بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا
إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ
الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

Dedication…

This work is dedicated to:

My late mother, father, sister, brother husband, mother in law, father in law, my kids, Mustafa, Bahaa El-Din and Ahmed

List of Errata

Page	Line	Mistake	Correct
7	17	*(Kao et al., 2006)*	*(Kano et al., 2003)*
18	15	*(Szepietowski et al., 2007)*	*(Szepietowski et al., 2004)*
18	24	*(Szepietowski et al., 2007)*	*(Szepietowski et al., 2004)*
29	16	**microconida, macroconidia, spirals, pepsinate, branches, pectinate, und nodular organs**	**microconida, macroconidia, spirals, branches, pectinate, and nodular organs**
63	8	*(Baeza,et al 2006)*	*(Baeza,et al 2004)*
65	16	*(Liu et al., 2000)*	*(Liu et al., 2000b)*
68	16	*(Hansen et al., 1995)*	*(Harmsen et al., 1995)*
74	16	*(Henry et al., 2000)*	*(Hery et al., 2000)*
76	15	*(Graser et al., 1999)*	*(Graser et al., 1999 c)*
81	6	*(Liu et al., 1998)*	*(Liu et al., 1997)*
85	17	*(Ohgst et al., 2004)*	*(Ohst et al., 2004)*
90	18	*(Graser et al., 1999)*	*(Graser et al., 1999a)*
90	10	*(Makimura et al 97)*	*(Makimura et al 98)*
118	13	**Rippon JW (1988):**	Deleted
118	16	**Roberts K, (2002):**	Deleted
108	10	**Graser Y, DeHoog GS, and Kuijpers AFA (2000):**	**Graser Y, DeHoog GS, and Kuijpers AFA (2000c):**
107	19	**Graser Y, Kuijpers AF, Presber W, and De Hoog GS**	**Graser Y, Kuijpers AF, Presber W, and De Hoog GS (2000a):**

		(2000):	
108	18	**Graser Y, Kuijpers FA, El Fari M, Presber W, and De Hoos GS (2000):**	**Graser Y, Kuijpers FA, El Fari M, Presber W, and De Hoos GS (2000b):**
113	1	**Liu D, Coloe S, Baird R, and Pedersen J (2000):**	**Liu D, Coloe S, Baird R, and Pedersen J (2000b):**
120	**Simpanya MF (2000): Dermatophytes, their taxonomy, ecology and pathogenicity. In Kushwaha RKS, and Guarro J (ed.), Biology of dermatophytes and other keratinophilic fungi. Revista Iberoamericana de Micologı´a, Bilbao, Spain; p: 1-12.**		
	Simpanya MF (2000): Dermatophytes, their taxonomy, ecology and pathogenicity. *In: Biology of dermatophytes and other keratinophilic fungi. Kushwaha RKS, and Guarro J (ed.),* Bilbao, Spain; p: 1-12.		
107	**Graser Y, DeHoog GS, and Kuijpers AFA (2000): Recent advances in the molecular taxonomy of dermatophytes. In Kushwaha RKS, and Guarro J (ed.), Biology of dermatophytes and other keratinophilic fungi. Revista Iberoamericana de Micologı´a, Bilbao, Spain; p: 17-21.**		
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INTRODUCTION

Dermatophytes are the main cause of superficial mycoses. These fungi have the capacity to invade keratinized tissue of humans or animals to produce infection that are generally restricted to the corneocytes of the skin, hair, and nail. Routine procedures for dermatophyte species identification rely on macroscopic examination of the colony (pigmentation of the surface and reverse sides, topography, texture, and rate of growth) and microscopic morphology (size and shape of macro conidia and microconidia, spirals, nodular organs, and pectinate branches) ***(Weitzman and Summerbell, 1995)***.

Further identification characteristics include nutritional requirements (vitamins and amino acids) and temperature tolerance as well as urease production, alkaline production of bromocresol purple medium, and in vitro hair perforation ***(Monod et al., 1989).***

Morphological and physiological characteristics can frequently vary, in fact the phenotypic features can be easily influenced by outside factors such as temperature variation and medium ***(Monod et al., 2000).***

That's why identification of dermatophytes often remains difficult or uncertain ***(Monod et al., 1989)***.

In the last few years genotypic approaches have proven to be useful for solving taxonomic problems regarding dermatophytes. Genotypic differences are considered more stable and more precise than phenotypic characteristics ***(Gräser et al., 2000b).***

Recent advances in molecular biology and progress in technology have allowed the development of new techniques for species determination and strain typing in microbiology ***(Hsiao et al., 2005).***

Molecular methods, such as, restriction fragment length polymorphism analysis of mitochondrial DNA ***(Hery et al., 2000)***, sequencing of the internal transcribed spacer (ITS) region of the ribosomal DNA ***(Gräser et al., 1999a)***, sequencing of protein-encoding genes ***(Gräser et al., 1999b)***, and PCR (random amplification of polymorphic DNA (RAPD) ***(Faggi et al., 2001)***, arbitrarily primed PCR (AP-PCR) ***(Gutzmer et al., 2004)***, and PCR finger printing ***(Faggi et al., 2002)*** have brought important progress in distinguishing between species and strains ***(Rakcman et al., 2005)***.

Most of these techniques are complex, laborious, time consuming and not easily employed for routine identification dermatophytes ***(Gräser et al., 1999a)***.

However PCR technology is simple, rapid and in the absence of specific neocleotide sequence information for the many dermatophyte species it is able to generate species-specific or strain-specific DNA polymorphism on the basis of characteristics band patterns detected by agarose gel electrophoresis ***(Faggi et al., 2002)***.

AIM OF THE WORK

The aim of the present work is to review the literature concerning advanced molecular biological techniques that have been employed for identification and classification of dermatophytes.

THE DERMATOPHYTES

Dermatophytes are group of closely related fungi that have the capacity to invade keratinized tissue (skin, hair and nails) of human and other animals to produce an infection ***(Santos et al., 2006).***

Dermatophytes have two important properties: they are keratinophilic and keratinolytic thus they don't invade mucosal surfaces, this means that, they have the ability to digest keratin in their saprophytic state and utilize it as a substrate in vitro .Some may invade tissue in vivo and provoke tineas, however their morphology in the parasitic growth phase is different from the morphology exhibited in culture or in vitro ***(Simpanya, 2000).***

Dermatophytes are common in tropics and may reach epidemic proportions in areas with high rate of humidity, overpopulation and poor hygienic conditions ***(Peerapur et al., 2004).***

There has been an increase in the incidence of fungal infections that may be the result of frequent usage of antibiotics, immune suppressive drugs and various conditions like organ transplant, lymphoma, leukemia and HIV ***(Kannan et al., 2006).***

Dermatophytosis commonly referred to as ringworm infections is generally cutaneous and restricted to non- living cornified layers because of inability of the fungi to penetrate the deeper tissues or organs of immunocomptitant hosts. Reaction to a dermatophyte infection may rang from mild to severe as a consequence of the host's reactions to the metabolic products of the fungus, the virulence of the infecting strain or species, the anatomic location of the infection, and local environmental factor ***(Weitzman and Summerbell, 1995).***

Dermatophytosis was common in age group of 21-30 years affecting males more than females; the higher incidence in young males could be due to greater physical activity and increase sweating ***(Peerapur et al., 2004).***

Transmition

Transmition can occur by direct contact, exposure to desquamated cells or direct inoculation through breaks in the skin that often occurs in individuals with depressed cell mediated immunity ***(Santos et al., 2006).***

The infecting fungi commonly spread in public facilities such as swimming pools and gyms. Fungal infections of the foot are more common in men, are associated with warm and moist conditions (e.g. environment inside shoes or boots), and are associated with specific age groups (teenagers as they reach