Ref: 20121218-53

MINISTRY OF MANPOWER

18 Dec 2012

All practising Designated Workplace Doctors

Dear Doctor,

REVISION OF LABORATORY REFERENCE INTERVAL FOR RED BLOOD CELL ACETYLCHOLINESTERASE LEVELS

1 Under the Workplace Safety and Health (WSH) (Medical Examinations) Regulations, workers who use, handle or are exposed to the liquid, fumes or vapour of organophosphate compounds are required to undergo pre-placement and periodic medical examinations conducted by Designated Workplace Doctors (DWDs). This includes a clinical examination for effects of exposure to organophosphates (OPs) and a laboratory test for red blood cell acetylcholinesterase (RBC AChE) conducted at pre-placement and at 6-monthly intervals. A detailed work history should be taken and the emphasis should be on the central and autonomic nervous systems during clinical examination.

2 RBC AChE is a biological indicator of the dose of OP an individual worker is exposed to and exposure to OP can depress the levels of RBC AChE. The current reference interval is 15,000 – 24,000 U/L.

3 Department of Pathology, Singapore General Hospital, has informed the Ministry of Manpower (MOM) of a change in assay methodology for RBC AChE with effect from 10 January 2013. Consequently, there will be an update of the reference interval from 15,000 – 24,000 U/L to 7,700 - 14,600 U/L. (Please see Annex 1).

4 With the revised assay methodology and reference interval, DWDs would not be able to use the test results conducted prior to 10 January 2013 as baseline for comparison. They should instead use the laboratory's revised lower limit of the reference interval. A new baseline can be established when subsequent tests are conducted.

5 The index of suspicion for suspected poisoning or overexposure must remain high and DWDs are reminded to correlate exposure history with individual symptoms and investigation results. Please refer to Annex 2 from the WSH Guidelines: Statutory Medical Examinations.

6 You may contact Dr Lucy Leong at 6692 5067 or email her at Lucy_Leong@mom.gov.sg if you need any clarification.

Yours faithfully,

Dr Kenneth Choy
for COMMISSIONER FOR WORKPLACE SAFETY AND HEALTH
OCCUPATIONAL SAFETY AND HEALTH DIVISION
MINISTRY OF MANPOWER
(This is a computer generated letter, no signature is required)

Date of issue	Classification	Circular no
18 Dec 2012	Statutory Medical Examinations	OSHD/SPECS/OM/SME/04-2012

Annex 1
Circular from Department of Pathology, Singapore General Hospital

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SingHealth

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MEMORANDUM

To: All Laboratory Users

From: Dr Yeo Chin Pin
Senior Consultant and Head of Clinical Biochemistry Section
Department of Pathology

Through: A/Prof Tan Puay Hoon
Senior Consultant and Head, Department of Pathology

Subject: Cholinesterase (Red Blood Cells)

Date: 5 November 2012

The Clinical Biochemistry Laboratory will be changing the assay methodology for Cholinesterase (RBC) with effect from 10 Jan 2013.

As a result of this change, reference interval for Cholinesterase (RBC) will be updated from 15000 – 24000 U/L to 7 700 – 14 600 U/L.

The new methodology will require more blood sample than the current methodology. Please send a full tube of blood (3 mL) to the laboratory.

For further clarification, kindly contact Dr Yeo Chin Pin at 6321 4916.

Thank you for your support and cooperation.

Annex 2
Health Effects of exposure to Organophosphates
(Source: WSH Guidelines - Statutory Medical Examinations)

Main Industries and Occupations at Risk
• Horticulture–gardeners, greenhouse workers;
• Agriculture–garden pest control operators, farmers;
• Vector control operators;
• Formulation and manufacture of organophosphates, e.g., insecticide sprays;
• Laboratory workers analysing organophosphates; and
• Packing and redistribution of organophosphates.

Note: Organophosphates may be used in domestic settings

Common Organophosphates used in Singapore are:
• Basudin 60
• Dichlorvos
• Dimethoate
• Dipterex
• Diazinon
• DDVP (2,2, Dichlorovinyl 0, 0-Dimethyl Phosphate)
• Fenthion
• Malathion
• Parathion
• Rogor
• Tamaron
• Temephos

(Note: The list is not exhaustive)

Routes of exposure
Workers are commonly exposed to organophosphates when they use, handle or are exposed to the liquid, fumes or vapour of organophosphate compounds. The common routes of exposure are through inhalation and / or skin contact (dermal). Poisoning can also occur if the OPs are ingested.

Toxic Effects of exposure to organophosphates

A. Signs and Symptoms of Acute Poisoning

- Onset is prompt but may be delayed up to 12 hours;
- Central Nervous System
    - anxiety, dizziness, headache, sleeplessness, confusion, coma, convulsions
- Respiratory
    - dyspnoea, chest tightness, bronchospasm, bronchial hypersecretion, pulmonary oedema
- Gastrointestinal
    - salivation, nausea, vomiting, abdominal colic, diarrhoea, pancreatitis
- Ocular
    - lacrimation, miosis, blurring of vision
- Muscular
    - fasciculations, cramps

B. Signs and Symptoms of Chronic Poisoning

- Non-specific
  - headache, quick onset of fatigue, disturbed sleep, anorexia
- Central and Autonomic Nervous System
  - nystagmus, tremors, failing memory, disorientation
- Peripheral Nervous System
  - paresis, neuritis, paralysis

Medical Examinations

Indications:

Workers are required to undergo clinical examinations if they are exposed to organophosphates. These examinations shall include a detailed medical and work history with emphasis on the systems affected by exposure to OPs and laboratory testing for red blood cell acetylcholinesterase (RBC AChE).

The pre-placement medical examinations should be conducted within 3 months of commencing exposure and in addition, include a plasma cholinesterase estimation.

Periodic medical examinations should be conducted every 6 months.

Specimen collection:

As exposure to OPs may be intermittent, it is recommended that blood samples for RBC AChE be collected at the end of the workday using EDTA tubes. The tubes should contain at least 3 ml blood to ensure there is an adequate amount for the test to be run.

Interpretation of results and and actions to be taken:

Where the RBC AChE shows a fall of 30% or more from the worker's baseline results or the laboratory lower limit of the reference interval, a detailed occupational history and clinical examination should be performed to determine if there is any correlation between the test results, clinical symptoms and signs and risk factors at work. The risk factors could include non-usage of personal protective equipment, accidental contact, wrong handling technique etc.

More information can be found in the following guidelines available at www.wshc.sg:

a. WSH Guidelines: Statutory Medical Examinations and
b. WSH Guidelines: Diagnosis and Management of Occupational Diseases.

A summary of actions to be taken by the DWD in the event of abnormal RBC AChE results is found in Table 1 on the next page. Doctors are strongly encouraged to refer to the relevant chapter in the WSH Guidelines: Statutory Medical Examinations for more information on interpretation and actions to be taken.

Table 1: Summary of actions DWD should take for abnormal results (Based on the lower limit of the revised reference interval)

Actions	**RBC AChE low (50-70% lab lower limit)**	**RBC AChE very low (≤50% lab lower limit)**
RBC AChE levels	**3,850 - 5,390 U/L rbc**	**≤3,850 U/L rbc**
Clinical Examination	Yes	Yes
Suspension from exposure	KIV, if repeat tests show >10% drop from previous	Immediate
Repeat RBC AChE test	Yes, immediately and monthly	Yes, immediately and monthly
Refer emergency department of hospital or toxicologist for management	Recommended if falling trend in serial RBC AChE or if symptomatic.	Yes Immediately if symptomatic
Inform company to review risk control measures	Yes	Yes
Counsel worker on preventive measures	Yes	Yes
Notify MOM (iReport)	Yes, if diagnosed as Poisoning	Yes, if diagnosed as Poisoning

Note: The worker's RBC AChE level following at least one month of suspension can be taken as the worker's baseline level if higher than the laboratory's lower limit of the reference interval.