped with appropriate traps (please see Appendix 8, Figure A8-2).

3. Add an equal volume of 0.1 M Tris-Cl (pH 8.0) to the phenol. Stir the mixture on a magnetic stirrer for 15 minutes. Turn off the stirrer and remove

the upper aqueous phase as described in Step 2. Repeat the extractions the pH of the phenolic phase is >7.8 (as measured with pH paper)

4. After the phenol is equilibrated and the final aqueous phase has been removed, add 0.1 volume of 0.1 M Tris-Cl (pH 8.0) containing 0.2% β-mercaptoethanol<!>. The phenol solution may be stored in this form under 100 mM Tris-Cl (pH 8.0) in a light-tight bottle at 4°C for periods of up to 1 month.

19. Phenol: Chloroform: Isoamyl Alcohol (25:24:1)

A mixture consisting of equal parts of equilibrated phenol and chloroform: isoamyl alcohol<!> (24:1) is frequency used to remove proteins from preparation of nucleic acids. The chloroform denatures protein and facilitates the seperation of the aqueous and organic phases, and the isoamyl alcohol reduces foaming during extraction. Neither chloroform nor isoamyl alcohol requires treatment before use. The phenol: isoamyl alcohol mixture may be stored under 100 mM Tris-Cl (pH8.0) in a light-tight bottle at 4 ^{0}C for period of up to 1 month.

20. Glycerol (10% v/v)

Dilute 1 volume of molecular-biology-grade glycerol in 9 volume of sterile pure H_2O. Sterilize the solution by passing it through a prerinsed 0.22 uM filter. Store in 200-ml aliquots at 4 ^{0}C

21. IPTG (20% w/v, 0.8 M)

IPTG is isopropylthio-B-D-galactoside. Make a 20% solution of IPTG by dissolving 2 g of IPTG in 8 ml of distilled H_2O. Adjust the volume of the solution to 10 ml with H2O and sterilize by passing it through a 0.22 uM disposable filter. Dispense the solution into 1-ml aliquots and store them at -20 ^{0}C

22. X-gal solution (2% w/v)

X-gal is 5-bromo-4-chloro-3-indolyl-B-d-galactoside. Make a stock solution by dissolving X-gal in dimethylformamide at a concentration of 20 mg/ml solution. Use a glass or polypropylene tube. Wrap the tube containing the solution in aluminum foil to prevent damage by light and store at -20 ^0C .It is not necessary to sterilize X-gal solution by filtration.

APPENDIX B

Table B1 Summary of partial gene sequences from RT-PCR using hepatopancreas first strand cDNA as template

Gene	Primer	Nucleotide Sequence
1. Cytochrome P450	F1R2	**TTCATGTTCGAAGGCCACGACAC**CACCACGGCGGCCATGAACTGGGTTCTCTACCTCCTGGGTCATCACCCAGAGATACAGGCTCGGGTCCACCAGGAGCTGG ACTCGATCTTCGGTGACGAGGACCGCCCGGCGACGATGGACGACCTGCGCTCCATGAAGCTGCTGGAGAACTGCATCAAGGAGGGCCTGAGGCTATTCCCGTC CGTCCACAGGTTTGCCAGGACGCTGCGAGAAGACGTCCGCATATGCGACTACGTCATCCCGGCCGGAACCAACATCATGCTCTTCGTGTACCGAATCCACCGC GACCCGAAGCAGTTCCCCGACCCGGAGAGGTTCGACCCGGACCGCTTCCTGCCCGAGAACAGCAAACACCGC**CATCCTTACGCGTATGTTCC**
2. Beta glucuronidase	F1R1	**GGTAAATCGCTACTATTCCTGG**TACAGTGACACAGGGCACCTAGAGCTGATTTATAATCAGACTGTGAATGAGTTCATTGAGTGGCATCTCCTCCACAACAAG CCCGTTATGATCTCAGAGTATGGAGCTGGGTCCATTGCTGGTTTCCACATGGACCCTGCATTCACATGGAC**TGAAGAATACCAAGCAGAGTTG**
3. Glutathione-s-transferase	F1R1	**AGGTCGGTAATGCTAACGGC**CAAGGCAGTGGGCATCGAACTCAACCTGAAGCTGCTTAACCTGCCGGCGGGAGAGCATATGAAGCCCGAGTTCGTGGCCATCA ACCCTCAGCACTGCATCCCCACCTTGGTCGACGGGAACCTGAAGCTGTGGGAGAGCCGCGCCATCTGCACCTACCTGATCGCCAAATACGCCGAGGACGACT**C** **ACTCTACCCGTCCGACCCG**

Remark: Underlined letter indicates location of primer

Table B2 Summary of 5' and 3'nucleotide sequences from RACE PCR

Gene	RACE PCR Product	Nucleotide Sequence
1. Carboxylesterase	5'	ACGCGGGGGGGGAGTCGTGGCTGTGCCTCCGGAGCGGAAAGATGGTTAGTCGAAGTTACGCAATGAAGCTGTGGGTCCCTCTTCTTCTGACGGCCTG GATGGCAACACTGTCGAAGGCGCAGCAGCAGGAAACCACGACATCCACAGAGCCTTCGATTGAGGTGCGTCTCCGGCAGGGCGTGATCACAGGGGCC CAGTCAGAGGCCGGAAACGGTAGGGTCTTCTACAGCTTCAAGACCATTCCCTTCGCCGAGCCTCCTGTCGAGGACCTAAGGTTTAGGGACCCTGTTC CTGCAAGGCCATGGGCAGGAGTAAGAAATGGATCCATCGCCACACCGAAATGCCCACAGTTGGGAAATGCTACTGTTGAGGGGCAGGAAGACTGTCT CTATCTCTCCGTCTACACACCTCGGCCTTACGCGTCGGACTTGCCTGTCATGGTGTGGATTCACGGCGGAGGATTCACGAACGGTCAAGGCGAGGTC TTCGGGCCCCTTCCTCTCCTCACGAAGGATGTGGTCCTCGTGGTCATACAGTATCGCCTGGCCACGCTGGGATTCTTATCGACTGAGGACAATGAGC TGCCTGGCAATCTAGGACTCAAGGACCAAAGGATGGCTCTCCTGTGGGTG**CAAGACAACATCCGTGACCT**
	3'	**ATTTTCTACCCGACTACCCCGCCGTTCT**GCTGAGAAGAGGACGGTATAACAAGGTGGACATTATATCTGGGATTACGCAAGATGAGGCAGCCGTGAT TGGCCTGATTTTCACCTTGGACAAAGCCGCTGCAAACAGCCTGGTCCAGAACTTCTCTGTCAACGGACCAGTTTCACTGATCTTCGAAGCTTGGGAA GATGACCCGGAGTACCTGGCACGCCGAGCCTTCCACCACTACCTGGGCGCCATTGAAGTGACAGAAGAGAAACGGGATTCACTTATCAGGCTTTTCA GTGATAGAATGTTCGACATGTGTCATCTTGACGCGGTCGGGCAACACCTCAGAACATCTCATCAGAACGTGTTTACATACAAACTGCAGCATGACGG AGAACACCAGTTTGTTTTTGGTCTTTTCCCTACTACTCCGGATTGGTACAAAAGCTATGTCGGTCACGCAGATGATATTTTGTACCTGTTCGGTCAA GCTGAGGGCAACAGAACGTTGAAGCGAGACGAGGATCTGTTCGTTAGCCGTATCATGGTAGAGCTGTGGACCAACTTCGCTTCCGTCGGACACCCGA CGCCTGACATGTCCCTCGGCTTCAAATGGAACCCGACGTCCTTCCCAACAGACTCCTACTTGTCCATCACCTCCTCACCCACCATGAAAACCTTCGA AGACTGCGAGACCCGTGAATTCTGGAAGAACATGCCTACCAAGAATAACAAAATGCTGTACCCTGAGCGCTTCTACAAGTGTCACTTACCTGGCTGC

Gene	RACE PCR Product	Nucleotide Sequence
		TTAGACATGTACCTGTAATAAACTGATAGGATGGCGCTTCACTGATATCTAGTTGTCAGTGTCATTAGTGCCAAGAGACCCTGTTCTTATTAGTTTA ACAAATATTTAGCAGATAATATGTTCTTGGTGTGCAGTTTATTGAAATCTAATAAATACAGGGTGAGTGTGATCTAATAACAGTAACGTAGCCATTG TTTACATTTTTTTCTTTTTTTTGCACCATATTATCAAAATATTTTGAAAGTATGATTACCATCAGCTTCTGTGCCAAATCATATTTTCCAGTTTGT CAGAGATTATCAGTATTTCTCATAACCTTTGTGTCACAATTTATGTAACATCGCAGTTATCCGTGATGCTGTTTTTGTGAACGTATATGTACACAAT TAATAAAGGAACTATTTCGAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGT
2. Cytochrome P450	5’	ACGCGGTGGAGTTGCTGCTGCGATGTGGCCCAAGAACGACACCCTCGTCTGGGCCTCGAGTGCCTTCACGTACCTAGCCTTCACCGTGACGCTGGCC CTCGGCCTGGCCTGGTTCTTGCAGAGGCAACGGAAGTCATGGCTTCTTGCCAAGATCCCTGGTCCCAAAGCCCACGTCCTCTTCGGTTCTCACCGTG CCGGTGGCGCTGCAGAGGACCGCATCCAATGGCTCATCAAGACAAGCACCCTGGGGGAAGTCGTCAAATTCTGGATTGGCTTTCTCCCGACGTGCAT GATCTGCAGCGCCAGAGGGGCAGAAGTTATTCTTACAAGTCAGAAGCACATCAATAAAGGCAATAATTACAACTTTCTCAGAGACTGGCTTGGCGAC GGCCTCCTGACAGCCACAGGAAGCAAGTGGCACTCCCGAAGGAAGCTGCTGACGCCCGCCTTCCACTTCAAGATCCTGGAGGACTTCCTGGACGTCT TCAACAGCCAGAGCACGACGATGATCCAGCAGCTGCGAGGGAAAGCCGACGGAAGCCGTTCGACGTTTTCCCTTTCATCACGCGCTGCGCCCTCGA CATCATATGTGAAACTGCGATGGGCCGAACGGTGAATGCCCAGTGCAATGCAAATTCCGAGTACGTGAAAGCCCTCAATAGGTTCGCTGAGCTACTG ATTAAGCGGTCGACGACGCCGTGGCTCCGCCCCGACTGGCTCTACACTCTCTTCGGCCAGAGGAGTGACTACGACGCCTGCCTGAAGGTCCTCCATG GCTTCTCCCAGGAGACCATCGTGGAGAGGAGGGCGCTACTGCAGAACTCCAAGAGGAATGGCAAGGAAGAGGACACAGAGGAAGTCTTTGGCAAGAA GAAGCGGCTGGCGTTCCTGGACCTCCTGCTGGAGTACTCGGAAGACGGCGCCAAGCTCTCCGACGAGGACATCCGCGAGGAGGTGGACACCTTCATG TTCGAGGGCCACGACACCACCACGGCGGCCATGAACTGGGTTCTCTACCTCCTGGGTCATCACCCAG**AGATACAGGCTCGGGTCCACCAGGAG**
	3’	**CACGACACCACCACGGCGGC**CATGAACTGGGTTCTCTACCTCCTGGGTCATCACCCAGAGATACAGGCTCGGGTCCACCAGGAGCTGGACTCGATCT TCGGTGACGAGGACCGCCCGGCGACGATGGACGACCTGCGCTCCATGAAGCTGCTGGAGAACTGCATCAAGGAGGGCCTGAGGCTATTCCCGTCCGT CCACAGGTTTGCCAGGACGCTGCGAGAAGACGTCCGCATATGCGACTACGTCATCCCGGCCGGAACCAACATCATGCTCTTCGTGTACCGAATCCAC CGCGACCCGAAGCAGTTCCCCGACCCGGAGAGGTTCGACCCGGACCGCTTCCTGCCCGAGAACAGCAAACACCGCCACCCGTACGCTTACATTCCCT TCAGCGCCGGACCCAGGAACTGCATCGGCCAGAAGTTCGCCCAGATGGAGGAGAAGGTCCTTCTCAGCAGCATCCTCCGCAAGTTCCGCGTCGAGAG CACTGTCCCTCGAGAGTCCCTGAGGACGATGGACCACTTTGTCTTGCGGCCAAAGGGAGGGAATAACCTGAGGCTCTTCCCGAGGTCGTGACGACAA ACACGCCAAGACGAGCTAACAATCCTGGGTATCGATTGATGGGATCAGTGTACAGTGATTGGGGGATCTTGCTTGGATGGAAGGAAATACACTCGTG TAATGTGAATAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGAAG
3. Glutathione-s-transferase	3’	**TGGGCACGCTCTACCACAGGTTCGGGGA**GTACGTGTACCCCGTGATGTTCTACGGGCAGGAGAAACTCGAGCCGGCGAAGTTGGAGAAGCTGCACGA AGCCCTGGGCTGGCTCGACGGGTTCCTGGCCGGCCACGACTGGGCCGCC*GGCAACAACATCACCGTCGCCGACTTCGTGCTGGTCGCTTCCGTGTC CTCCTTCGAGGTCTGCGGCATCGACCTGAGCAAGCACAGGAACGTGACGACGTGGCTGGCGCGCTGCAAGGCCGGCCTTCGGGGCTACGACGAGGCG AATGCTCCCGGCGTGAAAGACCTCGCCAGGATGACGGAGGCGAAGCTGGCGGGCAAGTAGGGGCGGCGGCGAGCATGGGGGCTCTTCTGCTTGCAAA GGCTCTATTACATGCAAGACTTAATCACCCAAATGGTTAGACGAGAGAGAGGCAGAGCGAGCGGAGATTTTAGAATGAAGAATACCACTCGTATAAC AGAAAGAAATGTATTATAAGCAGTTACATACTGAAATGAAAAGGAAATGAAGATTAGGGAATAGGTGTCGGAAATCACTTTATCAGTATATTTTCTT TGTTGAACTTTGTCCAAAAATTGTTCGTTACATAATCTGCTGGAATCTAGCGCTCTCTCAGCCAAAATAAAGGAGTGACTAANAAAAAAAAAAAAAA AAAAAAAAAAGT

Remark: Underlined letter indicates location of primer

Table B3 Summary of partial gene sequences from mRNA DDRT-PCR using A anchored oligodT first strand cDNA as template

Product	Nucleotide Sequence
OPA07A-350-7-1	**GAAACGGGTG**TTGGTGTGCTCCCTCAGCGGAACATCCTGCCACGTGCTGATGTCTAACCTCACGCACCCAAGAGGTATACAGCTGGACTTGGAGAACAGGTACGTGTACTGGACTGACGTTAACCGGTCGACCTTGGAGCGAGCTAGCCTGGATGGGTCAGGTCGAACAGTCCTCATCTCGGAGGGCGTGAGGTGGCCCAATGGACTGTGGATAGATGCTCCAGCGCGGAGGATATACATAGCGGATGCTCATACCAACGAGGTCTTTCATGTGAACTATAATGGACCGATAAAAAGCACCTTGCGGAGGCGTCAGTGGAT**CACCCGTTTC**
OPA18A-500-19-1	**AGGTGACCGT**GACTTCGATTGCCATGACCGATCTGATGAGGCTAACTGCTCTTCTGTACAGTAAGTGAAGCATATTGTGTTCTGGCCTGATATAACGTAAACATTTTGCATTATATCTTGTTTCCATGATTGCCTCAAACACGAGGAAACGATCCTAGTATGATTAATATTAAGTCCAGGCGATTTCAATAGACTTTCAGGAATTACAAATACTTTTAGGTTAAATCATCCAATCGTAGCTGAATAAATAGTTCTAGAAATACCAAATCACATTAACTTGTATAATGACCTCAAGTATAATAAACCCTACACTCTGAAACGACACTTGAGGTCAAAATCTCATCCTTGAAACTAAAACCAGAAAACACACTTAATACGACTTGAAAGTTTTTTTTATATCACATGTGACCTTTTTCAGCACCTGTGACCTTTTTTCTTGCATATAAGACCTTTTTATAGCACACGCGAGATTTTTTCCAGCACATGTGACTTTTTTTCAGCACATGTGGTCCTTCTTACCATCGCTGCGGAG**ACGGTCACCT**
OPA18A-550-18-1	**AGGTGACCGT**GAGCAGTTTCTTAGTCAGCCTCCACTGTATGCTCCTGCCACACCAGTCTGTGAACAGGAAGTGTCTCTCGCATCCATGATATCAGTTGAAACTAACCATCCAGATTCATCAGATCGAGTTACATCTCCTTCAGTTTTATCAGTATCAAGTGCTGCCTCAAGCAAAAGACTGGAATGGGACTCTGGGGCTGACGTTGGCTATGCAGGCAACACACCAGAACAAATGACAGCATCCTTGAGTACTCTAGAGAGGATTGCTATTGGAAACTATGCATCTGTGTTAAGAACAGAACCTGAAGGGACAACCCAAGTGAAAGAAAAACTAAAGAATTCTAAGAAGAATTACAAAGCAAGTGGAGCAAAAGGTGGTGGAAGCCTTATGAGTGTTAAGCGCAACATTCCTGAGGTTGTGGGTTCATTGCCTACTCGATCACTTAGAGTCCCACAGATTCGTGAAAGAAAACTTGTCTCTTCTAGTGATGAGGAATTTGACAGCAGACGGACAAGTCCCTCTCAAAGTCCAAGACGGAAGCCAAGAAG**ACGGTCACCT**
OPA18A-550-18-2	**AGGTGACCGT**CTACCTCGGCCTGCGCTTGCACTCGTCCAAACTCGAGAAAATTACGCTGAATAATGTCAGTCTCAGCGATACAGTCGACAGTATCAAGCAGACAGCAGCTAGCAAGGGCAAGACGTCGGCGGATAAAATCGAACTAGTCCACTGTGGTGTCATTCTGAATGGATCGGAGACGCTGGAAGAAGCAGGAATCACCTCGGGTGCTATGATTCACTGTCTTCCCAAAAAAGAGGATCCTGTAACTGTGGCCGTCCCATTAAGCCTCCCTGAAGTGCAGACATTACTGGTGTCTCTGAGAAATGTTGCCGCTCACCCAAATTTCCGTGCTTTTATACAAAAACTGCGAACCCCAGAGATGGTGGAGAAGGTGCTCTCATCGTGTCCGATTGCTCGCAGTGATCCATCAGCTCTCTCCATGCTTCAAGACCCTGAGCTGTTTATGGGACTCACTAATCCAGATAACTTAAGCAAGGTCGTAGATAGTAATCCTGCAGTGGGAAGGGTGGCAGAGTATGTGACATCCCTCATGACGTCGGACACCACTTCACCTCG**ACGGTCACCT**
OPA18A-600-17-1	**AGGTGACCGT**CTACCTCGGCCTGCGCTTGCACTCGTCCAAACTCGAGAAAATTACGCTGAATAATGTCAGTCTCAGCGATACAGTCGACAGTATCAAGCAGACAGCAGCTAGCAAGGGCAAGACGTCGGCGGATAAAATCGAACTAGTCCACTGTGGTGTCATTCTGAATGGATCGGAGACGCTGGAAGAAGCAGGAATCACCTCGGGTGCTATGATTCACTGTCTTCCCAAAAAAGAGGATCCTGTAACTGTGGCCGTCCCATTAAGCCTCCCTGAAGTGCAGACATTACTGGTGTCTCTGAGAAATGTTGCCGCTCACCCAAATTTCCGTGCTTTTATACAAAAACTGCGAACCCCAGAGATGGTGGAGAAGGTGCTCTCATCGTGTCCGATTGCTCGCAGTGATCCATCAGCTCTCTCCATGCTTCAGGACCCTGAGCTGTTTATGGGACTCACTAATCCAGATAACTTAAGCAAGGTCGTAGATAGTAATCCTGCAGTGGGAAGGGTGGCAGAGTATGTGACATCCCTCATGACGTCGGACACCACTTCACCTCG**ACGGTCACCT**
OPA18A-600-17-3	**AGGTGACCGT**GAGCAGTTTCTTAGTCAGCCTCCACTGTATGCTCCTGCCACACCAGTCTGTGAACAGGAAGTGTCTCTCGCATCCATGATATCAGTTGAAACTAACCATCCAGATTCATCAGATCGAGTTACATCTCCTTCAGTTTTATCAGTATCAAGTGCTGCCTCAAGCAAAAGACTGGAATGGGACTCTGGGGCTGACGTTGGCTATGCAGGCAACACACCAGAACAAATGACAGCATCCTTGAGTACTCTAGAGAGGATTGCTATTGGAAACTATGCATCTGTGTTAAGAACAGAACCTGAAGGGACAACCCAAGTGAAAGAAAAACTAAAGAATTCTAAGAAGAATTACAAAGCAAGTGGAGCAAAAGGTGGTGGAAGCCTTATGTGTGTTAAGCGCAACATTCCTGAGGTTGTGGGTTCATTGCCTACTCGATCACTTAGAGTCCCACAGATTCGTGAAAGAAAACTTGTCTCTTCTAGTGATGAGGAATTTGACAGCAGACGGACAAGTCCCTCTCAAAGTCCAAGACGGAAGCCAAGAAG**ACGGTCACCT**
OPA18A-650-16-3	**AGGTGACCGT**CCTCGCAGAAGGTGGCTGGCAGGTGGAATTCAGAGTCACTGTTGGAAATGACAACGGCTTTGTTGGCATTGATGACGTCATTCTGAGTCCCGACGCCTGTCCCGATCCTGTTTCCTGTGACTTCGAAGATGGCAGTTGCTTGTGGCTGAACTTCGGGGGAAATAGTTGGATCACGGGCCGCGTGACGGACGACCCGAGCCAGTCTCCTGCCCTGGGTTTCGCTCCGCCGTACGACCACACGACCGGGACTCCATATGGCCACTACCTTTACTTCTACGATGCCGCGGACTTGCCTGCAGAAGCGGTCACGGCCATCGTTCTCTCTGAGGTCTTCAGCGTCCAACGGCAGTCGTGTTTGTCCTTTTGGATCCATATGTTCGGTGATAAGGTTGGTCGACTCACCCTCAAGACCATACAAGACCAGGGTACCCTCGTCCTTAAATCACTAGAGGGCTCACAAGGACTTCGCTGGAAAAACATACGGGTCGAATTAAGCGTCACTCCCGACCACTGGCTATCTTTCACGGCAGAGGGCGTTGCTGGCCACACCAACGTTGTGGCCATAGATGACATTTCACTCTATGCAGGACCCTGTCTGGATAATTCT**ACGGTCACCT**

Product	Nucleotide Sequence
OPB07A-225-15-3	**GGTGACGCAG**AGAACGCAGGCAGAAAGTCTAGCAGTTGCTTCGCCTCATTAGCCTGCTTTTCGTATTTCATCTGGAGGCCCAGGGTGTCCCTCCCCCACCCCTCCTCTCCAGTACAGGCGACTGGACAGAAC GACTCACCTTAAGCATCACAACAAGAAGAAGAAGCTGACTGAGAACTCTGCTTGCCATGCTCAGGGTGTAATCAACACATTCCCTCCACAAGG**CTGCGTCACC**
OPB07A-250-14-1	**GGTGACGCAG**GACCAGTTGGCGAGTGTCAATACCGTGGTGAAATTTGCCGACAAGGGTAAATTGATTGCTGGGTTTGCCCGTTCTGAAAATATCAATGACGGTTCAAACTCTTTAACACAGATTAACACCAC GGCAGATGCAACAGGTAAATTATCGGGGAATGCGGCTCGTGTTGAACTGAACTATGCCTATAAGAATATGGAGCTGAAAACCTACCATAATCAGGCAAATACAGGGTTCTATAACA**CTGCGTCACC**
OPB07A-250-14-2	**GGTGACGCAG**CTGGCTGTGAGCGGAGGAGCGGAGGAACAAGCGAAGAGACGCGGTTGGGTGCTGCTCCTGTGAAGACCTCGTGTGTGCCTTGTGACCTGAGATAAACCTGGTGTTGCCCTGTTATAAGCTGT ATTGTGCTGTGTGACATGCTGGTTTCCCCCCTGTATTGTGCCTATAGAAAAGTGTACGGGTAAATAACTTGTGTAAATAAAGGAAAGACTGTCATTTTGTGTTTACTTCGTGCC**CTGCGTCACC**
OPB07A-650-13-1	**GGTGACGCAG**GAGCAAATGAAGGAATTGCAGACCAAGCTTCAAGCCCGCGGCTATGACATGGAAAAATCGACGGCGTTTTTGGCGTACTGACGCGTGATGCCGTTCGCACCGAACAGTTGCGCCTTGGAAT GCCTGCCGATTCATGGCCAACGCCCGAACTGCTCGAAAAGCTCTAAACCAAAGTAAATCAAAGGCGCGGACCACCCCCGCGCCTTTCAACTTTTGCAAGTTATTCAAGCGCCATGATTTCCACCCTTATCAT CGTTCTGCCCGTCTTCGCTCTCATCTTTTCAGGTTGGGGTGCATTCAAGCTGAAGATATTGGGGCCGCATGCAATCGCAGAGCTCAACCGTTCCGTTGTCTATCTGGCCCTGCCAGCCCTGCTTTTCGACAT CATGGCCAATACCCACGGCAGCGATTTGTGGCAACCCGGCTTTATCAGCGTCTTTCTATTGAGCAGCGCTATCGCCTTTGCCCTGCCTTTCATCATCCGCCTTCGCGGCAAGTTATCTTGGCCGACAATGC GCTTGATGGACTGAACGCCGCCTATCCCAATACGGGCTATATGGGCATCCCGCTTTCGATGATCGCTTTCGGATCCGGCGTTCTGGCTGCTACAACGATTTCTATCATCATCACCGT**CTGCGTCACC**
OPB08A-275-8-3	**GTCCACACGG**AACGATACTTTGTGCTCCAACACACATTTTGACAAGACAGAGCTTGGACTAACTTTATACTTATCTTGCCTCAAAGCCCTCCATTCCCCATCTTGTTATAATATATGTGGTGGAGGTTTGTT GACAGTCACTGAAGCATGAAGCACTGAAGTCATGGTACTGTTTAAGAATTAACTAGAAATCTATGTTTACCTTTATTTTATGTAGATGCAGTTTATGACTTCTTTATATCAAATCAATGCTTTTCTCTTCT**C** **CGTGTGGAC**
OPB12A-800-20-5	**CCTTGACGCA**CTCCATGGATTTGGGAGCAAGAGATTCAAGAAGCCTGAATTAACCTCCTTGATGGAACACACACGGTTGAGAAATATTGCCATCTCCAGGCGAAAACTGGATCTGCCATTTGACATAGTTAG CAGAGCCATCAATTCGTTAGACTTAAAGACGCTGAGTGTAGAGAGTGTGGAACTCCTTCAGCGCATGATACCCAATGATTCAGAGGTCAAGGCGTATCGTGAGTACGAACGTGATCGGAAACCTGTGAACCA GCTGACAGATGAAGACCAGTACATGCTCCAGCTCAGCAAGGTGGACAGATTGAGTACCAAACTACAGATTATGAGCTTTATTGCCAACTTCTTTGACAGTGTACATACTGTCACTCCACAAGTTCATGCAAT CATCACAGCATCGCGCTCAGTTAGAAATAGTAACAAGTTGAAAAAAGTACTTGAAGTAATTCTTGCTTTTGGTAACTACATGAATAGCAGCAAACGTGGTCCAGCTTATGGCTTCAAACTTTCGAGTCTGGA TACTTTGTGTGATACAAAGTCAGCGGACAAAAAGATGAGTGTGATGCATTACATTCAGGAAACCATGAGAGCGAAGTTCCCAGATATCACTAATTTCGACGCAGAACTAAGGTTTATTGAAAAGGCTGCACA GGTATCACTGGAGAATATTATCACAGATGTCAGTGAACTAGAAAAGGGTATGGAGCAAGCAAAGAAGGAATATGAACGGGGAAGAGACATGAGGAGTGTGGAGGGACAGGC**TGCGTCAAGG**
UBC119A-250-11-2	**ATTGGGCGAT**GTGCTGTCAACCAGAGACAAGTAGTGATTGCTCTCACCGGGGGAGAAATTGTTTACTTTGAAATGGATCCAACAGGGCAGCTAAATGAATACACAGAGAGGAAGGAGATGAAGAGTGACGTC ATCTGCATGGGCCTTGGGCGTGTGCCTGCTGGGGAACAGCGATCCAGGTTCTTGGCTGTGGGGCTCTCGGACAACACTGTCAGGATCATATCCTTGGATCCTAATG**ATCGCCCAAT**
UBC119A-250-11-4	**ATTGGGCGAT**CGGAAAGTGCGAACAGGCTCATCACGTGGGCCTTAAATGCTAAAGTCCACGCCTCGATTTTGCTTTTCCCAAGGAAGCCGTTATGCCGGATGCAACGTCCCTAAGCGCTGGATTCATGGTGG TTCATGGCAACCGCCTGGACGAACTGCGCAGCCTGGTGGTCAGTTGGATGCGCCGCTATCCCTTGGCCCCGCTGGAAAACGAAATCGCCTTGGTGCAAAGCAACGGT**ATCGCCCAAT**
UBC119A-650-F-5	**ATTGGGCGAT**GGTGATGGGCAAGAGGTACTCCTACGACGACGCCAAAATGGCCACCCTCCTGAAGACGTTCATCGCGCCGGCCGACATCAACTTCCTCTCTCCTCTCCACTTCATCCCCGGAGCGCTAAAGT TAGCTTCCTTCATACCCATACTAAAGCAAGACGTTAAGCCGTTAAAGAACGTTACCAATTTCATCAAGAATGAGTTGGAGGAATTCCAGCGTGACGAGACGGCGAAGAAAAGCGACTGTTTGACGGCCTTGT ACCTGCGAGAGATTGAGGAGCACAAGGACAAACCTTCCTTCTTCCACTTGGATCAGCTAGTGGCAGTGATTTTCGAAATGTTTGTTGCCGGAAGCGAGACGACATCGAGCACACTGTCCATGGCGGTGTACT TGCTCGCCAAACGCCCGGAGGTCCAAAAGCGTGTCCATGAGGAACTGGACAGGGTGGTGGACAAAGACCAGCTACCGTCCTTCTCTCATATGGACCAGTTACCATACACGCTGGCTACCATACACGAAGTGC AAAGGACATTCAGACTCGCCCCGTTCAGCCTCCCGCACTCAGTGGTGCAGGATATCACGATCAATGGTTATCATATCCCCAAAGGAACAATTCTC**ATCGCCCAAT**
UBC119A-700-9-1	**ATTGGGCGAT**CAAATTAAGTTGAAGGTGTCGGAAGATGTTGAAGACAACACCACAACGGCCTACGCGAATGTCAAAGGATTTTCGGGTAGCGGGCTGTTTAGACAGGATAACAACCATGTTTACATTGCCGG GATTGTAACAGAGTACCAAGCGGGTATCAAGCGATTCATTGCCCATACCCTCCCCCCGCTGAATACCTTATTGCGTACGCACAACTTTCCCGAGTTGAGTTTTACAGTCGCTTCAGCTACCAGTATTAGCAG TGCCCAGAATGATCCAGTGGATTTTGTTGATCAATGTCAGCGTTTGTTAGATGGGGCTAAGCAGGCCTGGGAAGACCTACGACCAAAGCAAGGGCTAATCCTTATTCGAACGGTTCGCGGTAACCTTGAAAC GGCTGTTTTGTCAACTGAACGAAGAAAATCGCTGCTGGCGCAAGTAAACTACTTGGAGGCATTCATGGTGGGGATCTCCGTGAGGATGTAGATGTAGATGAATTATTCATCGAAGCCCATTTGCTTATCCC CGAAGTATTGAATTATCAGGAACGGGCAGCCAATGCTTACCTGAACAAAGAACAACCTGACAAAGCCTACGAAGTAGCAGAGACTATTCTAAAGGAACATCCATTTAACCCCTATGCTTGGCTAATC**ATCGC**

Product	Nucleotide Sequence
	CCAAT

Remark: Bald letter indicates primer location

Table B4 Summary of partial gene sequences from mRNA DDRT-PCR using C anchored oligodT first strand cDNA as template

Product	Nucleotide Sequence
UBC101C -1000-D-3	**GCGCCTGGAG**CACTTCCTCGACAGCGCGGCCCTCCTCGCCTGCCTCAGGGGCGTCTCGGCCGAAGCCCTCGTCGACGTGCAGAGGGAATTCTATATCTGGGCGAGCTCGCCGCAAGTGATGCTACCTCGCGT GGACGGTGCGTTCCTGCCCAACCATCCTGCCACGCTACTAAGGGAAGGCCGTTATAACAAGGTCGACATCATATCAGGCGTCACGTCCCACGAGGGCGCCCTCTTCACCACGATGATCCTCGGCGACGCAGA CTTCTCAGAACGGCTACTCAAGAATTTCAGTGTTGCTGGGCCGCTGGGACTCGGCGTCGACCAGGAGGAGGACCCCGAGTACCTGGCGAGGAGAGCCTACCATCACTACCTCGGTTCTCCTCTGACTATGGA AAAAGCAGAGGCGTTCACGCAGCTCATGACAGACCGCATGTTTGTCATGTGCCATCTGGACGTCGTGAAGCACCACCAGCGAGAGGAGGCCTTCGGGACCCGCGTGTTCACCTACGAGCTGCAACATCGCGC AGAATTCGCCTTCTTGGAAATGTTCTTCGGGCCTTCGGAGGTAGGCAGAGAGTGGGTCGGCCACGCAGACGATATCCAGTATTTGTTCGACCCAATTTCGGAGAACTTCACACTGGGCCGAGAGGAGGATCT GCTGGTCAAGCGGATCATGCTGGATCTCTGGACGTCGTTCGCCGCCACGGGGCACCCGACACCCGACCTCGCGCTGGGCTTCGGCTGGGAACCGACCACGAATGACAGGGACGCCTATCTGGC
UBC119C -350-5-1	**ATTGGGCGAT**GACGGCGACCAGGTGCAAGAACCCGACGGAGGAAGCAAGCAGAACTGCGTCAACTTGAACAAGAATGACCACTTTTTTTTCGGCGACTCGAAGTGCAGCGTAGATTATGCTGTCGTTTGCGA GAAGATTTAATGAAGTTTGGGGAAGATGAAAAAAAAAAAAAAAATCTCTCTCTCTCTCTCTCTCTCTCTTTCACCGAGCCATTTTCACAACTACCATCATTATTTTGTAATCATAACCTTTTCTTTGTTG TTATTCCTCTTTCTCACTAATTCCAATTTAGGATAACGTAATCGCTCATTTTAACACC**ATCGCCCAAT**
UBC122C -375-6-1	**GTAGACGAGC**GACGAGAGCGTAGGAAGAGAAAGATTTACATGGAGAGAAGGAGGGAATGGAGGGGTGATGGCTGAGGAGAGGGAGGGGCGAATGAGAGGCGGGAGGGGAGGATAGGAGAGGGAAAGGTAGGG AACGTAGGGGGTAGGATGGGAGAGAAGAGCAAAAGAAGAAAGGAGAGGTGAGAAGAGGGGAAGGGACGGAATTGGAAGAGAAGGGAAGAGGAGGAGAAGAGAGGATAAGAAAGGAAGAGGGGAAGGGGAGAA GAGGAGAAGAGGTAAATGATGCTAATGGCTCAGGACAGGTTTGCTTTCTGTTGCT**GCTCGTCTAC**

Remark: Bald letter indicates primer location

Table B5 Summary of partial gene sequences from mRNA DDRT-PCR using G anchored oligodT first strand cDNA as template

Product	Nucleotide Sequence
OPA01G 415 1	**CAGGCCCTTC**TGTATCTGTCTAGCTTCCTTCCCAAAGCCTTAGTGCCTACCATTGTCAGCCACTGCATGTCACGACTAAGAGGACTGCAGCAAGACCAGGACAAGGAAGAATCTTATGTCACGTATGTAAAT GCTCTGTGTAACTGGAATCGTGTAGATGACATCTTGGAACTGGCAACAGAATGGCTGAATGAAGGTTTTAGAGCTGGTGTTACTACAAGTAGTAAGGAACGCAGAAAAAGCCGCAAAGGTGTGCGATTCCAA GAGGCACTTACACCGCAACCTCTGTTGGCTCTACGTCTTGTGGGTCATATCCTACAACATCCATTAAATAAACTTGCTGCCCTTGGGAGAAACAGACATCTTTTAGTACAAATGTCAGAGAACATGGCTGAA GT**GAAGGGCCTG**
OPA01G 415 3	GATTTCCCCCCTCCCCTCCAAAAAAAAAAAAAAAAAAAAATATATGTAAAAGAAATGATGTTTATCACTTTTTTTAAGACAAAAAAAAAAAAAAAAAAAGAAGAAAAAGAAAAAGAAAACGGACGCCAGCATTA CCAACCAATCATAAAAGAAGAATAGGAATAAAAATAAGATTAAGAAATGAGAAAGAGAACGATATAGAAAAAAGACAGGGAGATAGAGAGAGATAGAGATAGAGAGTAAAAGGTATAAAAAAAAATCATCCC TATAATACATTTCCAGAGTTGAATATTCACTCCGTTCCAAAAACGAGCGTTCAAAACTCCTTAAAAACTGCCGGGGAAACAAAGTTTACAAAATAGCCATAAACAACGCAATCATACAGTTTACTGCTCGGA AATATGAGG**GAAGGGCCTG**
OPA01G 600 3	**CAGGCCCTTC**AGAAAGTACCCCGTGGCCCCCCTGGGGACCATGACCTCCAGGTTGGGAACCAGTGGAATGGAAAATAGCAAAACTAATAATACAAGAGATAAAGGAGAATGAATAAATACGACATTAATGGT TCTTATAATGATAAGAACATTAACAACGATGATGCTAAGAACAGTAACTGTTAAGATGAGTATAATATAATGATGATGATAATATTAATTTTAGTAATAATAATCTACTGATCCATGTGCCATGGCCAACCC ACCCATAAACATTCATCTTACTATCATAGTTCTGCTGATAAGCCAATTCAAAGAAGATGGATTAGTGAAAAACATTAGTAATGAGCAGAACTTGGTTACAATAATCCCCTTCGTCCAGTGGAAATAACGATA GTGATAGCAATTACAATGATAGAAACAAAGACAGTTATTACAATAACAAGAACAATATTCGTGATCATACAGAAGAGGAGCTCCTTACAGAAAAAATGGTCGGTACTAAATCAACAGCTTGATGTTTTAGTA ATGAATCCCATCGGTACCTTGTTACCTCTTTTCACTTGATGAGTTAAGGATTATGAATCANAGTTAACGACATCTGCTATG**GAAGGGCCTG**

Product	Nucleotide Sequence
OPA02G 450 2	**TGCCGAGCTG**GAAACTCTGAGCGAAAACCGAAGAGCAGGAAAAAATATAGCACACAATACTGTGGGCTTGAAGAAAAATTTCCAGCTGCTGAAGGGGGAGTTTAGGAAGATGAGTCCTCCACCAGGACTCGA GGGCGTCCCACTGACTCCCAGTCTCATCAATTCCTGCAGCAGGTCCCCGGCACAGCAGCCGAGAGATGCCAATACACCAGAGAAAGAGAGAGAAGGCGCACAAGGAGAATCGGAGAAAGAGATGAGAGGGGC AGCAGGAGGGCAGGCTGGTGGACCTGTCCGCACACGAATAAGAAAAACCTCAAGAGCCAACTTGTTCATGGGCAAACCACAGAGCGATACCAATAAGCATGGTGGTCACAGTTCGGGCATCCCCGTGAGCAA AGTTGGCAGCAGCAGTTCCAGTAGTAGCAGTAGCAG**CAGCTCGGCA**
OPA02G 450 3	**TGCCGAGCTG**ATCATCCCACTCATTCACAAAGCTCACTTTGTGGACTCACTCCTTTCCACCATGAAGAAGTCTCTGCATGATGACAACCCTGGCATCAATGACATCACAGGCGAGAGTGAATGTGAAGTGGT GGTGTCTGACATCACTGAGATCTTCTCCTGGATGGTCAACTGCCTGGTAGCATCACCCCAACACAAACACTTCATGCTGAGTCTTGAGGTGCTTCACCAGCTAAACCTCTTATGTCGAGGGGAAGCAGCCCA GTGTGGAGGCCAGGCCAGTTGTGTGGGGCATTTGCGCAGCACAGAGGCAGCTCTTTTGCAAGTCGCTCTTACACGTATTCAAGCCACAGCCTCCACACATCTACATTCCATTGGACAGGATCTGAGTGACAG TATCAGAGAGGAGAAGACCTTTGCAGTGTCTGGATCATCCAGTCTACACAACATCAAGCTGTTTGCCACCATGG**CAGCTCGGCA**
OPA07G-350-27-1	**GAAACGGGTG**TTGGTGTGCTCCCTCAGCGGAACCTCCTGCCACGTGCTGATGTCTAACCTCACGCACCCAAGAGGTATACAGCTGGACTTGGAGAACAGGTACGTGTACTGGACTGACGTTAACCGGTCGAC CTTGGAGCGAGCTAGCCTGGATGGGTCAGGTCGAACAGTCCTCATCTCGGAGGGCGTGAGGTGGCCCAATGGACTGTGGATAGATGCTCCAGCGCGGAGGATATACATAGCGGATGCTCATACCAACGAGGT CTTTCATGTGAACTATAATGGGACCGATAAAAAGCACCTTGCGGAGGCGTCAGTGGAT**CACCCGTTTC**
OPA09G-3-5	**GTAACGCCAT**CTGACTCTGTGGCAGTTATAGCCGACAACACTGACTGCATCCCGTATTTCAAGAAAAATGGAGTCAAGGGCTTAGCACGTAGTATGCCCACAGGATGTGCCATTGACAGAGTTGCTGCCAAG AAAGGAATGGAAATATTTGAGGTTCCTACTGGCTGGAAATACTTTGGAAATCTTATGGATGCTGGAAGGTTGTCCATTTGTGGTGAAGAGAGCTTTGGACCGGCTGCT
OPA11G-350-21-2	**CAATCGCCGT**CATCTCCATTCGCAAATCATTTACTGTAAATTTCATATCACTTGCTTTTTTTGTAATGGAGGAGTGTGAGAGAATATTATAATATAAGGAGTCAAGGAGGCAGTGTGTGTGTGTGTGTGT GTGTGTGTGTATGTGTGTGTTTGTGTATATGTTGGTGTGTGTGTGGTGGGAGGGGGTGCAGGTGTGGTGTCAGTCTTGTTACCATCTTCAACTAATGCTTTTTCCACATCTGGGATGCTGATGTCTTGGCTA GCAGCTAGGGTGCCCAGCACCAGCAGCAAAGCCAGGGAGAAGAAAGACAGTCTGGCC**ACGGCGATTG**
OPA18G-600-4-1	**AGGTGACCGT**CTACCTCGGCCTGCGCTTGCACTCGTCCAAACTCGAGAAAATTACGCTGAATAATGTCAGTCTCAGCGATACAGTCGATAGTATCAAGCAGACAGCAGCTAGCAAGGGCAAGACGTCGGCGG ATAAAATCGAACTAGTCCACTGTGGTGTCATTCTGAATGGATCGGAGACGCTGGAAGAAGCAGGAATCACCTCGGGTGCTATGATTCACTGTCTTCCCAAAAAAGAGGATCCTGTAACTGTAGCCGTCCCAT TAAGCCTCCCTGAAGTGCAGACATTACTGGTGTCTCTGAGAAATGTTGCCGCTCACCCAAATTTCCGTGCTTTTATACAAAAACTGCGAACCCCAGAGATGGTGGAGAAGGTGCTCTCATCGTGTCCGATTG CTCGCAGTGATCCATCAGCTCTCTCCATGCTTCAAGACCCTGAGCTGTTTATGGGACTCACTAATCCAGATAACTTAAGCAAGGTCGTAGATAGTAATCCTGCAGTGGGAAGGGTGGCAGAGTATGTGACAT CCCTCATGACGTCGGACACCACTTCACCTCG**ACGGTCACCT**
OPA18G-650-5-1	**AGGTGACCGT**GGTGATTAAACCATTCAAGCTGGAGGACGTGCGTGAAGCCCTATCCTCTGTAGGTATTCAGGGGCTGACCGTAAGCGAAGTGAAAGGCTTTGGTCGCCAGAAAGGGCATGCTGAGCTGTATC GCGGCGCTGAGTACAGCGTCAACTTCTTACCCAAAGTTAAAATCGACATTGCTATCGCTGACGACCAGTTAGATGAAGTAGTTGATGTCATTAGTAAAGCTGCCTATACCGGAAAAATAGGTGACGGCAAAA TTTTCGTTGCCGACTTGCAACGTGTCATTCGCATTCGCACCGGCGAAACAGATGAAGCAGCACTGTAATCACAGGCTCAGTAAAGTAATGGGGATGGATTGATAATGAAAAAACTTTTATCCATGTTGGGCC TGAGTACGGTAACCATGGTTCCTTCTTTGGCCCTGGCCGCTCCGGCGGTCGCAGACAAGGCTGACAACGCCTTCATGATGATTTGCACCGCTTTGGTGCTGTTCATGACCTTGCCGGGTGTGGCGTTGTTTT ACGGTGGTTTGCTGCGTTCCAAAAACGTGCTTTCCATGTTG**ACCCAAGTGACGGTCACCT**
OPA18G-650-5-2	**AGGTGACCGT**CTACCTCGGCCTGCGCTTGCACTCGTCCAAACTCGAGAAAATTACGCTGAATAATGTCAGTCTCAGCGATACAGTCGATAGTATCAAGCAGACAGCAGCTAGCAAGGGCAAGACGTCGGCGG ATAAAATCGAACTAGTCCACTGTGGTGTCATTCTGAATGGATCGGAGACGCTGGAAGAAGCAGGAATCACCTCGGGTGCTATGATTCACTGTCTTCCCAAAAAAGAGGATCCTGTAACTGTGGCCGTCCCAT TAAGCCTCCCTGAAGTGCAGACATTACTGGTGTCTCTGAGAAATGTTGCCGCTCACCCAAATTTCCGTGCTTTTATACAAAAACTGCGAACCCCAGAGATGGTGGAGAAGGTGCTCTCATCGTGTCCGATTG CTCGCAGTGATCCATCAGCTCTCTCCATGCTTCAAGACCCTGAGCTGTTTATGGGACTCACTAATCCAGATAACTTAAGCAAGGTCGTAGATAGTAATCCTGCAGTGGGAAGGGTGGCAGAGTATGTGACAT CCCTCATGACGTCGGACACCACTTCACCTCG**ACGGTCACCT**
OPB04G-6-1	**GGACTGGAGT**TCCCAAAACGTCTTATCTGTAGGTCTCGGTCACTGCGTCTATCTCTGGTCAGCTTACACCTCCCAGGTCACGAGACTTTGTGATCTCTCCCCAGATGGAGACACCGTCACATCAGTGTCTTG GTCAGAAAGAGGGAGTCAGGTCGCTGTTGGTACACACAGAGGCCTGGTCCAGGTGTGGGACGTAGCCAGTAGTAAAAGAGTGTGTGTGTTGAATGGTCACACAGCCCGAGTTGGAGCGTTGGCGTGGAATGG TGACGTACTGTCCTCAGGCTCACGCGACAGACTTATTCTCCAGAGGGATGTGCGCACCCCATGCATTATCCCAGATAGAAGATTAGCTGGACATAGACAGGAGGTATGTGGATTAAAGTGGTCTCCAGACAG CCAGTACTTAGCCTCTGGTGGAAATGACAACAAGTTATATGTTTGGAACTTGCATTCCCTC**ACTCCAGTCC**

Product	Nucleotide Sequence
OPB10G-700-23-2	**CTGCTGGGAC**TCTCGGGGATCTTAGGGGCGGAAAGAACGACACAGTGAAGGGAATTAACGTTATTGAATATGGTCGCGGTGGCAGTGATTGGGAGAGGAAGAGGGGCTCCGAGGAAATGGAGGAAATGATGC AAAGGAGAGGAGAGTAGACGGGGACGAACTGTAAGTCGATTAAAGGACTTAGAAAGAAGAGCGAAGATATAAAGAAGAGGAAATGGCGTGTGAGTAAGTTGGAGATGCAGGAAGCAGAGAGAGGAGTAGTAG TATTACCCCTTCCAGCTCAGTAATTAACAGTGGTGCCGACAGATGAGCGAAGGAACAAGAGGAGGCGAAGGGCGGCCGAGAGGGCCTTCTACGTGCTTCCAGGCGCTCTTCTCGCTGTTGCTAAAAGAGGCA AGCATTATGCGTGGGGATGGCTTTATGCTGGACCCAAAAACAAAATAAATAGAATAAAGTGGAGTGTTTGGGGCTGGCAAGGCGTTGTAACAAACGGTGGAAATATTTAAAGAAACTGAGTGTAATTTTAGT ATTTTAGATTGTCGCCCGGGGAAAAACTTTAACAAGGACGCCTTTTCAGTTTCCCCTCGAGCTCCACCATGTAGTATTAAAGATTAAAAGATGGAGCTTTGCAGAGTACCAGCGGAATAAAATGAATCCGGG AGATGTTCTGAGCAGTGCCCAC**GTCCCAGCAG**
OPB10G-700-23-3	**CTGCTGGGAC**AGACAATTACGCACACGATACAGAGAAATCCAAACACAAATTACACACGAAATTAAAGTAATGAACAAACACCACTGGACACACTCGCGCAAAGACTATGTCAAAACTCTAAAGACCCCAAG AAATTTTGGAGTTCCTTCAAAAAACTCATGGGGTCGAACAAACAGATAATCACATACATATACAACACACACAGACAGAAGGTTGACTCGGTGGAGGAGATGGAGCCTCTCCATAGGGAATTCTGGCAACAG AATTTCCAAATCTCCCCCACCGAGAACGCCCGATTCCACCACATTACAGAGACCGAGGTTACAAACTACATACAACAACATAGGAACATAATTCTCCCAGAAAACATCATTACACTAAACACTCTCACAGAG GACAGTCCCCTCTCCACACCAATCACTTCAGAAGAAATAACAAACACAATCAAACGCACTAAAAACACAACACCAGGAGCTAGCAACATAAACAAAACAATCATCGAACATCTTCCACCCAGAATGATCAGC AGACTACGCCATATCTTCAATGCAGCACTGGCAACAGGATATTTCCCTGACAAGTTCAAACATGCCACACTCACCTTAATACCCAAACCAGGGAAATCTGCACACGAGGTGGGGAATTACCGCCCCATCTCA CTCTTAGAA**GTCCCAGCAG**
OPB10G-850-22-1	**CTGCTGGGAC**ATCATGGATGGTGCAAGTAGTCCTGTTTTTACAGGATTTCCTCTTCCACCCATTATCTTTACTCCAGACATGTCACCGAGAAATCATGAGTCTAGCCCTATGGACGTGCCGGGTGCTGTGGA ACACGGTGCTAGCGGCAACAAATCTGGTGCTAGCAGCCCTGGTGTGGACTTCCATTCCATCGGTTCAAAGGAAAGTCCTCTGAAGGGGAAGGGGGGGGCACTGCTACACCATTTCTTGCACCCCCTCGATTA TTATCACCAGCATCAGGCCAAAAGGAGAAGTCGCAATAATTCAATATGTAGTGACCAGGGAGATATAACCCTTGAACTTGCAAATGCACATGCCCAAGGACAGGCACAGAAAGAAAAAGAAAAATCATTCCG CTCAAAGACACCTGACCCTCCGCGAATGCAGAGGCAGGGGAGAGAGAGATCCCGCACACCTGAACCATGGCCAGTCTACAGACCCCATGCACGACAACGACCACGCCCTAAAAACCTATTTATCCCAGTGCC AAACCAGCCCCAGTCAAGAGGTAGTCCTGTAGTCACATCCCAAACAAAGGCAGAAAGGCCTTACTACAATCGAAGGGGCAGTGGTACAGAAAGCATTCCAAGTATAGCCAGTAGTGAGAGTGGCAGTAGCAC AGGGAGCAGTAGTAGTTATACTGGTAGTGAAAGTGAGAGTGAGAGTGAAGATGAAAAGCCAAAAACCTGGACATCTGGAGTACGGACTTTAGGACAGGAATATAACCAAGTCTCATCTTCGCCT
OPB10G-850-22-2	CAGTAGATGATGTGGCATTACGAATGAGAGTAGAAAGATGTACAGGCGGAGAGAGAAAGAGAACAGCGGTATCAAACTGGGACGAGTTCGAGGCTCAGGAGCGCGTCAAGAACTCCCGCCCGGACGGCCAGC CCGAAACTCCTCTTGGACACAGATAAATCTCCAAAATTCCCTATACAAATATACATTTCCTTGAGTGAACAGAGAACGAGAATCTCTTTAATTGATAATGTCGAAGTGAATTTTTCCTCGCTGAAGGAAATT GTTTAAGAATAAGTATCACATTCGAAATAAATTTTTGCCTAAGTAAACAAGATGGAAAGAAAGAAACAGACAAAAACAGATTAATAGAAGGACAGACAGAGAGAGAGGAAAAAGGAGGAAGGGGAGCGGATT GGAAAGAAGTGGAGAGGAGAGGAGAAGAGAGAGAAAGAGACAGGGACAGAGAGGAAGCGGGGGGCTGGAGCACTGAAGAAAATTGAGCAAAGGATATGCAACCCTCTTAATTTTATATGAGGAAACAACTTA GATTTTAGCAGCTGGAGTGCGCTACCGATGCGGAAGGGGCTCGCGGATACAATAATATCGTAAGAACGTGGGCCTTTAATGCTCCTCTATCACTGAATCGCTTATGCATAGAAGTAACGAAGAATTAACAAA AATACCGAAACTTTCAAAATCTGTGTAAAGAACAGTAACAACACTTGATAATAGGATCACAAGATAGACAGCCATGCCAATTATATCCCAACAATAAAGGTTCACATTTCAGTTTG**GTCCCAGCAG**
UBC101G-225-A-1	**GCGCCTGGAG**GTACACAGAGCAGGATTCGGTGGACATGTTATGCTGCGACATGGGAGTTCATGATCACTGCACTGGAAGGAAATAGTTGCTCTATTTATAACCAAGAGCGCCATTTACAAAATATATATTGA GAAAATATATATTGATCTTAACGTACCAAACATAATGAAAGTTCAAGGAGAGGGTACG
UBC119G-225-29-3	**ATTGGGCGAT**GACCTTGACAATCCCAGCTACCTTCAGGTAGTAGCAGGAGAACATAACCTAGAAGTTGACGAGGGCAACGAGCAGACGGTCGTCCTCTCCAAGATCATTCAACACGAGGACTACAACGGCTT CTCCATCAGTAACGACATCTCCCTGCTCAAGTTCTCTCACTCTCTGTCCTTCACGTAAATGTGCCTCATGAGTTCTGG**ATCGCCCAAT**
UBC119G-275-C-1	**TTGGGCGATG**GCGGGGGAAGGATGAGTGTGAAGAATGATAGTCATTTGGACTTCTTTGTGCAATCACTTTGGTAAATTGTTAACTTTCATTTTCTCCTTTTCTTCCGTGGAATGGTAGATTTAAGACGTGGA TTTTCACTTTGGCTGTCAAGCGTACCATTTTTCGAACAATCACGTAAATTGTTTACTTACCTTTTCGTCTTTATTTCGTTTTATTGTCATGATTGTCCATGTTCGATTATGACAGCGTGGTTGG**CAAAAAAA AAAAAAAA**
UBC119G-275-C-3	GTTTATTCATTCAGTATTGATTGTTTAAGACAATGGTGAAGAAATTCATAAAATCGTTTGAACTTGGACCCAGAATAGGCAGTGGGTGACCATAAAATTGTGGATGTTGACTATGAAGGGACTTTTTTAATA GAGGACACCAGTGATGATGATATAGTTGGTTTTATTTTCAGTAACCAAAGTAATTATAAGTTTTATGTCATGATGTGGAAGAAGGGACCTAAAAGCCTGTTTGGCTAAGCAGGGAGAGGAGTGAATAGTAAA TATAAGAGATTTATGCCACGGAGCCGTGAAACGGCGAATTAGGGTATGCTAAGTGGCTCAAAGGATATAAAACAAAACAGGCAATTTTGATCAGGGATGATAGCAGTATTGGATGGACCCATAAAGTTGCGT AAATATGGATGTTTAACCAATGGCATGATATAGGTAACAGGAGGTTCTAATTGTACCAGGGTAACAACCAAGTAATTGAGTGTGGAAACATATATGGCAGCACCATAAAAGGAGGCAGGTTAGGTGTTTTTT

Product	Nucleotide Sequence
	GCTTCTCCCAGAAGCAAATTATAAGGTCCAATGTGAAGTATTCATGTTACAGATGATGTACCACTAAGACATGTTTAAGGACTTTCCCACTAACTAAAAGATGAAAGTTCTGGTTTCAAAAGGAATTGATTT TTGCACAAAAAAAAGAGTTTTGCAATTGGCCATGAAGAATCACGAAGATAGGTCAAGTTACTATAAGTCTTCTCGTTTATCTTTCNTTTNCCNTCGCCCAAT
UBC119G -350-5-3	**<u>ATTGGGCGAT</u>**GACTTTGACAATCCCAGCTACCTTCAGGTAGTAGCAGGAGAACATAACCTAGAAGTTGACGAGGGCAACGAGCAGACGGTCGTCCTCTCCAAGATCATTCAACACGAGGACTACAACGGCTT CTCCATCAGTAACGACATCTCCCTGCTCAAGTTCTCTCACTCTCTGTCCTTCAACGACTTCGTGCACTACGTCGACCTGAGCAAGAACCCGCTGGAGTGTGATTGCGCCGTGCAGTGG**<u>ATCGCCCAAT</u>**
UBC122G -7-2	**<u>GTAGACGAGC</u>**CAGACTATGGTTGCAACGGGTTCGACTATTGCGAGCAGCCCGATGACATCACCTGCTTCTTGACGTCAGACCACTACACTGACGAAGGAGTCGAGATCGGGAATTCCCCGACCTGCTCGCAT TACTCACGCGAGTATTACGATGGGAAGGACATGAACGCTTACGCCCACAGCAGGCAGTACACAACAGCCAGGAGCAGAA**<u>GCTCGTCTAC</u>**
UBC135G -200-24-2	**<u>AAGCTGCGAG</u>**GAGAGCCTGGCGATGCTGGGCGAACAGACCACACTCCTGGTAGGCCTAAGCAGGAGTCCAATTCCTTTGACCAACATCTTTGTAAAACAGAGTCCTCACGTTCTTAAAAAAAGAAAAATAAA TCGCATGTATGTTAATTTTTTTGTTTTTTTAGAGTCCCCGATTCGTTTCCTTCGCTTT**<u>CTCGCAGCTT</u>**
UBC135G -200-25-2	**<u>AAGCTGCGAG</u>**AGGTGGAGGTGAAGTCCCAAATCATCTGATGAGCATAGTGGAGTTAGTTTTGGATCAAGAGGAACAGCTGGTAGAGGAGAAGAGATTGCCAGGAGAGAATAATATTGGCATGGTTGCCTGGC GCATGACACTACACACACCAGAGTATCCCGATGGCCGTGATATCATTGTGATCTGTAACGACATCACCTACCAAATAGGATCCTTTGGCCCACATGAGGATATTCTGTTCCTCAGAGC**<u>CTCGCAGCTT</u>**

<u>Remark</u>: Bald-underlined letter indicates primer location

APPENDIX C

Blast X result for carboxylesterase

Sequences producing significant alignments:	Score (Bits)	E Value
gi|91084115|ref|XP 967137.1| PREDICTED: similar to CG6414-PA [Tr	311	1e-82
gi|91086415|ref|XP 967183.1| PREDICTED: similar to CG10175-PC...	294	1e-77
gi|48097744|ref|XP 391943.1| PREDICTED: similar to CG6414-PA [Ap	287	2e-75
gi|54311783|emb|CAH64510.1| putative esterase [Tribolium castane	282	5e-74
gi|100811805|dbj|BAE94685.1| juvenile hormone esterase [Psacothe	281	7e-74
gi|86515416|ref|NP 001034534.1| putative esterase [Tribolium ...	280	2e-73
gi|54311781|emb|CAH64509.1| putative esterase [Tribolium castane	279	4e-73
gi|62086395|dbj|BAD91555.1| carboxylesterase [Athalia rosae]	278	7e-73
gi|54311777|emb|CAH64507.1| putative esterase [Tribolium castane	273	2e-71
gi|108876577|gb|EAT40802.1| alpha-esterase [Aedes aegypti]	270	2e-70
gi|11761909|gb|AAG40239.1|AF302777 1 carboxylesterase precursor	270	2e-70
gi|54019713|emb|CAH60164.1| esterase [Tribolium castaneum]	270	2e-70
gi|54019717|emb|CAH60166.1| putative esterase [Tribolium castane	270	3e-70
gi|54019719|emb|CAH60167.1| putative esterase [Tribolium confusu	270	3e-70
gi|54311779|emb|CAH64508.1| putative esterase [Tribolium castane	268	1e-69
gi|54019715|emb|CAH60165.1| putative esterase [Tribolium castane	266	3e-69
gi|86515386|ref|NP 001034512.1| esterase 1 [Tribolium castane...	265	5e-69
gi|91086429|ref|XP 967916.1| PREDICTED: similar to CG1128-PB,...	262	5e-68
gi|17646748|gb|AAL41023.1|AF448479 1 juvenile hormone esterase [	262	5e-68
gi|54019721|emb|CAH60168.1| putative esterase [Tribolium freeman	262	5e-68
gi|544256|sp|P35502|ESTF MYZPE Esterase FE4 precursor (Carbox...	262	5e-68
gi|91084517|ref|XP 972335.1| PREDICTED: similar to CG10175-PC...	261	9e-68
gi|91086427|ref|XP 967835.1| PREDICTED: similar to CG10175-PC...	260	2e-67
gi|115650767|ref|XP 782312.2| PREDICTED: similar to acetylcho...	259	4e-67
gi|91086425|ref|XP 967598.1| PREDICTED: similar to CG10175-PC...	259	4e-67
gi|91089215|ref|XP 967444.1| PREDICTED: similar to CG10175-PC...	259	5e-67
gi|544255|sp|P35501|ESTE MYZPE Esterase E4 precursor (Carboxy...	258	1e-66
gi|62086393|dbj|BAD91554.1| juvenile hormone esterase [Athalia r	257	2e-66
gi|108881320|gb|EAT45545.1| carboxylesterase [Aedes aegypti]	256	2e-66
gi|72077750|ref|XP 782249.1| PREDICTED: similar to acetylchol...	255	5e-66
gi|37574080|ref|NP 932116.1| hypothetical protein LOC72361 [M...	255	5e-66
gi|115653078|ref|XP 788440.2| PREDICTED: similar to acetylcho...	254	9e-66
gi|108881319|gb|EAT45544.1| carboxylesterase [Aedes aegypti]	254	1e-65
gi|66560187|ref|XP 392698.2| PREDICTED: similar to CG10175-PC, i	253	2e-65
gi|91086417|ref|XP 967268.1| PREDICTED: similar to CG10175-PC...	252	4e-65
gi|91084421|ref|XP 968215.1| PREDICTED: similar to CG6414-PA [Tr	252	4e-65
gi|118782888|ref|XP 312564.3| ENSANGP00000014256 [Anopheles g...	252	6e-65
gi|68697266|emb|CAJ14159.1| putative esterase [Anopheles gambiae	251	7e-65
gi|91091806|ref|XP 970836.1| PREDICTED: similar to CG6414-PA [Tr	251	1e-64
gi|77735475|ref|NP 001029432.1| carboxylesterase 2 (intestine...	251	1e-64
gi|116829962|gb|ABK27874.1| carboxylesterase [Bombyx mori]	249	4e-64
gi|91083857|ref|XP 974072.1| PREDICTED: similar to CG4382-PA [Tr	249	4e-64
gi|37718991|ref|NP 937814.1| hypothetical protein LOC234669 [...	249	4e-64
gi|119721182|gb|ABL98071.1| carboxylesterase [Bombyx mandarina]	249	5e-64
gi|91086419|ref|XP 967349.1| PREDICTED: similar to CG10175-PC...	249	5e-64
gi|108881318|gb|EAT45543.1| carboxylesterase [Aedes aegypti]	248	6e-64
gi|84095052|dbj|BAE66716.1| carboxylesterase [Aphis gossypii]	248	6e-64
gi|84095050|dbj|BAE66715.1| carboxylesterase [Aphis gossypii]	248	8e-64
gi|119699079|gb|ABL96242.1| carboxylesterase [Bombyx mori]	247	1e-63
gi|91076732|ref|XP 972864.1| PREDICTED: similar to CG10175-PC...	247	1e-63
gi|108881317|gb|EAT45542.1| carboxylesterase [Aedes aegypti]	247	2e-63
gi|28317060|gb|AAO39549.1| RE03380p [Drosophila melanogaster]	247	2e-63
gi|24649333|ref|NP 651151.1| CG10175-PC, isoform C [Drosophil...	247	2e-63
gi|24649335|ref|NP 732874.1| CG10175-PA, isoform A [Drosophil...	247	2e-63
gi|3426006|dbj|BAA32385.1| carboxylesterase precursor [Aphis ...	246	2e-63
gi|42412531|gb|AAS15642.1| carboxylesterase [Aphis gossypii] ...	246	3e-63
gi|27658990|ref|XP 226397.1| PREDICTED: similar to carboxyles...	246	4e-63
gi|72007966|ref|XP 786979.1| PREDICTED: similar to acetylchol...	246	4e-63
gi|118782091|ref|XP 312052.3| ENSANGP00000016214 [Anopheles g...	245	5e-63
gi|91084505|ref|XP 972277.1| PREDICTED: similar to CG10175-PC...	245	5e-63
gi|125773103|ref|XP 001357810.1| GA10132-PA [Drosophila pseud...	245	5e-63
gi|42412533|gb|AAS15643.1| carboxylesterase [Aphis gossypii]	245	7e-63
gi|54043019|gb|AAV28503.1| acetylcholinesterase [Culex pipiens p	244	9e-63
gi|34222522|sp|Q86GC8|ACES CULPI Acetylcholinesterase precursor	244	9e-63
gi|32968054|emb|CAD33707.2| acetylcholinesterase [Culex pipiens]	244	9e-63
gi|91084423|ref|XP 968291.1| PREDICTED: similar to CG6414-PA [Tr	244	1e-62

APPENDIX C

Blast X result for carboxylesterase

Sequences producing significant alignments:		Score (Bits)	E Value
gi|91084115|ref|XP 967137.1|	PREDICTED: similar to CG6414-PA [Tr	311	1e-82
gi|91086415|ref|XP 967183.1|	PREDICTED: similar to CG10175-PC...	294	1e-77
gi|48097744|ref|XP 391943.1|	PREDICTED: similar to CG6414-PA [Ap	287	2e-75
gi|54311783|emb|CAH64510.1|	putative esterase [Tribolium castane	282	5e-74
gi|100811805|dbj|BAE94685.1|	juvenile hormone esterase [Psacothe	281	7e-74
gi|86515416|ref|NP 001034534.1|	putative esterase [Tribolium ...	280	2e-73
gi|54311781|emb|CAH64509.1|	putative esterase [Tribolium castane	279	4e-73
gi|62086395|dbj|BAD91555.1|	carboxylesterase [Athalia rosae]	278	7e-73
gi|54311777|emb|CAH64507.1|	putative esterase [Tribolium castane	273	2e-71
gi|108876577|gb|EAT40802.1|	alpha-esterase [Aedes aegypti]	270	2e-70
gi|11761909|gb|AAG40239.1|AF302777 1	carboxylesterase precursor	270	2e-70
gi|54019713|emb|CAH60164.1|	esterase [Tribolium castaneum]	270	2e-70
gi|54019717|emb|CAH60166.1|	putative esterase [Tribolium castane	270	3e-70
gi|54019719|emb|CAH60167.1|	putative esterase [Tribolium confusu	270	3e-70
gi|54311779|emb|CAH64508.1|	putative esterase [Tribolium castane	268	1e-69
gi|54019715|emb|CAH60165.1|	putative esterase [Tribolium castane	266	3e-69
gi|86515386|ref|NP 001034512.1|	esterase 1 [Tribolium castane...	265	5e-69
gi|91086429|ref|XP 967916.1|	PREDICTED: similar to CG1128-PB,...	262	5e-68
gi|17646748|gb|AAL41023.1|AF448479 1	juvenile hormone esterase [	262	5e-68
gi|54019721|emb|CAH60168.1|	putative esterase [Tribolium freeman	262	5e-68
gi|544256|sp|P35502|ESTF MYZPE	Esterase FE4 precursor (Carbox...	262	5e-68
gi|91084517|ref|XP 972335.1|	PREDICTED: similar to CG10175-PC...	261	9e-68
gi|91086427|ref|XP 967835.1|	PREDICTED: similar to CG10175-PC...	260	2e-67
gi|115650767|ref|XP 782312.2|	PREDICTED: similar to acetylcho...	259	4e-67
gi|91086425|ref|XP 967598.1|	PREDICTED: similar to CG10175-PC...	259	4e-67
gi|91089215|ref|XP 967444.1|	PREDICTED: similar to CG10175-PC...	259	5e-67
gi|544255|sp|P35501|ESTE MYZPE	Esterase E4 precursor (Carboxy...	258	1e-66
gi|62086393|dbj|BAD91554.1|	juvenile hormone esterase [Athalia r	257	2e-66
gi|108881320|gb|EAT45545.1|	carboxylesterase [Aedes aegypti]	256	2e-66
gi|72077750|ref|XP 782249.1|	PREDICTED: similar to acetylchol...	255	5e-66
gi|37574080|ref|NP 932116.1|	hypothetical protein LOC72361 [M...	255	5e-66
gi|115653078|ref|XP 788440.2|	PREDICTED: similar to acetylcho...	254	9e-66
gi|108881319|gb|EAT45544.1|	carboxylesterase [Aedes aegypti]	254	1e-65
gi|66560187|ref|XP 392698.2|	PREDICTED: similar to CG10175-PC, i	253	2e-65
gi|91086417|ref|XP 967268.1|	PREDICTED: similar to CG10175-PC...	252	4e-65
gi|91084421|ref|XP 968215.1|	PREDICTED: similar to CG6414-PA [Tr	252	4e-65
gi|118782888|ref|XP 312564.3|	ENSANGP00000014256 [Anopheles g...	252	6e-65
gi|68697266|emb|CAJ14159.1|	putative esterase [Anopheles gambiae	251	7e-65
gi|91091806|ref|XP 970836.1|	PREDICTED: similar to CG6414-PA [Tr	251	1e-64
gi|77735475|ref|NP 001029432.1|	carboxylesterase 2 (intestine...	251	1e-64
gi|116829962|gb|ABK27874.1|	carboxylesterase [Bombyx mori]	249	4e-64
gi|91083857|ref|XP 974072.1|	PREDICTED: similar to CG4382-PA [Tr	249	4e-64
gi|37718991|ref|NP 937814.1|	hypothetical protein LOC234669 [...	249	4e-64
gi|119721182|gb|ABL98071.1|	carboxylesterase [Bombyx mandarina]	249	5e-64
gi|91086419|ref|XP 967349.1|	PREDICTED: similar to CG10175-PC...	249	5e-64
gi|108881318|gb|EAT45543.1|	carboxylesterase [Aedes aegypti]	248	6e-64
gi|84095052|dbj|BAE66716.1|	carboxylesterase [Aphis gossypii]	248	6e-64
gi|84095050|dbj|BAE66715.1|	carboxylesterase [Aphis gossypii]	248	8e-64
gi|119699079|gb|ABL96242.1|	carboxylesterase [Bombyx mori]	247	1e-63
gi|91076732|ref|XP 972864.1|	PREDICTED: similar to CG10175-PC...	247	1e-63
gi|108881317|gb|EAT45542.1|	carboxylesterase [Aedes aegypti]	247	2e-63
gi|28317060|gb|AAO39549.1|	RE03380p [Drosophila melanogaster]	247	2e-63
gi|24649333|ref|NP 651151.1|	CG10175-PC, isoform C [Drosophil...	247	2e-63
gi|24649335|ref|NP 732874.1|	CG10175-PA, isoform A [Drosophil...	247	2e-63
gi|3426006|dbj|BAA32385.1|	carboxylesterase precursor [Aphis ...	246	2e-63
gi|42412531|gb|AAS15642.1|	carboxylesterase [Aphis gossypii] ...	246	3e-63
gi|27658990|ref|XP 226397.1|	PREDICTED: similar to carboxyles...	246	4e-63
gi|72007966|ref|XP 786979.1|	PREDICTED: similar to acetylchol...	246	4e-63
gi|118782091|ref|XP 312052.3|	ENSANGP00000016214 [Anopheles g...	245	5e-63
gi|91084505|ref|XP 972277.1|	PREDICTED: similar to CG10175-PC...	245	5e-63
gi|125773103|ref|XP 001357810.1|	GA10132-PA [Drosophila pseud...	245	5e-63
gi|42412533|gb|AAS15643.1|	carboxylesterase [Aphis gossypii]	245	7e-63
gi|54043019|gb|AAV28503.1|	acetylcholinesterase [Culex pipiens p	244	9e-63
gi|34222522|sp|Q86GC8|ACES CULPI	Acetylcholinesterase precursor	244	9e-63
gi|32968054|emb|CAD33707.2|	acetylcholinesterase [Culex pipiens]	244	9e-63
gi|91084423|ref|XP 968291.1|	PREDICTED: similar to CG6414-PA [Tr	244	1e-62

gi|66505864|ref|XP 394404.2|	PREDICTED: similar to Esterase-6...	244	2e-62
gi|24583086|ref|NP 609301.1|	CG4382-PA [Drosophila melanogast...	244	2e-62
gi|71834068|dbj|BAE16975.1|	juvenile hormone esterase isoform A	243	2e-62
gi|67678086|gb|AAH97486.1|	LOC679149 protein [Rattus norvegicus]	243	3e-62
gi|115653076|ref|XP 788459.2|	PREDICTED: similar to cholinest...	243	3e-62
gi|29120004|emb|CAD56155.1|	acetylcholinesterase [Culex pipiens]	242	4e-62
gi|71834070|dbj|BAE16976.1|	juvenile hormone esterase isoform B	242	6e-62
gi|42412529|gb|AAS15641.1|	carboxylesterase [Aphis gossypii]	241	8e-62
gi|15983755|gb|AAL09822.1|	carboxylesterase [Aphis gossypii]	241	8e-62
gi|62002225|gb|AAX58712.1|	pheromone-degrading enzyme 2 [Anthera	241	8e-62
gi|40363516|dbj|BAD06210.1|	acetylcholinesterase [Culex tritaeni	241	8e-62
gi|108881316|gb|EAT45541.1|	carboxylesterase [Aedes aegypti]	241	1e-61
gi|62002223|gb|AAX58711.1|	pheromone-degrading enzyme 1 [Anthera	241	1e-61
gi|21064383|gb|AAM29421.1|	RE16761p [Drosophila melanogaster]	240	2e-61
gi|108881321|gb|EAT45546.1|	carboxylesterase [Aedes aegypti]	240	2e-61
gi|24639611|ref|NP 570089.1|	CG6414-PA [Drosophila melanogast...	240	2e-61
gi|47213516|emb|CAF96163.1|	unnamed protein product [Tetraodon n	240	2e-61
gi|91091808|ref|XP 970896.1|	PREDICTED: similar to CG6414-PA [Tr	239	3e-61
gi|120474987|ref|NP 001073334.2|	hypothetical protein LOC7190...	239	3e-61
gi|88192514|pdb|2C0P|A	Chain A, Aged Form Of Mouse Acetylchol...	239	3e-61
gi|46015343|pdb|1Q83|A	Chain A, Crystal Structure Of The Mous...	239	3e-61
gi|40889078|pdb|1KU6|A	Chain A, Fasciculin 2-Mouse Acetylcholine	239	3e-61
gi|1421161|pdb|1MAH|A	Chain A, Fasciculin2 - Mouse Acetylchol...	239	3e-61
gi|13928664|ref|NP 033729.1|	acetylcholinesterase [Mus muscul...	239	3e-61
gi|6980490|pdb|1C2O|A	Chain A, Electrophorus Electricus Acety...	239	3e-61
gi|6730113|pdb|1C2B|A	Chain A, Electrophorus Electricus Acetylch	239	3e-61
gi|28373898|pdb|1N5M|A	Chain A, Crystal Structure Of The Mous...	239	3e-61
gi|3062827|dbj|BAA25691.1|	carboxylesterase precursor [Rattus no	239	4e-61
gi|2641986|dbj|BAA23605.1|	carboxylesterase precursor [Mesocrice	239	4e-61
gi|112491234|pdb|2HA4|A	Chain A, Crystal Structure Of Mutant ...	238	6e-61
gi|24649337|ref|NP 732875.1|	CG10175-PB, isoform B [Drosophil...	238	6e-61
gi|89148031|gb|ABD62772.1|	esterase [Chilo suppressalis]	238	8e-61
gi|91095115|ref|XP 969956.1|	PREDICTED: similar to Esterase-6...	238	8e-61
gi|62087113|dbj|BAD92015.1|	carboxylesterase [Athalia rosae]	238	8e-61

Blast X result for glutathione-s-transferase

Sequences producing significant alignments:		Score (Bits)	E Value
gi|91080623|ref|XP 974273.1|	PREDICTED: similar to Glutathion...	189	1e-46
gi|22218855|pdb|1JLV|A	Chain A, Anopheles Dirus Species B Glu...	182	2e-44
gi|53828193|emb|CAH58743.1|	putative glutahione S-transferase...	181	4e-44
gi|31208165|ref|XP 313049.1|	ENSANGP00000011661 [Anopheles ga...	178	3e-43
gi|1632771|emb|CAB03592.1|	GSTD1-5 protein [Anopheles gambiae]	177	4e-43
gi|2738075|gb|AAB94639.1|	glutathione S transferase-1 [Culicoide	177	6e-43
gi|60678789|gb|AAX33729.1|	Per a 5 allergen [Periplaneta america	176	1e-42
gi|14517793|gb|AAK64362.1|AF336288 1	glutathione-S-transferase-l	174	6e-42
gi|11596154|gb|AAG38507.1|AF273041 1	glutathione transferase ...	174	6e-42
gi|108883615|gb|EAT47840.1|	glutathione-s-transferase theta, gst	173	8e-42
gi|1786091|gb|AAB41104.1|	glutathione S-transferase I [Anopheles	172	2e-41
gi|112983444|ref|NP 001036974.1|	glutathione S-transferase th...	171	3e-41
gi|3511227|gb|AAC79994.1|	glutathione S-transferase [Anophele...	171	4e-41
gi|1346214|sp|P42860|GSTT1 LUCCU	Glutathione S-transferase 1-1 (	171	4e-41
gi|31208163|ref|XP 313048.1|	ENSANGP00000023508 [Anopheles ga...	171	4e-41
gi|21464458|gb|AAM52032.1|	RH47312p [Drosophila melanogaster]	171	5e-41
gi|2842718|sp|Q93113|GSTT6 ANOGA	Glutathione S-transferase 1-...	170	7e-41
gi|121696|sp|P28338|GSTT1 MUSDO	Glutathione S-transferase 1 (...	170	7e-41
gi|58384153|ref|XP 313050.2|	ENSANGP00000024808 [Anopheles gambi	170	7e-41
gi|14538008|gb|AAK66764.1|AF386788 1	glutathione S-transferase D	169	2e-40
gi|385883|gb|AAB26519.1|	glutathione S-transferase D1, DmGST1...	169	2e-40
gi|17737923|ref|NP 524326.1|	Glutathione S transferase D1 CG1...	169	2e-40
gi|54637753|gb|EAL27155.1|	GA10031-PA [Drosophila pseudoobscura]	169	2e-40
gi|1495235|emb|CAA96105.1|	GSTD2 protein [Anopheles gambiae]	169	2e-40
gi|108873197|gb|EAT37422.1|	glutathione-s-transferase theta, gst	167	8e-40
gi|116128452|gb|EAA09273.4|	ENSANGP00000013097 [Anopheles gambia	166	1e-39
gi|21435007|gb|AAM53609.1|AF513637 1	glutathione S-transferase D	166	1e-39
gi|10443882|gb|AAG17624.1|	glutathione transferase [Anopheles...	166	1e-39
gi|58385036|ref|XP 313665.2|	ENSANGP00000013097 [Anopheles gambi	166	1e-39
gi|1125671|emb|CAA63946.1|	GST-3/GST-5; glutathione transferase	166	2e-39
gi|20386063|gb|AAM21563.1|AF448500 1	glutathione S-transferase [	164	4e-39
gi|1079182|pir||S43851	glutathione transferase (EC 2.5.1.18) ...	163	9e-39
gi|1125669|emb|CAA63945.1|	GST-3; glutathione transferase [Musca	163	1e-38
gi|242503|gb|AAB20908.1|	glutathione S-transferase 27, GST27=...	163	1e-38
gi|1125663|emb|CAA63948.1|	GST-3/GST-5; glutathione transferase	163	1e-38
gi|17864598|ref|NP 524916.1|	Glutathione S transferase D8 CG4...	163	1e-38
gi|385882|gb|AAB26518.1|	glutathione S-transferase D27, DmGST...	162	1e-38

gi|1170120|sp|P46433|GSTT4 MUSDO	Glutathione S-transferase 4 ...	162	3e-38
gi|54637754|gb|EAL27156.1|	GA10065-PA [Drosophila pseudoobscura]	162	3e-38
gi|1708068|sp|P46431|GSTT2 MUSDO	Glutathione S-transferase 2 ...	161	3e-38
gi|1170119|sp|P46432|GSTT3 MUSDO	Glutathione S-transferase 3 ...	161	3e-38
gi|232194|sp|P30107|GSTT1 DROTE	Glutathione S-transferase 1-1 (G	159	1e-37
gi|232191|sp|P30104|GSTT1 DROER	Glutathione S-transferase 1-1 (G	159	2e-37
gi|1125661|emb|CAA63950.1|	GST-4; glutathione transferase [Musca	159	2e-37
gi|54037234|sp|P67804|GSTT1 DROMA	Glutathione S-transferase 1...	158	3e-37
gi|232195|sp|P30108|GSTT1 DROYA	Glutathione S-transferase 1-1 (G	158	3e-37
gi|27752553|gb|AAO19738.1|	glutathione S-transferase [Bactrocera	158	4e-37
gi|232193|sp|P30106|GSTT1 DROSE	Glutathione S-transferase 1-1 (G	158	4e-37
gi|2117755|pir||S51566	glutathione transferase (EC 2.5.1.18) 2 -	157	8e-37
gi|22218861|pdb|1JLW|A	Chain A, Anopheles Dirus Species B Glu...	156	1e-36
gi|56462176|gb|AAV91371.1|	hypothetical protein 3 [Lonomia obliq	155	2e-36
gi|38493021|pdb|1R5A|A	Chain A, Glutathione S-Transferase >gi...	155	2e-36
gi|54637757|gb|EAL27159.1|	GA14590-PA [Drosophila pseudoobscura]	155	3e-36
gi|54637755|gb|EAL27157.1|	GA18009-PA [Drosophila pseudoobscura]	155	3e-36
gi|24646251|ref|NP 650181.1|	Glutathione S transferase D9 CG1...	154	5e-36
gi|1125665|emb|CAA63952.1|	GST-5; glutathione transferase [Musca	154	7e-36
gi|24646259|ref|NP 650183.1|	CG17639-PA [Drosophila melanogas...	153	9e-36
gi|110763730|ref|XP 392997.3|	PREDICTED: similar to Glutathio...	153	1e-35
gi|76262439|gb|AAT39512.2|	glutathione-S-transferase 1 [Apis mel	153	1e-35
gi|17864592|ref|NP 524912.1|	Glutathione S transferase D2 CG4...	153	1e-35
gi|116128908|gb|EAA08622.3|	ENSANGP00000011261 [Anopheles gambia	152	2e-35
gi|116128909|gb|EAL40657.2|	ENSANGP00000028057 [Anopheles gambia	152	2e-35
gi|385880|gb|AAB26516.1|	glutathione S-transferase D21, DmGST...	152	2e-35
gi|57967576|ref|XP 562675.1|	ENSANGP00000011261 [Anopheles ga...	152	2e-35
gi|3511225|gb|AAC79992.1|	glutathione S-transferase [Anophele...	151	3e-35
gi|57967586|ref|XP 562680.1|	ENSANGP00000028492 [Anopheles ga...	151	3e-35
gi|58384149|ref|XP 313047.2|	ENSANGP00000023440 [Anopheles gambi	151	3e-35
gi|45549270|ref|NP 524914.3|	Glutathione S transferase D5 CG1...	151	4e-35
gi|54637756|gb|EAL27158.1|	GA18171-PA [Drosophila pseudoobscura]	151	4e-35
gi|385879|gb|AAB26515.1|	glutathione S-transferase D24, DmGST...	150	6e-35
gi|1125675|emb|CAA63951.1|	GST-5; glutathione transferase [Musca	150	8e-35
gi|17864594|ref|NP 524913.1|	Glutathione S transferase D4 CG1...	149	2e-34
gi|385881|gb|AAB26517.1|	glutathione S-transferase D23, DmGST...	149	2e-34
gi|108883616|gb|EAT47841.1|	glutathione-s-transferase theta, gst	147	5e-34
gi|108883614|gb|EAT47839.1|	glutathione-s-transferase theta, gst	146	1e-33
gi|91085767|ref|XP 974204.1|	PREDICTED: similar to Glutathion...	144	7e-33
gi|54637752|gb|EAL27154.1|	GA14986-PA [Drosophila pseudoobscura]	143	9e-33
gi|24646249|ref|NP 652713.1|	Glutathione S transferase D10 CG...	143	1e-32
gi|116128453|gb|EAL40527.2|	ENSANGP00000029040 [Anopheles gambia	142	2e-32
gi|112984484|ref|NP 001037183.1|	glutathione S-transferase [B...	141	5e-32
gi|78172883|gb|ABB29466.1|	glutathione S-transferase [Corcyra ce	140	8e-32
gi|55794094|gb|AAV65948.1|	delta glutathione-S-transferase [S...	139	1e-31
gi|14495354|gb|AAK64286.1|AF384858 1	glutathione S-transferas...	133	9e-31
gi|6560681|gb|AAF16718.1|AF117596 1	glutathione S-transferase [M	135	2e-30
gi|57966486|ref|XP 562128.1|	ENSANGP00000029040 [Anopheles gambi	135	2e-30
gi|85861087|gb|ABC86493.1|	IP02541p [Drosophila melanogaster]	135	3e-30
gi|477693|pir||B46681	glutathione transferase (EC 2.5.1.18) D...	135	3e-30
gi|17933730|ref|NP 525114.1|	Glutathione S transferase D7 CG4...	135	3e-30
gi|478238|pir||H46681	glutathione transferase (EC 2.5.1.18) D...	135	3e-30
gi|112982796|ref|NP 001037546.1|	glutathione S-transferase 3 ...	135	3e-30
gi|17864596|ref|NP 524915.1|	Glutathione S transferase D6 CG4...	135	3e-30
gi|12007376|gb|AAG45165.1|AF316637 1	glutathione S-transferase D	133	1e-29
gi|57967606|ref|XP 562690.1|	ENSANGP00000028085 [Anopheles ga...	133	1e-29
gi|58384160|ref|XP 313057.2|	ENSANGP00000000321 [Anopheles gambi	133	1e-29
gi|4704804|gb|AAD28279.1|AF133268 1	glutathione S-transferase GS	132	3e-29
gi|46391804|gb|AAS90947.1|	glutathione S-transferase [Aedes aegy	131	5e-29
gi|108883613|gb|EAT47838.1|	glutathione-s-transferase theta, gst	130	8e-29
gi|91080625|ref|XP 974300.1|	PREDICTED: similar to Glutathion...	130	8e-29
gi|91076556|ref|XP 966702.1|	PREDICTED: similar to CG17531-PA [T	129	2e-28
gi|91078560|ref|XP 971136.1|	PREDICTED: similar to CG17533-PA [T	128	3e-28

Blast X result for glutathione-s-transferase

Sequences producing significant alignments:		Score (Bits)	E Value
gi|60729680|pir||JC8026	cytochrome P450 enzyme, CYP4C39 enzym...	535	4e-150
gi|6456874|gb|AAF09264.1|AF091117 1	cytochrome P450 [Orconectes	482	3e-134
gi|18032259|gb|AAL56662.1|AF263607 1	cytochrome P450 CYP4 [Chera	471	8e-131
gi|50657412|ref|NP 001001879.1|	cytochrome P450, family 4, subfa	434	1e-119
gi|108871345|gb|EAT35570.1|	cytochrome P450 [Aedes aegypti]	424	6e-117
gi|231885|sp|P29981|CP4C1 BLADI	Cytochrome P450 4C1 (CYPIVC1)...	423	2e-116
gi|108876007|gb|EAT40232.1|	cytochrome P450 [Aedes aegypti]	412	3e-113

gi|17864130|ref|NP 524598.1|	Cytochrome P450-4c3 CG1438-PA [D...	407	1e-111
gi|54637319|gb|EAL26721.1|	GA12945-PA [Drosophila pseudoobscura]	402	4e-110
gi|118404542|ref|NP 001072667.1|	hypothetical protein LOC7801...	397	1e-108
gi|109076402|ref|XP 001088961.1|	PREDICTED: similar to cytoch...	394	9e-108
gi|121583883|ref|NP 001073465.1|	hypothetical protein LOC5620...	394	1e-107
gi|114597206|ref|XP 001165629.1|	PREDICTED: hypothetical protein	392	3e-107
gi|114597208|ref|XP 001165592.1|	PREDICTED: hypothetical protein	392	3e-107
gi|68373569|ref|XP 687753.1|	PREDICTED: similar to cytochrome...	392	3e-107
gi|119625029|gb|EAX04624.1|	cytochrome P450, family 4, subfam...	392	5e-107
gi|34532967|dbj|BAC86562.1|	unnamed protein product [Homo sapien	392	5e-107
gi|61743922|ref|NP 997235.2|	cytochrome P450, family 4, subfa...	392	5e-107
gi|116642350|dbj|BAF35771.1|	cytochrome P450 4 family [Daphnia m	391	8e-107
gi|38603630|dbj|BAD02915.1|	Cytochrome P450 [Xenopus laevis]	390	2e-106
gi|115625651|ref|XP 783244.2|	PREDICTED: similar to ENSANGP00...	389	4e-106
gi|73979556|ref|XP 849364.1|	PREDICTED: similar to cytochrome...	388	5e-106
gi|117606212|ref|NP 001071070.1|	hypothetical protein LOC5588...	387	9e-106
gi|71648657|sp|Q5RCN6|CP4V2 PONPY	Cytochrome P450 4V2 >gi|557...	387	9e-106
gi|74151909|dbj|BAE29740.1|	unnamed protein product [Mus musculu	385	6e-105
gi|19527190|ref|NP 598730.1|	family 4 cytochrome P450 [Mus mu...	384	7e-105
gi|109503398|ref|XP 001064152.1|	PREDICTED: similar to family...	383	2e-104
gi|49257971|gb|AAH74131.1|	MGC81840 protein [Xenopus laevis]	383	2e-104
gi|108876008|gb|EAT40233.1|	cytochrome P450 [Aedes aegypti]	380	2e-103
gi|77735695|ref|NP 001029545.1|	hypothetical protein LOC51015...	379	2e-103
gi|108876009|gb|EAT40234.1|	cytochrome P450 [Aedes aegypti]	374	8e-102
gi|47216297|emb|CAF96593.1|	unnamed protein product [Tetraodon n	371	8e-101
gi|47605530|sp|Q964T1|CP4CU BLAGE	Cytochrome P450 4c21 (CYPIV...	355	6e-96
gi|2431938|gb|AAB71169.1|	cytochrome P450 [Drosophila melanog...	352	3e-95
gi|12644424|sp|Q27589|CP4D2 DROME	Cytochrome P450 4d2 (CYPIVD2)	352	3e-95
gi|2431964|gb|AAB71182.1|	cytochrome P450 [Drosophila simulans]	351	7e-95
gi|3249041|gb|AAC69184.1|	corpora allata cytochrome P450 [Diplop	351	7e-95
gi|2431960|gb|AAB71180.1|	cytochrome P450 [Drosophila melanog...	350	2e-94
gi|17933518|ref|NP 525043.1|	Cytochrome P450-4d2 CG3466-PA [D...	350	2e-94
gi|91085551|ref|XP 966563.1|	PREDICTED: similar to Cytochrome...	349	3e-94
gi|542555|pir||S41192	cytochrome P450 4D2 - fruit fly (Drosop...	348	6e-94
gi|2894114|emb|CAA15698.1|	EG:152A3.4 [Drosophila melanogaster]	346	3e-93
gi|93278141|gb|ABF06549.1|	CYP4BF1 [Ips paraconfusus]	345	4e-93
gi|312904|emb|CAA80549.1|	cytochrome P-450 [Drosophila melanogas	344	1e-92
gi|47779228|gb|AAT38512.1|	pheromone-degrading enzyme [Phylloper	338	5e-91
gi|108876251|gb|EAT40476.1|	cytochrome P450 [Aedes aegypti]	337	1e-90
gi|108876247|gb|EAT40472.1|	cytochrome P450 [Aedes aegypti]	337	2e-90
gi|94158626|ref|NP 001035323.1|	cytochrome P450 monooxygenase...	335	5e-90
gi|91078612|ref|XP 966411.1|	PREDICTED: similar to Cytochrome...	332	6e-89
gi|21355669|ref|NP 652020.1|	Cyp4d14 CG3540-PA [Drosophila me...	332	6e-89
gi|38679391|gb|AAR26517.1|	antennal cytochrome P450 CYP4 [Mamest	329	4e-88
gi|5263306|gb|AAC03111.2|	family 4 cytochrome P450 [Coptotermes	329	4e-88
gi|37287641|gb|AAQ90477.1|	cytochrome P450 CYP4AB2 [Solenopsis i	328	6e-88
gi|108876250|gb|EAT40475.1|	cytochrome P450 [Aedes aegypti]	326	3e-87
gi|93278137|gb|ABF06547.1|	CYP4BE1 [Ips paraconfusus]	325	7e-87
gi|91094839|ref|XP 971612.1|	PREDICTED: similar to CG3466-PA [Tr	324	1e-86
gi|115625653|ref|XP 783176.2|	PREDICTED: hypothetical protein...	323	2e-86
gi|5230695|gb|AAD40966.1|AF081807 1	cytochrome P450 4W1 [Boophil	323	3e-86
gi|91078618|ref|XP 967724.1|	PREDICTED: similar to Cytochrome...	322	3e-86
gi|72014091|ref|XP 786946.1|	PREDICTED: hypothetical protein ...	321	1e-85
gi|56710314|dbj|BAD81026.1|	cytochrome P450 CYP4G25 [Antheraea y	320	2e-85
gi|91082471|ref|XP 971854.1|	PREDICTED: similar to Cytochrome...	319	3e-85
gi|54643537|gb|EAL32280.1|	GA17510-PA [Drosophila pseudoobscura]	318	5e-85
gi|71990269|ref|NP 502152.3|	CYtochrome P450 family member (c...	318	6e-85
gi|95102948|gb|ABF51415.1|	cytochrome P450 CYP4G25 [Bombyx mori]	318	8e-85
gi|71985409|ref|NP 496939.2|	CYtochrome P450 family member (c...	318	8e-85
gi|39587668|emb|CAE58606.1|	Hypothetical protein CBG01773 [Caeno	317	1e-84
gi|72001484|ref|NP 507688.2|	CYtochrome P450 family member (c...	317	2e-84
gi|93278153|gb|ABF06555.1|	CYP31B1 [uncultured nematode]	316	2e-84
gi|39580225|emb|CAE72981.1|	Hypothetical protein CBG20323 [Caeno	316	2e-84
gi|33150238|gb|AAP97090.1|	cytochrome P450 CYP4AB1 [Solenopsis i	315	7e-84
gi|93448327|gb|ABC72321.2|	cytochrome P450 [Spodoptera litura]	313	2e-83
gi|39580246|emb|CAE69638.1|	Hypothetical protein CBG15879 [Caeno	313	2e-83
gi|93278139|gb|ABF06548.1|	CYP4BE2 [Ips paraconfusus]	311	6e-83
gi|17560320|ref|NP 507109.1|	CYtochrome P450 family member (c...	311	8e-83
gi|17542994|ref|NP 500637.1|	CYtochrome P450 family member (c...	311	1e-82
gi|27763613|gb|AAO20251.1|	cytochrome P450 monooxygenase CYP4G19	310	1e-82
gi|108877330|gb|EAT41555.1|	cytochrome P450 [Aedes aegypti]	309	4e-82
gi|108875660|gb|EAT39885.1|	cytochrome P450 [Aedes aegypti]	309	4e-82
gi|33518703|gb|AAQ20834.1|	p450 enzyme precursor [Rhodnius proli	308	9e-82
gi|91081697|ref|XP 975951.1|	PREDICTED: similar to Cytochrome...	307	1e-81
gi|91093475|ref|XP 967939.1|	PREDICTED: similar to Cytochrome...	306	3e-81
gi|91082475|ref|XP 971963.1|	PREDICTED: similar to Cytochrome...	306	3e-81
gi|47779230|gb|AAT38513.1|	ubiquitous cytochrome P450 [Phylloper	306	3e-81

gi|21552585|gb|AAM54722.1|	cytochrome P450 monooxygenase CYP4M6	305	7e-81
gi|24642101|ref|NP 573003.2|	Cyp4s3 CG9081-PA [Drosophila mel...	303	2e-80
gi|17565220|ref|NP 503598.1|	CYtochrome P450 family member (c...	303	2e-80
gi|91081695|ref|XP 966683.1|	PREDICTED: similar to Cytochrome...	302	5e-80
gi|17946332|gb|AAL49205.1|	RE63964p [Drosophila melanogaster]	301	6e-80
gi|91082459|ref|XP 966858.1|	PREDICTED: similar to Cytochrome...	300	1e-79
gi|115534628|ref|NP 505009.4|	CYtochrome P450 family member (...	300	1e-79
gi|66562674|ref|XP 625057.1|	PREDICTED: similar to Cytochrome...	300	2e-79
gi|95103020|gb|ABF51451.1|	cytochrome P450 [Bombyx mori]	300	2e-79
gi|39591336|emb|CAE73389.1|	Hypothetical protein CBG20829 [Caeno	298	5e-79
gi|93278147|gb|ABF06552.1|	CYP4BJ1 [Ips paraconfusus]	298	7e-79
gi|54643625|gb|EAL32368.1|	GA21527-PA [Drosophila pseudoobscura]	297	1e-78
gi|115647018|ref|XP 784930.2|	PREDICTED: similar to cytochrom...	297	2e-78
gi|72098778|ref|XP 799260.1|	PREDICTED: similar to cytochrome...	296	2e-78
gi|91090792|ref|XP 970404.1|	PREDICTED: similar to Cytochrome...	296	3e-78
gi|9652058|gb|AAF91384.1|AF261080 1	P450 CYP319A1 [Boophilus mic	295	6e-78

APPENDIX D

Table D1 Residue concentration of chlorpyrifos in treatment water (1 h post treatment).

Specimen	Chorpyrifos contration (µg/l)					
	0	**6.81**	**13.62**	**27.24**	**54.48**	**68.10**
Rep1	0.00	1.36	3.37	5.56	14.46	14.76
Rep2	0.00	2.95	3.22	5.48	10.93	12.28
Rep3	0.00	1.75	2.53	12.29	11.71	28.07
Rep4	0.00	2.02	3.04	7.78	12.37	18.37
Rep5	0.00	0.83	0.45	3.91	1.86	8.49
mean	0.00	1.36	3.37	5.56	14.46	14.76
SD	0.00	2.95	3.22	5.48	10.93	12.28

Table D2 Residue concentration of chlorpyrifos in treatment water (24 h post treatment).

Specimen	Chorpyrifos contration (µg/l)					
	0	**6.81**	**13.62**	**27.24**	**54.48**	**68.10**
Rep1	0.00	0.02	0.56	0.38	1.16	1.67
Rep2	0.00	0.06	0.12	0.31	1.19	0.98
Rep3	0.00	0.00	0.26	0.74	0.89	1.47
Rep4	0.00	0.03	0.31	0.48	1.08	1.37
Rep5	0.00	0.03	0.23	0.23	0.16	0.35
mean	0.00	0.02	0.56	0.38	1.16	1.67
SD	0.00	0.06	0.12	0.31	1.19	0.98

Table D3 Residue concentration of chlorpyrifos in treatment water (48 h post treatment).

Specimen	Chorpyrifos contration (µg/l)					
	0	**6.81**	**13.62**	**27.24**	**54.48**	**68.10**
Rep1	0.00	0.00	0.06	0.13	0.49	0.89
Rep2	0.00	0.00	0.04	0.11	0.63	0.38
Rep3	0.00	0.00	0.00	0.24	0.46	0.78
Rep4	0.00	0.00	0.03	0.16	0.53	0.68
Rep5	0.00		0.03	0.07	0.09	0.27
mean	0.00	0.00	0.06	0.13	0.49	0.89
SD	0.00	0.06	0.12	0.31	1.19	0.98

Table D4 Inhibitory effects of chlorpyrifos on AChE (mean±S.D.) in gills of juvenile *P. monodon* at the lethal concentration of chlorpyrifos (30 min post treatment).

Specimen	Chorpyrifos contration (µg/l)				
	0	**0.0681**	**6.81**	**68.1**	**681**
Rep1	4.85128	3.55815	4.34531	3.51016	1.92816
Rep2	3.78904	4.48589	4.90191	3.02807	0
Rep3	6.05623	3.97086	2.06462	1.53839	0.19357
Rep4	4.93096	2.71356	2.97339	2.45759	2.60125
Rep5	2.03864	3.04978	5.55079	1.79295	1.68405
mean	4.33323	3.55565	3.9672	2.46543	1.28141
SD	1.51292	0.7076	1.42582	0.82458	1.13444

Table D5 Inhibitory effects of chlorpyrifos on AChE (mean±S.D.) in gills of juvenile *P. monodon* at the sub-lethal concentration of chlorpyrifos (24 h post treatment).

Specimen	Chorpyrifos contration (µg/l)			
	0	**0.00681**	**0.0681**	**0.681**
Rep1	5.34439	6.20337	8.52766	6.90408
Rep2	6.71449	4.40453	2.71462	5.46918
Rep3	5.57484	7.39289	8.94145	3.92896
Rep4	8.62909	6.84910	6.48230	5.07045
Rep5	7.02023	10.94697	4.35934	8.51315
mean	6.65661	7.15937	6.20507	5.97716
SD	1.31514	2.39790	2.67156	1.77241

Table D6 Inhibitory effects of chlorpyrifos on AChE (mean±S.D.) in gills of juvenile *P. monodon* at the sub-lethal concentration of chlorpyrifos (48 h post treatment).

Specimen	Chorpyrifos contration (µg/l)			
	0	**0.00681**	**0.0681**	**0.681**
Rep1	2.99903	2.07333	4.46586	1.10501
Rep2	3.91211	2.21492	12.61716	0.82891
Rep3	3.00903	3.17947	1.80544	1.16192
Rep4	4.13912	3.19576	2.82747	1.69885
Rep5	2.18494	23.57416	2.60909	6.46199
mean	3.24885	6.84753	4.86500	2.25134
SD	0.78809	9.36515	4.44007	2.37482

Table D7 Inhibitory effects of chlorpyrifos on AChE (mean±S.D.) in gills of juvenile *P. monodon* at the sub-lethal concentration of chlorpyrifos (72 h post treatment).

Specimen	**Chorpyrifos contration (µg/l)**			
	0	**0.00681**	**0.0681**	**0.681**
Rep1	5.94171	5.60530	2.91295	1.49516
Rep2	2.92083	5.07247	4.65568	1.49997
Rep3	3.57659	0.49330	1.99221	3.33831
Rep4	3.68519	2.91377	1.60298	2.74348
Rep5	4.64339	3.65047	3.00776	1.54238
mean	4.15354	3.54706	2.83432	2.12386
SD	1.17360	2.01869	1.18099	0.86334

Table D8 Inhibitory effects of chlorpyrifos on AChE (mean±S.D.) in gills of juvenile *P. monodon* at the sub-lethal concentration of chlorpyrifos (96 h post treatment).

Specimen	**Chorpyrifos contration (µg/l)**			
	0	**0.00681**	**0.0681**	**0.681**
Rep1	1.55925	2.13577	1.86149	2.21919
Rep2	5.89584	1.14548	2.29556	1.93445
Rep3	5.53862	3.00097	3.01399	1.69486
Rep4	1.64003		2.34469	1.92354
Rep5	3.40132		4.17288	
mean	3.60701	2.09407	2.73772	1.94301
SD	2.06606	0.92845	0.90191	0.21471

Table D9 DNA tail length (μm) (mean ± SD) from haemocytes after 1 h of chlorpyrifos exposure.

Specimen	Chlorpyrifos concentration (μg/l)			
	0	**0.007**	**0.034**	**0.170**
Rep1	9.87	14.45	25.52	20.58
Rep2	7.10	10.50	21.95	21.16
Rep3	6.84	16.70	22.06	24.60
mean	7.94	13.88	23.17	22.11
SD	1.68	3.14	2.03	2.17

Table D10 DNA tail length (μm) (mean ± SD) from haemocytes after 6 h of chlorpyrifos exposure.

Specimen	Chlorpyrifos concentration (μg/l)			
	0	**0.007**	**0.034**	**0.170**
Rep1	10.20	9.60	13.41	21.04
Rep2	7.12	18.71	14.54	21.57
Rep3	14.45	17.29	16.11	21.27
mean	10.59	15.20	14.69	21.29
SD	3.68	4.90	1.35	0.27

Table D11 DNA tail moment (mean ± SD) representing DNA damage after 1 h of chlorpyrifos exposure.

Specimen	Chlorpyrifos concentration (μg/l)			
	0	**0.007**	**0.034**	**0.170**
Rep1	3.98	3.13	9.74	5.35
Rep2	2.46	2.05	7.61	6.04
Rep3	1.85	4.51	10.78	10.69
mean	2.76	3.23	9.38	7.36
SD	1.09	1.23	1.61	2.90

Table D12 DNA tail moment (mean ± SD) representing DNA damage after 6 h of chlorpyrifos exposure.

Specimen	Chlorpyrifos concentration (μg/l)			
	0	**0.007**	**0.034**	**0.170**
Rep1	4.90	3.85	4.94	10.14
Rep2	3.32	6.71	4.92	7.86
Rep3	4.43	6.19	6.28	8.57
mean	4.22	5.58	5.38	8.86
SD	0.81	1.53	0.78	1.17

Table D13 Relative expression level of cytochrome P450 (*CYP4C39*) in hepatopancreas of *P. monodon* after 0 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.69	*NA**	*NA**	*NA**	*NA**
Rep2	1.09	*NA**	*NA**	*NA**	*NA**
Rep3	0.88	*NA**	*NA**	*NA**	*NA**
mean	0.89	*NA**	*NA**	*NA**	*NA**
SD	0.20	*NA**	*NA**	*NA**	*NA**

Remark: * data was not available according to 0 h exposure was specifically set for control group.

Table D14 Relative expression level of cytochrome P450 (*CYP4C39*) in hepatopancreas of *P. monodon* after 12 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.94	1.47	1.42	1.00	1.18
Rep2	0.99	1.14	1.05	1.13	1.02
Rep3	1.08	0.89	1.27	0.53	0.84
mean	1.00	1.16	1.25	0.88	1.01
SD	0.07	0.29	0.18	0.31	0.17

Table D15 Relative expression level of cytochrome P450 (*CYP4C39*) in hepatopancreas of *P. monodon* after 24 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.18	1.10	0.10	0.87	*NA***
Rep2	0.76	1.03	0.93	0.76	*NA***
Rep3	0.92	0.42	0.09	0.65	*NA***
mean	0.95	0.85	0.37	0.76	*NA***
SD	0.21	0.37	0.48	0.11	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D16 Relative expression level of cytochrome P450 (*CYP4C39*) in hepatopancreas of *P. monodon* after 48 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.13	1.20	0.77	1.13	*NA***
Rep2	1.09	0.60	0.97	0.97	*NA***
Rep3	0.54	1.17	0.93	1.01	*NA***
mean	0.58	0.99	0.89	1.04	*NA***
SD	0.48	0.34	0.10	0.08	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D17 Relative expression level of cytochrome P450 (*CYP4C39*) in hepatopancreas of *P. monodon* after 72 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.98	1.30	0.93	0.88	*NA***
Rep2	1.04	0.74	0.88	1.00	*NA***
Rep3	0.70	0.21	0.82	0.98	*NA***
mean	0.91	0.75	0.87	0.96	*NA***
SD	0.18	0.54	0.06	0.06	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D18 Relative expression level of cytochrome P450 (*CYP4C39*) in hepatopancreas of *P. monodon* after 96 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.04	0.09	0.22	0.03	*NA***
Rep2	0.74	0.95	0.07	0.93	*NA***
Rep3	0.88	0.70	0.73	0.82	*NA***
mean	0.89	0.58	0.34	0.59	*NA***
SD	0.15	0.44	0.34	0.49	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D19 Relative expression level of beta glucuronidase in hepatopancreas of *P. monodon* after 0 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (μg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.06	*NA**	*NA**	*NA**	*NA**
Rep2	1.09	*NA**	*NA**	*NA**	*NA**
Rep3	1.09	*NA**	*NA**	*NA**	*NA**
mean	1.08	*NA**	*NA**	*NA**	*NA**
SD	0.02	*NA**	*NA**	*NA**	*NA**

Remark: * data was not available according to 0 h exposure was specifically set for control group.

Table D20 Relative expression level of beta glucuronidase in hepatopancreas of *P. monodon* after 12 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (μg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.64	0.94	0.75	0.72	0.82
Rep2	0.78	0.53	0.85	0.79	0.92
Rep3	0.81	0.86	0.94	0.81	0.70
mean	0.74	0.78	0.84	0.77	0.81
SD	0.09	0.22	0.09	0.05	0.11

Table D21 Relative expression level of beta glucuronidase in hepatopancreas of *P. monodon* after 24 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (μg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.90	0.87	0.94	1.03	*NA***
Rep2	1.11	0.82	0.78	1.03	*NA***
Rep3	0.89	1.04	1.06	1.08	*NA***
mean	0.96	0.91	0.92	1.05	*NA***
SD	0.13	0.11	0.14	0.03	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 μg/l was 100% within 12 h.

Table D22 Relative expression level of beta glucuronidase in hepatopancreas of *P. monodon* after 48 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (μg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.03	0.72	1.03	0.87	*NA***
Rep2	1.08	1.04	1.18	0.94	*NA***
Rep3	0.99	0.80	0.81	0.80	*NA***
mean	1.03	0.85	1.01	0.87	*NA***
SD	0.04	0.16	0.19	0.07	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 μg/l was 100% within 12 h.

Table D23 Relative expression level of beta glucuronidase in hepatopancreas of *P. monodon* after 72 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (μg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.89	0.92	0.59	0.80	*NA***
Rep2	0.96	0.96	0.86	0.86	*NA***
Rep3	0.97	0.99	0.96	0.81	*NA***
mean	0.94	0.96	0.80	0.82	*NA***
SD	0.05	0.03	0.19	0.03	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 μg/l was 100% within 12 h.

Table D24 Relative expression level of beta glucuronidase in hepatopancreas of *P. monodon* after 96 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (μg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.50	0.78	1.00	0.85	*NA***
Rep2	1.13	0.96	1.00	0.75	*NA***
Rep3	0.73	0.96	1.01	0.36	*NA***
mean	0.78	0.90	1.00	0.65	*NA***
SD	0.32	0.11	0.01	0.26	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 μg/l was 100% within 12 h.

Table D25 Relative expression level of heat shock protein 70 in hepatopancreas of *P. monodon* after 0 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.93	*NA**	*NA**	*NA**	*NA**
Rep2	1.03	*NA**	*NA**	*NA**	*NA**
Rep3	0.97	*NA**	*NA**	*NA**	*NA**
mean	0.97	*NA**	*NA**	*NA**	*NA**
SD	0.05	*NA**	*NA**	*NA**	*NA**

Remark: * data was not available according to 0 h exposure was specifically set for control group.

Table D26 Relative expression level of heat shock protein 70 in hepatopancreas of *P. monodon* after 12 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.18	1.18	1.06	1.30	0.78
Rep2	1.05	1.14	1.07	1.13	1.22
Rep3	1.05	1.06	1.05	1.02	1.11
mean	1.09	1.13	1.06	1.15	1.04
SD	0.07	0.06	0.01	0.14	0.23

Table D27 Relative expression level of heat shock protein 70 in hepatopancreas of *P. monodon* after 24 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.88	0.95	0.92	0.92	*NA***
Rep2	0.86	0.81	0.89	0.91	*NA***
Rep3	0.77	0.88	0.86	0.89	*NA***
mean	0.84	0.88	0.89	0.91	*NA***
SD	0.06	0.07	0.03	0.02	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D28 Relative expression level of heat shock protein 70 in hepatopancreas of *P. monodon* after 48 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.84	0.91	0.89	0.89	*NA***
Rep2	0.93	0.88	0.94	0.84	*NA***
Rep3	0.87	0.74	0.75	0.80	*NA***
mean	0.88	0.84	0.86	0.84	*NA***
SD	0.05	0.09	0.10	0.04	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D29 Relative expression level of heat shock protein 70 in hepatopancreas of *P. monodon* after 72 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.14	1.30	1.29	0.92	*NA***
Rep2	1.08	1.11	1.15	1.10	*NA***
Rep3	1.07	1.17	1.13	1.11	*NA***
mean	1.09	1.19	1.19	1.04	*NA***
SD	0.04	0.10	0.09	0.11	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D30 Relative expression level of heat shock protein 70 in hepatopancreas of *P. monodon* after 96 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.94	0.94	0.92	0.96	*NA***
Rep2	0.97	0.88	0.89	0.90	*NA***
Rep3	0.91	0.92	0.94	0.82	*NA***
mean	0.94	0.91	0.92	0.89	*NA***
SD	0.03	0.03	0.03	0.07	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D31 Relative expression level of heat shock protein 90 in hepatopancreas of *P. monodon* after 0 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.87	*NA**	*NA**	*NA**	*NA**
Rep2	0.73	*NA**	*NA**	*NA**	*NA**
Rep3	0.73	*NA**	*NA**	*NA**	*NA**
mean	0.78	*NA**	*NA**	*NA**	*NA**
SD	0.08	*NA**	*NA**	*NA**	*NA**

Remark: * data was not available according to 0 h exposure was specifically set for control group.

Table D32 Relative expression level of heat shock protein 90 in hepatopancreas of *P. monodon* after 12 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.10	0.18	0.05	0.45	0.05
Rep2	0.47	0.09	0.20	0.54	0.37
Rep3	0.04	0.06	0.04	0.58	0.16
mean	0.21	0.11	0.10	0.52	0.19
SD	0.23	0.06	0.09	0.06	0.16

Table D33 Relative expression level of heat shock protein 90 in hepatopancreas of *P. monodon* after 24 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.87	0.14	0.47	0.68	*NA***
Rep2	0.49	0.14	0.18	0.51	*NA***
Rep3	0.15	0.68	0.78	0.66	*NA***
mean	0.50	0.32	0.48	0.62	*NA***
SD	0.36	0.31	0.30	0.09	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D34 Relative expression level of heat shock protein 90 in hepatopancreas of *P. monodon* after 48 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (μg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.85	0.76	0.81	0.62	*NA***
Rep2	0.68	0.44	0.78	0.75	*NA***
Rep3	0.88	0.62	0.72	0.51	*NA***
mean	0.80	0.61	0.77	0.63	*NA***
SD	0.11	0.16	0.04	0.12	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 μg/l was 100% within 12 h.

Table D35 Relative expression level of heat shock protein 90 in hepatopancreas of *P. monodon* after 72 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (μg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.64	0.07	0.67	0.71	*NA***
Rep2	0.73	0.31	0.68	0.70	*NA***
Rep3	0.73	0.43	0.08	0.37	*NA***
mean	0.70	0.27	0.48	0.59	*NA***
SD	0.05	0.18	0.35	0.19	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 μg/l was 100% within 12 h.

Table D36 Relative expression level of heat shock protein 90 in hepatopancreas of *P. monodon* after 96 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (μg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.41	0.92	0.63	0.73	*NA***
Rep2	0.75	0.85	0.85	0.96	*NA***
Rep3	0.61	0.77	0.71	0.57	*NA***
mean	0.59	0.85	0.73	0.75	*NA***
SD	0.17	0.07	0.11	0.20	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 μg/l was 100% within 12 h.

Table D37 Relative expression level of UBC101C-1,000-D-3 (Esterase) in hepatopancreas of *P. monodon* after 0 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.40	*NA**	*NA**	*NA**	*NA**
Rep2	0.02	*NA**	*NA**	*NA**	*NA**
Rep3	1.04	*NA**	*NA**	*NA**	*NA**
mean	0.49	*NA**	*NA**	*NA**	*NA**
SD	0.51	*NA**	*NA**	*NA**	*NA**

Remark: * data was not available according to 0 h exposure was specifically set for control group.

Table D38 Relative expression level of UBC101C-1,000-D-3 (Esterase) in hepatopancreas of *P. monodon* after 12 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.01	0.02	0.02	0.00	0.94
Rep2	1.05	0.01	0.00	0.02	0.00
Rep3	0.70	0.00	0.28	0.00	0.01
mean	0.58	0.01	0.10	0.01	0.32
SD	0.53	0.01	0.15	0.01	0.54

Table D39 Relative expression level of UBC101C-1,000-D-3 (Esterase) in hepatopancreas of *P. monodon* after 24 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.06	0.73	0.00	0.05	*NA***
Rep2	0.00	0.94	1.03	0.85	*NA***
Rep3	1.04	0.19	0.46	0.50	*NA***
mean	0.37	0.62	0.50	0.47	*NA***
SD	0.59	0.39	0.52	0.40	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D40 Relative expression level of UBC101C-1,000-D-3 (Esterase) in hepatopancreas of *P. monodon* after 48 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.57	0.81	0.10	0.86	*NA***
Rep2	0.91	0.00	0.94	0.01	*NA***
Rep3	0.89	0.04	0.03	0.02	*NA***
mean	0.79	0.28	0.35	0.30	*NA***
SD	0.19	0.45	0.51	0.49	*NA***

<u>Remark</u>: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D41 Relative expression level of UBC101C-1,000-D-3 (Esterase) in hepatopancreas of *P. monodon* after 72 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.80	1.06	0.02	0.95	*NA***
Rep2	0.37	0.75	0.93	0.97	*NA***
Rep3	1.00	0.78	0.94	0.32	*NA***
mean	0.72	0.87	0.63	0.75	*NA***
SD	0.32	0.17	0.53	0.37	*NA***

<u>Remark</u>: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D42 Relative expression level of UBC101C-1,000-D-3 (Esterase) in hepatopancreas of *P. monodon* after 96 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.24	0.92	1.06	0.90	*NA***
Rep2	0.01	0.00	0.82	0.91	*NA***
Rep3	1.00	0.91	0.86	0.01	*NA***
mean	0.75	0.61	0.91	0.60	*NA***
SD	0.65	0.53	0.13	0.51	*NA***

<u>Remark</u>: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D43 Relative expression level of UBC119A-650-F-5 (CYP330A1) in hepatopancreas of *P. monodon* after 0 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.86	*NA**	*NA**	*NA**	*NA**
Rep2	0.83	*NA**	*NA**	*NA**	*NA**
Rep3	0.82	*NA**	*NA**	*NA**	*NA**
mean	0.84	*NA**	*NA**	*NA**	*NA**
SD	0.02	*NA**	*NA**	*NA**	*NA**

Remark: * data was not available according to 0 h exposure was specifically set for control group.

Table D44 Relative expression level of UBC119A-650-F-5 (CYP330A1) in hepatopancreas of *P. monodon* after 12 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.29	0.77	0.94	0.98	0.97
Rep2	1.04	0.76	0.55	1.10	0.88
Rep3	0.95	0.67	0.83	0.81	0.83
mean	0.76	0.73	0.78	0.97	0.89
SD	0.41	0.06	0.20	0.14	0.08

Table D45 Relative expression level of UBC119A-650-F-5 (CYP330A1) in hepatopancreas of *P. monodon* after 24 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.03	1.03	0.83	0.95	*NA***
Rep2	0.57	1.06	0.94	0.85	*NA***
Rep3	1.03	0.81	0.85	1.01	*NA***
mean	0.88	0.96	0.87	0.93	*NA***
SD	0.26	0.14	0.06	0.08	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D46 Relative expression level of UBC119A-650-F-5 (CYP330A1) in hepatopancreas of *P. monodon* after 48 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.04	0.89	0.74	1.00	*NA***
Rep2	0.94	0.78	0.91	0.85	*NA***
Rep3	0.59	0.83	0.83	0.74	*NA***
mean	0.52	0.83	0.82	0.86	*NA***
SD	0.45	0.06	0.08	0.13	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D47 Relative expression level of UBC119A-650-F-5 (CYP330A1) in hepatopancreas of *P. monodon* after 72 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.83	0.70	0.88	0.84	*NA***
Rep2	1.06	0.86	0.83	1.04	*NA***
Rep3	0.85	0.89	0.91	1.12	*NA***
mean	0.91	0.82	0.87	1.00	*NA***
SD	0.13	0.10	0.04	0.14	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D48 Relative expression level of UBC119A-650-F-5 (CYP330A1) in hepatopancreas of *P. monodon* after 96 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.62	0.54	0.77	0.20	*NA***
Rep2	0.86	0.77	0.66	0.88	*NA***
Rep3	0.80	0.37	0.81	0.96	*NA***
mean	0.76	0.56	0.75	0.68	*NA***
SD	0.12	0.20	0.08	0.42	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D49 Relative expression level of glutathione-s-transferase in hepatopancreas of *P. monodon* after 0 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.96	*NA**	*NA**	*NA**	*NA**
Rep2	0.45	*NA**	*NA**	*NA**	*NA**
Rep3	1.13	*NA**	*NA**	*NA**	*NA**
mean	0.85	*NA**	*NA**	*NA**	*NA**
SD	0.34	*NA**	*NA**	*NA**	*NA**

Remark: * data was not available according to 0 h exposure was specifically set for control group.

Table D50 Relative expression level of glutathione-s-transferase in hepatopancreas of *P. monodon* after 12 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.36	0.07	0.63	0.69	0.93
Rep2	0.47	0.71	0.92	0.93	0.63
Rep3	0.94	0.04	0.66	0.08	0.40
mean	0.59	0.27	0.74	0.57	0.65
SD	0.31	0.38	0.16	0.44	0.27

Table D51 Relative expression level of glutathione-s-transferase in hepatopancreas of *P. monodon* after 24 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.85	0.99	0.53	0.49	*NA***
Rep2	0.00	1.42	0.97	0.59	*NA***
Rep3	0.90	0.26	0.28	0.74	*NA***
mean	0.58	0.89	0.59	0.61	*NA***
SD	0.51	0.58	0.35	0.12	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D52 Relative expression level of glutathione-s-transferase in hepatopancreas of *P. monodon* after 48 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (μg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.01	0.66	0.62	0.68	*NA***
Rep2	0.82	0.40	0.54	0.16	*NA***
Rep3	0.22	0.52	0.10	0.68	*NA***
mean	0.35	0.53	0.42	0.51	*NA***
SD	0.42	0.13	0.28	0.30	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 μg/l was 100% within 12 h.

Table D53 Relative expression level of glutathione-s-transferase in hepatopancreas of *P. monodon* after 72 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (μg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.03	0.29	0.13	0.74	*NA***
Rep2	0.67	0.67	0.10	0.64	*NA***
Rep3	0.20	0.03	0.07	0.13	*NA***
mean	0.64	0.33	0.10	0.51	*NA***
SD	0.41	0.32	0.03	0.33	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 μg/l was 100% within 12 h.

Table D54 Relative expression level of glutathione-s-transferase in hepatopancreas of *P. monodon* after 96 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (μg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.34	0.03	0.38	0.01	*NA***
Rep2	0.57	0.09	0.01	0.08	*NA***
Rep3	0.92	0.42	0.42	0.76	*NA***
mean	0.61	0.18	0.27	0.28	*NA***
SD	0.29	0.21	0.22	0.41	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 μg/l was 100% within 12 h.

Table D55 Relative expression level of OPA18G-600-4-1 (Ubiquitin-like-7) in hepatopancreas of *P. monodon* after 0 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.92	*NA**	*NA**	*NA**	*NA**
Rep2	0.68	*NA**	*NA**	*NA**	*NA**
Rep3	0.76	*NA**	*NA**	*NA**	*NA**
mean	0.79	*NA**	*NA**	*NA**	*NA**
SD	0.05	*NA**	*NA**	*NA**	*NA**

Remark: * data was not available according to 0 h exposure was specifically set for control group.

Table D56 Relative expression level of OPA18G-600-4-1 (Ubiquitin-like-7) in hepatopancreas of *P. monodon* after 12 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.40	0.19	0.22	0.07	0.35
Rep2	0.62	0.23	0.33	0.72	1.39
Rep3	0.61	0.59	0.34	0.53	0.22
mean	0.54	0.34	0.30	0.44	0.65
SD	0.12	0.22	0.07	0.33	0.64

Table D57 Relative expression level of OPA18G-600-4-1 (Ubiquitin-like-7) in hepatopancreas of *P. monodon* after 24 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.45	0.14	0.91	1.07	*NA***
Rep2	1.03	0.22	0.68	0.49	*NA***
Rep3	0.15	2.25	0.97	0.92	*NA***
mean	0.88	0.87	0.85	0.83	*NA***
SD	0.66	1.20	0.15	0.30	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D58 Relative expression level of OPA18G-600-4-1 (Ubiquitin-like-7) in hepatopancreas of *P. monodon* after 48 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.25	0.13	0.97	0.10	*NA***
Rep2	0.23	0.75	0.59	0.61	*NA***
Rep3	0.26	0.11	0.20	0.16	*NA***
mean	0.24	0.33	0.59	0.29	*NA***
SD	0.02	0.36	0.38	0.28	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D59 Relative expression level of OPA18G-600-4-1 (Ubiquitin-like-7) in hepatopancreas of *P. monodon* after 72 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.18	0.31	0.15	0.34	*NA***
Rep2	0.72	0.80	0.46	0.41	*NA***
Rep3	0.62	0.42	0.59	0.06	*NA***
mean	0.51	0.51	0.40	0.27	*NA***
SD	0.29	0.26	0.22	0.18	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D60 Relative expression level of OPA18G-600-4-1 (Ubiquitin-like-7) in hepatopancreas of *P. monodon* after 96 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.01	0.31	0.60	0.72	*NA***
Rep2	0.57	0.38	0.52	0.02	*NA***
Rep3	0.00	0.46	0.56	0.42	*NA***
mean	0.19	0.38	0.56	0.39	*NA***
SD	0.33	0.08	0.04	0.35	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D61 Relative expression level of OPA01G-415-1 (Leucine zipper protein 5) in hepatopancreas of *P. monodon* after 0 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.29	*NA**	*NA**	*NA**	*NA**
Rep2	0.91	*NA**	*NA**	*NA**	*NA**
Rep3	0.97	*NA**	*NA**	*NA**	*NA**
mean	1.05	*NA**	*NA**	*NA**	*NA**
SD	0.07	*NA**	*NA**	*NA**	*NA**

Remark: * data was not available according to 0 h exposure was specifically set for control group.

Table D62 Relative expression level of OPA01G-415-1 (Leucine zipper protein 5) in hepatopancreas of *P. monodon* after 12 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.11	0.23	0.08	0.30	0.30
Rep2	0.47	0.04	0.15	0.13	0.13
Rep3	0.21	0.12	0.25	0.12	0.12
mean	0.26	0.13	0.16	0.18	0.18
SD	0.19	0.10	0.09	0.10	0.10

Table D63 Relative expression level of OPA01G-415-1 (Leucine zipper protein 5) in hepatopancreas of *P. monodon* after 24 h of chlorpyrifos exposure

Specimen	Chlorpyrifos Concentration (µg/l) (N=3)				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.26	0.07	0.15	0.24	*NA***
Rep2	0.11	0.06	0.01	0.24	*NA***
Rep3	0.02	0.09	0.23	0.22	*NA***
mean	0.13	0.07	0.13	0.23	*NA***
SD	0.12	0.02	0.11	0.01	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D64 Relative expression level of OPA01G-415-1 (Leucine zipper protein 5) in hepatopancreas of *P. monodon* after 48 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.23	0.02	0.16	0.09	*NA***
Rep2	0.37	0.60	0.36	0.58	*NA***
Rep3	0.46	0.00	0.50	0.11	*NA***
mean	0.35	0.21	0.34	0.26	*NA***
SD	0.12	0.34	0.17	0.28	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D65 Relative expression level of OPA01G-415-1 (Leucine zipper protein 5) in hepatopancreas of *P. monodon* after 72 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	1.15	0.83	0.48	0.52	*NA***
Rep2	0.51	0.60	0.34	0.51	*NA***
Rep3	0.88	0.70	0.56	0.18	*NA***
mean	0.85	0.71	0.46	0.40	*NA***
SD	0.32	0.12	0.11	0.19	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D66 Relative expression level of OPA01G-415-1 (Leucine zipper protein 5) in hepatopancreas of *P. monodon* after 96 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.14	0.58	0.94	1.10	*NA***
Rep2	1.01	0.22	0.46	0.24	*NA***
Rep3	0.20	0.34	0.29	0.24	*NA***
mean	0.45	0.38	0.56	0.53	*NA***
SD	0.48	0.18	0.34	0.50	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D67 Relative expression level of OPA02G-450-2 (sequence of unknown gene) in hepatopancreas of *P. monodon* after 0 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.25	*NA**	*NA**	*NA**	*NA**
Rep2	0.17	*NA**	*NA**	*NA**	*NA**
Rep3	0.16	*NA**	*NA**	*NA**	*NA**
mean	0.19	*NA**	*NA**	*NA**	*NA**
SD	0.02	*NA**	*NA**	*NA**	*NA**

Remark: * data was not available according to 0 h exposure was specifically set for control group.

Table D68 Relative expression level of OPA02G-450-2 (sequence of unknown gene) in hepatopancreas of *P. monodon* after 12 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.08	0.00	0.00	0.09	0.00
Rep2	0.01	0.16	0.05	0.00	0.18
Rep3	0.21	0.12	0.00	0.00	0.00
mean	0.10	0.09	0.02	0.03	0.06
SD	0.10	0.08	0.03	0.05	0.10

Table D69 Relative expression level of OPA02G-450-2 (sequence of unknown gene) in hepatopancreas of *P. monodon* after 24 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.03	0.03	0.00	0.00	*NA***
Rep2	0.05	0.00	0.00	0.00	*NA***
Rep3	0.01	0.12	0.04	0.01	*NA***
mean	0.03	0.05	0.02	0.00	*NA***
SD	0.02	0.07	0.02	0.01	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D70 Relative expression level of OPA02G-450-2 (sequence of unknown gene) in hepatopancreas of *P. monodon* after 48 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.11	0.00	0.00	0.00	*NA***
Rep2	0.09	0.07	0.09	0.04	*NA***
Rep3	0.07	0.07	0.00	0.10	*NA***
mean	0.09	0.05	0.03	0.05	*NA***
SD	0.02	0.04	0.05	0.05	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D71 Relative expression level of OPA02G-450-2 (sequence of unknown gene) in hepatopancreas of *P. monodon* after 72 h of chlorpyrifos exposure

Time of Exposure (h)	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.45	0.07	0.06	0.24	*NA***
Rep2	0.20	0.25	0.25	0.15	*NA***
Rep3	0.18	0.28	0.41	0.00	*NA***
mean	0.28	0.20	0.24	0.13	*NA***
SD	0.15	0.11	0.18	0.12	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

Table D72 Relative expression level of OPA02G-450-2 (sequence of unknown gene) in hepatopancreas of *P. monodon* after 96 h of chlorpyrifos exposure

Specimen	**Chlorpyrifos Concentration (µg/l) (N=3)**				
	0	**0.0681**	**6.81**	**13.62**	**27.24**
Rep1	0.04	0.42	0.54	0.01	*NA***
Rep2	0.16	0.03	0.53	0.06	*NA***
Rep3	0.00	0.20	0.00	0.00	*NA***
mean	0.07	0.22	0.36	0.02	*NA***
SD	0.08	0.20	0.31	0.03	*NA***

Remark: ** data was not available according to mortality of shrimp exposed to 27.24 µg/l was 100% within 12 h.

BIOGRAPHY

Miss Tassanee Eamakmon was born on September 18, 1976 in Chaiyaphume Province, Thailand. She graduated with the degree of Master of Science in Zoology from Chulalongkorn University. She has studied for a degree of doctoral degree of science at faculty of graduate school, Chulalongkorn University.

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