

**UNIVERSITI TEKNOLOGI MARA**

**THE COMPARISON BETWEEN BETA-  
GLUCURONIDASE (BG) WITH PLASMA  
BUTYRYLCHOLINESTERASE (BChE) AS  
BIOMARKER OF LOW-LEVEL  
ORGANOPHOSPHATE INSECTICIDE AMONG  
VECTOR CONTROL OPERATORS**

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Thesis submitted in fulfillment of the requirements  
for the degree of  
**Master of Science**

**Faculty of Health Sciences**


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## AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of the Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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## ABSTRACT

This study aims to compare two detection methods of organophosphate poisoning using plasma butyrylcholinesterase (BChE) and  $\beta$ -glucuronidase (BG) assay, their relationship with insecticide exposure characteristics, as well as comparing the differences of both biomarkers between the exposed group (vector control operators) with the non-exposed control group (normal Malaysian). A total of 96 vector control operators from four centres; Pejabat Kesihatan Daerah (PKD) Petaling, PKD Kuala Langat, PKD Kuala Selangor and Majlis Bandaraya Shah Alam were the subject group while 49 healthy blood donors from Pusat Darah Negara were recruited as the negative control group. Occupational insecticide poisoning characteristics of the subject group (employment period, lapse time between insecticide use and blood collection, type of insecticide used, types of Personal Protective Equipments (PPE) and compliance with use) were obtained through questionnaire. The association of BChE and BG level with age, race, employment year, compliance to PPE use, and lapse time between insecticide use and blood collection were evaluated. Both assays showed similar results where both were not influenced by the mentioned variables. A comparison between the methods of both the assays provides insight into suitability of each biomarker for different situations. BChE assay is recommended as a suitable assay for acute exposure to insecticides due to its rapid test turnaround time. Meanwhile BG assay is suitable for continuous biomonitoring of organophosphate poisoning among occupationally exposed workers due to its low cost and minimal laboratory requirement. A correlation test between BChE and BG level showed significant positive correlation ( $r=0.301$ ,  $p=0.003$ ). Comparison of the results of BChE and BG level among the control and subject group showed no significant difference ( $p>0.05$ ). In conclusion, findings of this study show that assaying for the BG enzyme can be an alternative or additional method to determine organophosphate poisoning alongside the BChE assay. The reference value established for BG assay from this study is between the range of 40- 720 U/dL and mean of  $204.19\pm 136.88$  U/dL. Results of both assays had also shown that vector control operators in these four areas in Selangor are not exposed to harmful level of organophosphate.

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