BORANG PENGESAHAN STATUS TESIS*

JUDUL: CORTISOL DIAGNOSIS TOOL

SESI PENGAJIAN: 2004/2007

Saya NURUL ASHIKIN BT ABD SAMAD
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Alamat tetap : 503, Semarak 10,
Tmn Panchor Jaya, 70400 Seremban
Negeri Sembilan Daril Khusus.

MASSILA KAMALRUDIN
Nama Penyelia

Tarikh : 12 NOV 2007

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CORTISOL DIAGNOSIS TOOL

NURUL ASHIKIN BT ABD SAMAD

This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Software Development)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2007

DECLARATION

I hereby declare that this project report entitled

CORTISOL DIAGNOSIS TOOL

is written by me and is my own effort and that no part has been plagiarized without citations.

STUDENT: _____ Date: 12 NOV 2007

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DEDICATION

To my beloved parents.

"Here comes success, here comes success
Over my hill, over my hill."
- Iggy Pop, Success.

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It is well-known as the greatest cliché to write the "biggest thanks" for your supervisor in the acknowledgement section for any supervised report. And even though I despise to begin my dissertation with any kind stereotype, I have to admit that my supervisor Puan Massila Kamalrudin is the person that I should express my highest gratitude for not just her guidance but also her enthusiasm, support and reassurance during the completion of this project document. Without her as my supervisor, I am sure this project still in the middle of nowhere.

Enormous thanks also go to Nurul Izzah Abd Samad whose trigger my interest in developing this project. Also for helping me understanding some of the issues related to Health, Safety and Environment (HSE) area and for those brilliant suggestion and ideas given. I am hoping that this project will extend our contribution not just to our Universities but also to the field of HSE in this country.

And finally, I would also like to thank my family, lecturers and friends for their support and understanding especially those who have taken time to advice upon and proof read this document.

ABSTRACT

Cortisol Diagnosis Tool moves the current environment of occupational stress assessment using salivary *cortisol* into the latest web technology. The current process of the assessment require different method in separate environments to be perform in order to get the sample reading and related statistical outcome. All the records in the current process are kept in the manual filing system. However by developing this system, it is hoping to merge the differences into the one centralized system. Its not just helping the laboratory assistant to record the diagnosis finding; but also beneficial to the Health, Safety and Environment (HSE) officer who responsible for the assessment in order to manage the organizations and respondents involve in the assessment other than to generate the statistical outcomes.

ABSTRAK

Cortisol Diagnosis Tool mengubah kaedah yang digunakan dalam menilai tahap tekanan di tempat kerja dengan menggunakan 'salivary *cortisol*' kepada teknologi web yang terkini. Kaedah semasa yang digunakan untuk menentukan tekanan di tempat kerja di mana untuk mendapatkan nilai sampel dan statistik; memerlukan proses yang berbeza di tempat yang berasingan. Kesemua rekod yang digunakan semasa penilaian ini disimpan di dalam system fail manual. Bagaimanapun, dengan adanya sistem ini adalah diharapkan kesemua proses yang terlibat dapat digabungkan dibawah sistem yang sama. Ia tidak hanya menguntungkan pihak makmal untuk merekodkan keputusan diagnosis, malahan juga memudahkan pihak pegawai Kesihatan, Keselamatan dan Persekitaran (HSE) yang memantau penilaian. Proses merekod maklumat organisasi dan responden yang terlibat juga akan menjadi lebih mudah dengan penggunaan sistem ini.

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ACTH	- Adrenocorticotropin-Releasing Hormone
CRH	- Corticotrophin-Releasing Hormone
CSS	- Cascading Style Sheet
DBMS	- Database Management System
DFD	- Data Flow Diagram
ERD	- Entity Relationship Diagram
FK	- Foreign Key
GUI	- Graphical User Interface
HSE	- Health, Safety and Environment
HTML	- Hypertext Markup Language
IE	- Internet Explorer
LAN	- Local Area Network
NIOSH	- National Institute for Occupational Safety and Health
NSB	- New Substance
OD	- Optical Density
PHP	- PHP Hypertext Preprocessor
PK	- Primary Key
PSM	- Projek Sarjana Muda
SDLC	- Software Development Life Cycle
SSADM	- Structured Systems Analysis and Design Method

UTeM	- Universiti Teknikal Malaysia Melaka
WAN	- Wide Area Network
XAMPP	- X-Apache-MySQL-PHP-Perl

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CHAPTER I

INTRODUCTION

1.1 Project Background

Stress is a psychological and physiological reaction to any events or situations that upset our personal strength. The event or situation that triggers the reaction is called stressor. Stressor is often remarked as a negative occurrence; such as failure, tiredness, frustration and the likes even though the fact is anything that triggered a person to shift pace can be called as stressor. As a stimulus, stress is integral to dynamic *homeostatic* functioning even though in the same time mount of evidence has been discovered on its potential chaotic effects on health.

The incentive to understand the mechanisms that underlie beneath stress-related negative health outcomes and prevent the development of stress-related disorders has never been greater. Symptom severity and subjective levels of stress, although frequently assessed in studies of stress, may not provide adequate data to fully understand the pervasive effects of chronic or overwhelming stress associated with stress disorders (King and Hegadoren, 2002). In addition, stress also causing disorder in psychological and physical health; which will lead to immune dysfunction.

According to Beaton (2003):

"The capabilities of the immune system are diminished after frequent activation of the autonomic nervous system in the case of chronic stresses".

There are several *neuroendocrine* products and *neurotransmitters* are involved in biological responses to stress, however in this project the focuses will be given on the approach for measuring the levels of *cortisol*. *Cortisol* is a hormone produced when we slip into stress, when we feel angry or fearful, or when we respond to a sheer of frustration. It is measured in μg/ml and can be found in urine, plasma, and more recently, saliva.

In humans, *cortisol* is the primary *glucocorticoid,* referring to their ability to increase blood glucose levels. Normally *cortisol* is synthesized and secreted in the *adrenal cortex* at the rate of about 10 mg daily in humans (Schimmer and Parker, 1996). Under basal conditions, *cortisol* interacts mostly with high-affinity *mineralocorticoid* receptors, which are important for normal *homeostatic* control of metabolic processes and fluid balance.

Increasing levels of *cortisol* act as a negative feedback signal to suppress further *corticotrophin-releasing* hormone (CRH) and *adrenocorticotropin-releasing* hormone (ACTH) release at the level of the *hypothalamus* and *pituitary*, respectively, as shown in Figure 1.1.

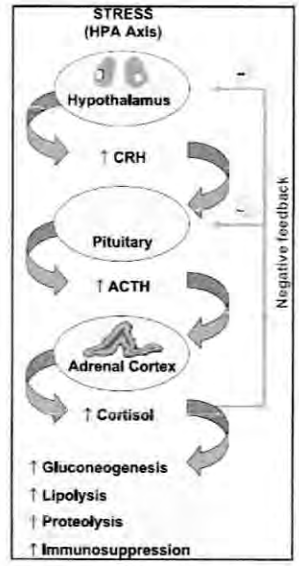

Figure 1.1 : C*ortisol* suppress and CRH and ACTH hormones

In the occupational environment, stress can affect the level of productivity of an organization as well as downsized the worker's job performance. As stated by National Institute for Occupational Safety and Health (NIOSH), occupational stress can be defined as the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources, or needs of the workers and it can lead to poor health and even injury. Results from the Bristol Stress and Health at Work study (described in detail in HSE Contract Research Report 265/2000) showed that about 20 percent of the sample collected from the various industries reported very high or extremely high levels of stress at work.

Since stress has been identified to cause a direct consequence on the quality of worker's performance, an organization should always welcome the approach to measure the level of occupational stress in their environment. One of the famous assessments done on the field of organization safety, health and environment is a stress assessment using saliva sampling. A major advantage of salivary sampling is that *cortisol* in saliva is 100% unbound and biologically active (Baum and Grunberg 1997). Salivary sampling is invasive, painless, less stressful, and more easily performed (Hofman 2001). It is also less expensive, raises fewer ethical concerns than more invasive methods, and has higher rates of compliance (Baum and Grunberg 1997). Moreover, it is proven that, salivary

cortisol appears to be as sensitive a measure of stress reactivity as urinary and plasma *cortisol* (Weinstein *et al* 1999).

This project deals with the development of *Cortisol* Diagnosis Tool. It is a web-based diagnosis tool that will analyze the occupational stress level in an organization by inputting the readings from saliva samples collected from ELISA reader to diagnose the level of *cortisol* hormone in the respective respondents. It will help calculate the values from the samples by using the specific formulas, tracking the outcome (the existence of cortisol hormone) and finally using it to suggest better steps to be taken afterwards.

In this project, the kit that will be used to collect all the samples is Salivary Cortisol Enzyme Immunoassay Kit from Salimetric Inc. because the kit is less expensive and used widely in most laboratory around Malaysia. The current method used by the laboratory assistant to measure the level of *cortisol* in salivary sample is by calculating the reading from ELISA reader in the suggested plate layout showed in Table 1.1 manually using a formulated calculation suggests by the kit.

Table 1.1 : Suggested plate layout for the saliva sample

	1	2	3	4	5	6	7	8	9	10	11	12
A	Std	Std	C-H	C-H								
B	Std	Std	C-L	C-L								
C	Std	Std	Unk-1	Unk-1								
D	Std	Std	Unk-2	Unk-2								
E	Std	Std	Unk-3	Unk-3								
F	Std	Std	Unk-4	Unk-4								
G	Zero	Zero	Unk-5	Unk-5								
H	NSB	NSB	Unk-6	Unk-6								

The formulated calculations suggests by the kit are:

i. Compute the average optical density (OD) for all duplicate wells.

ii. Subtract the average OD for the NSB wells from the average OD of the zero, standards, controls and unknowns.

iii. Calculate the percent bound (B/Bo) for each standard, control and unknown by dividing the average OD (B) by the average OD for the zero (Bo).

iv. Determine the concentrations of the controls and unknowns by interpolation using software capable of logistics.

v. The result of the calculation then will be input into the chart showed in Table 1.2.

Table 1.2 : Chart for the diagnosis result

Well	Sample	Average OD	B	B/Bo	Cortisol (µg/dL)
A1,A2	S1				
B1,B2	S2				
C1,C2	S3				
D1,D2	S4				
E1,E2	S5				
F1,F2	S6				
G1,G2	Bo				
H1,H2	NSB				

The purpose of this project is to provide a systematic method to records the reading of the samples, which can automatically compute the formulated calculation and produced a reliable outcome for the next level of user, which in this case is the HSE officer. In order to provide the ease of use; one of the proposed additional modules of *Cortisol* Diagnosis Tool is to create user interface to aid the users of this tool. The implementation of database for data storage is also applied other than to develop two different modules for the lab assistant and administrator within the same application.

1.2 Problem Statement

This web based *Cortisol* Diagnosis Tool is a totally new approach in recording the information from the readings of saliva sample taken from the respective