Intracellular protozoan parasites of humans: the role of molecular chaperones in development and pathogenesis

Table 1: The diversity and potential role in development and pathology of Hsp100, Hsp90, Hsp70 and Hsp40 chaperones of intracellular protozoan parasites

Chaperone	***Leishmania* spp.**		***Trypanosoma cruzi***		***Plasmodium falciparum***		***Toxoplasma gondii***	
	Number[1]	Dev/Path[2]	Number[1]	Dev/Path[2]	Number[1]	Dev/Path[2]	Number[1]	Dev/Path[2]
Hsp100	1	Hsp100						
Hsp90/HspC:								
Hsp90α/HspC2 (cytosolic inducible)	17	Hsp90	6	TcHsp83	1	PfHsp90	1	TgHsp90
Hsp90β/HspC3 (cytosolic constitutive)							1	
Grp94/HspC4 (ER)	1	Grp94	3		1		1	
TRAP1/HspC5 (mitochondrial)	1		2		2		1	
Hsp70/HspA:								
Hsp72/HspA1A (cytosolic inducible) Hsp73/Hsc70/HspA1B (cytosolic constitutive)	2	Hsp70	2		2	PfHsp70-1	1	TgHsp70
BiP/HSPA5 (ER)	1	BiP	1		1		1	
Hsp70/HspA9 (mitochondrial)	5		1		1		1	
Other isoforms:							1	
Grp170/Hsp110/HspH	2		3		2		1	
Hsp70.a	1		2	TcHsp70.a				
Hsp70.b	1		1					
Hsp70.c	1		1					
Hsp70.4	1		?[3]	TcHsp70.4				
Hsp40/DnaJ:								
Type I (DnaJA)			3	Tcj2	2	Pfj1	2	
Type II (DnaJB)			1		9	PFA0660w	3	
Type III (DnaJC)			2	TcDJ1	21		26	
Type IV					12	RESA; PF10_0381	2	
Uncategorized (types I-IV)	66		61					

[1]The number of chaperones for *L. major* and *T. cruzi* [24], *P. falciparum* [14, 25] and *T. gondii* [14, 131, 144, 148] are listed; where there is no listing indicated for a particular chaperone, these proteins are either not well characterized or have not been discussed in the text

[2] Those chaperones potentially involved in development and/or pathogenesis are listed by a common name; for *Leishmania* spp. the species is not designated as a prefix since the information is obtained from more than one species; see text for details

[3]LmHsp70.4 has been annotated on the *L. major* genome and a TcHsp70.4 was identified on the basis of amino acid sequence identity to LmHsp70 [65], but has not been annotated on the *T. cruzi* genome