

# 1 Compliance and Treatment Outcomes of Various 2 Regimens for Trichomoniasis in Trinidad & Tobago

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## 13 **Abstract:**

14 *Background:* Trichomoniasis is the most common non-viral STI globally and yet is not a  
15 reportable disease. Trichomonas Vaginalis is an important source of reproductive morbidity  
16 and may increase risk of acquisition and transmission of HIV. WHO and CDC recommend  
17 various regimens of Nitro-Imidazoles for treatment. The common Nitro-Imidazoles used for  
18 Trichomoniasis are Metronidazole and Tinidazole, which vary in their cost, efficacy and side  
19 effect profile and it is relevant to study these factors, for better management of the patients.

20 *Objectives:* This study aims to compare and study the efficacy, compliance of various  
21 treatment regimens, their outcomes and side-effects for Trichomoniasis, among STI clinic  
22 attendees in Trinidad.

23 *Methods:* A clinical trial study was designed and after obtaining the informed consent a  
24 routine clinical examination was conducted and the swabs for Trichomoniasis tests were  
25 collected for diagnosis from the 692 participants. Out of 692 participants, Eighty two (82)  
26 patients with established diagnosis of Trichomonas infection were quasi-randomly treated  
27 using different regimens. Compliance to treatment, side effects and outcome were evaluated.

28 *Results:* The prevalence of the Trichomoniasis in population attending our STI clinic is  
29 11.9% and prevalence of HIV is 9%. Of the total 82 participants for the treatment, 80% were  
30 females; nearly 90% of the patients belonged to age group 15-45 years and over 60% were  
31 below 30 yrs. Among those diagnosed for Trichomonas vaginalis, 13.3% had associated HIV  
32 infection. The compliance with respect to single dose treatment was significantly better than  
33 the long duration oral regimen and has significant relation with side effects of the treatment.  
34 The outcome is generally better and comparable and shows no significant difference between  
35 different treatment regimens used in the study.

36 *Conclusions:* Metronidazole and Tinidazole are commonly used drugs in various regimens.  
37 compliance is better with those treated with Tinidazole and Metronidazole stat, than with  
38 other groups. Outcome is comparable between these regimens, especially when combined  
39 with other important factors like abstinence and treatment of the partners. The treatment  
40 regimens mainly differ in the compliance and side effects profile, which suggests that to  
41 improve the compliance the drugs with less side effects, short course regimen would be a  
42 preferred choice.

43 **Keywords:** Trichomonas Vaginalis; Compliance; Treatment; STIs; HIV; Cost-effectiveness

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## 45 **1. Introduction**

46 Trichomoniasis is a highly prevalent, treatable, non-viral STI of worldwide importance and is  
47 the most common curable STI. According to the World Health organization's fact sheet, it is  
48 estimated that more than 143 million cases of Trichomoniasis occur annually worldwide<sup>i</sup> almost  
49 half of all curable sexually transmitted diseases worldwide might be attributable to T vaginalis<sup>ii</sup>. The  
50 estimated incidence in normal population is approximately 10%. Trichomoniasis has been  
51 considered one of the most common sexually transmitted diseases due to prevalence rates of 15% or  
52 higher among women in many developing countries<sup>iii</sup>. Despite being a readily diagnosed and  
53 treated STD, trichomoniasis is not a reportable infection and control of the infection has received

54 relatively little emphasis from public health STD control programs. *T. vaginalis* infection is associated  
55 with two- to threefold increased risk for HIV acquisition, preterm birth, and other adverse  
56 pregnancy outcomes among pregnant women<sup>iv v vi</sup>

57 Trichomoniasis is commonly treated with Metronidazole and Tinidazole drugs. These drugs  
58 belong to the 5-Nitro-Imidazoles drug family with 95% cure rate for TV. The guidelines as per The  
59 WHO and US CDC include:

- 60 1) MNZ or TNZ 2 gm single dose
- 61 2) MNZ 400-500 mg BID 7 days dose

62 Furthermore, if a patient fails a single dose of MNZ therapy, 7 day dose of MNZ or even single  
63 dose TNZ can be administered<sup>vii</sup>.

64 Nitro-Imidazoles are inexpensive and short treatment regimens are as effective as longer  
65 treatment regimens which makes treatment of individual cases or even large-scale interventions  
66 quite feasible in under-resourced areas<sup>3</sup>, but medication resistance for above drugs is a worldwide  
67 concern. Also, failure to treat partners shows a lack of therapeutic success.

68 In one study, Tinidazole was found to be more effective than metronidazole although the study  
69 quality of this comparison was not optimal(ref).

70 The incidence and prevalence rates have not been clearly and reliably established in Trinidad  
71 and Tobago especially in the high-risk population. There are no published reports about prevalence  
72 of this disease in the Caribbean Islands. Trichomoniasis causes significant morbidity, psychological  
73 stress and economic burden on the community and its association with transmission of HIV has cost  
74 implications in terms of time and money to the individual or the government. In this study our aim  
75 is to compare the drug efficacy, the compliance and outcomes of various treatment regimens, for  
76 Trichomoniasis in the high risk populations of Trinidad & Tobago.

77 **Aim of the study:** To study and describe the drug efficacy, drug compliance, treatment  
78 outcomes and side effects of various regimens for Trichomoniasis in high risk populations of  
79 Trinidad & Tobago.

## 80 2. Materials and Methods

81 **Study design:** The study is a quasi-experimental clinical trial design combined with cross  
82 sectional survey method which is more appropriate to estimate the prevalence of an STI through  
83 laboratory conformation. Patients were recruited at the public STI disease clinic, Queen's Park  
84 Counseling Center and Clinic (QPCC&C), Ministry of Health, Trinidad and Tobago. A  
85 convenience sample with consecutive sampling is used to recruit all males and females who were  
86 eligible, if they are over 15 years of age or had sexual exposure and consented for routine genital  
87 examination. Informed consent was obtained from all the patients recruited in the study. In the case  
88 of minors (persons below the age of eighteen), informed consent was obtained from the parent or  
89 guardian. At the time of obtaining consent, the participant was given the required information  
90 regarding the purpose of the study, treatment options, confidentiality and rights and  
91 responsibilities.

92 **Sample size:** Sample size was calculated based on precision and estimated prevalence.  
93 Considering the estimated prevalence of Trichomonas among high risk population is 20% and  
94 precision of 3% (for disease prevalence >10%), then the largest sample size needed for Trichomonas  
95 would be 683. The current study included a sample 692 participants in total which is slightly more  
96 than the estimated value of 683<sup>viii</sup>.

97 **Data collection:** A questionnaire that was prepared, tested, revised and approved by Medical  
98 Ethics Committee was administered to collect the clinical data. Following a routine clinical  
99 examination, the samples were collected for laboratory testing. Vaginal/Urethral swabs were  
100 collected– one for wet mount preparation of T.V; and one for In Pouch culture; and other two (2) for  
101 OSOM Rapid test/and Fluorescent antibody testing and HIV testing. When laboratory test results  
102 were positive for Trichomonas Vaginalis, the patients were treated according the treatment  
103 guidelines. After discussing treatment options with the patients, they were categorized into four (4)  
104 groups based on their most acceptable treatment regimen by quasi-random method.

- 105 • Group I Metronidazole 2g stat PO,  
 106 • Group II - Metronidazole 400mg bid for 7 days,  
 107 • Group III with Tinidazole 2g stat PO,  
 108 • Group IV Topical Vaginal Metronidazole gel/cream bid for 7-10 days.

109 Metronidazole is relatively cheap and is widely available in public health institutions in  
 110 Trinidad. Tinidazole is comparatively more expensive and is less widely available. The patients who  
 111 received treatment were re-evaluated clinically upon follow up with emphasis on drug compliance,  
 112 side effects, abstinence, treatment of the partner(s) and efficacy by testing for organisms. Patients  
 113 were asked to return seven and 14 days after the start of therapy; and all those returned for follow  
 114 up were tested for TV organisms with repeated tests as above. Compliance to treatment, side effects  
 115 and outcome were evaluated. The patients who did not return for follow up and test of cure were  
 116 interviewed over telephone about the clinical response and side effects.

117 *Treatment failure* was considered when reappearance of Trichomonas within 14 days of the start  
 118 of treatment in a patient who denied sexual contact.

119 *Reinfection* was defined as reappearance of Trichomonas in a patient who admitted further  
 120 sexual contact. *Recurrence* was treatment failure plus reinfection.

121 Those who failed to return for follow up were contacted for assessment of response. Contact  
 122 tracing was done on a few patients and partners of T.V positive patients also were treated.

123 Results were documented and statistical analysis was done with the help of SAS software  
 124 version 9.4. Simple frequencies and descriptive statistics were applied. The different treatment  
 125 regimens used were compared using Chi Square test and correlation studies, further confirmed by  
 126 linear regression. The p-value was considered significant at < 0.05.

### 127 3. Results

128 The results of the study of treatment regimens in patients with trichomoniasis are given below:  
 129 82 patients with established diagnosis of Trichomonas infection were treated using different  
 130 regimens. Among these 82 patients, who were treated for Trichomonas, the majority of 80% were  
 131 females. It was also observed that nearly 90% of the patients belonged to age group 15-45 years and  
 132 over 60% were below 30 years of age. Among those diagnosed for Trichomonas vaginalis, 14.6% had  
 133 associated HIV infection.

134 **Table 1.** below compares the demographic variables like sex, age and HIV positivity in the  
 135 participants of the study.

variable	Sub-category	Trichomoniasis positive (N=82)		Trichomoniasis negative (N=610)	
		Frequency	Percent	Frequency	Percent
Sex	Male	17	20.7	249	40.8
	Female	65	79.3	361	59.2
Age (in Years)	5-14	0	0	9	1.5
	15-24	33	40.2	243	39.8
	25-34	27	32.9	197	32.3
	35-44	18	22	83	13.6
	45-54	3	3.6	59	9.7
	55-64	1	1.2	15	2.4
	>65	0	0	4	0.7
HIV	Positive	12	14.6	51	8.3
	Negative	70	85.4	559	91.7

136 **Table 2.** Comparison of different treatment options for trichomoniasis who were treated.

Variable	Metronidazole 2g stat PO;	Metronidazole 400mg bid for 7 days;	Tinidazole 2g stat PO;	Metronidazole Vaginal gel/cream gel/ Twice daily/1 week.
No. of cases (N=82)	18	36	22	6
Drug compliance	100%	61.1%	100%	33.3%
Abstinence	33.3%	36.1%	27.27%	16.67%

Cure rate	94.4%	97.2%	90.9%	100%
Side effects	55.6%	50%	31.8%	0%
Nausea	38.9%	27.8%	13.7%	0%
Vomiting	22.2%	30.6%	4.6%	0%
Anorexia	16.7%	13.9%	9.1%	0%
Metallic Taste	44.4%	25%	2%	0%
Abdominal cramps	5.6%	13.9%	0%	0%
Loose stools	0%	3%	0%	0%
Headaches	5.6%	13.9%	0%	0%
Rash	0%	5.6%	0%	0%

137 Table 2 compares different groups who received treatment upon diagnosis of Trichomoniasis.  
 138 Various parameters evaluated are listed in the first column. Drug compliance was poor for Group 2  
 139 and Group 4 and metallic taste was prominent with Group 1 (Metronidazole 2g stat). There was no  
 140 statistically significant difference for other side effects like nausea, vomiting, anorexia, headache,  
 141 rash, and treatment outcome. Overall results were better with those treated with Tinidazole and  
 142 Metronidazole stat for drug compliance than with other groups as expected.

143

Table 3.

Statistics	Correlations (Probability)		
	Treatment vs side effects	Treatment vs compliance	Compliance vs side effects
Chi-square	0.0566	0.0867	<0.0001
Mantel-Haenszel Chi-Square	0.0114	0.0699	<0.0001
Fishers exact test	0.0004	<0.0001	<0.0001
Mante-carlo estimate for the exact test	0.0519	0.0721	<0.0001

144 Table 3 shows correlations between Treatment, side effects and drug compliance. The  
 145 correlation between drug compliance and side effects of the treatment were more significant,  
 146 although Fisher's exact test shows all the 3 correlations were significant in the study.

147 The above correlations were further confirmed with Linear regression, where drug compliance  
 148 was considered as the dependent variable on side effects and treatment modality. The model as  
 149 shown in table 4a and 4b shows the relation between side effects and drug compliance in the study is  
 150 statistically significant.

151

Table 4a.

Analysis of Variance					
Source	DF	Sum of squares	Mean square	F Value	Pr > F
Model	4	32.26141	8.06535	5.97	0.0003
Error	77	103.9825	1.35042		
Corrected Total	81	136.2439			

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153

**Table 4b.** Simple linear regression.

Parameter Estimates						
Parameter	DF	Estimate	Standard error	t Value	Pr >  t	
Intercept	1	2.666667	0.474416	5.62	<.0001	
treat	1	-0.50545	0.568307	-0.89	0.3766	
treat	2	-0.23824	0.530202	-0.45	0.6544	
treat	3	-0.33343	0.542179	-0.61	0.5404	
treat	4	0	.	.	.	
seffect	1	-1.19019	0.272267	-4.37	<.0001	
seffect	2	0	.	.	.	

154 Table 5 below shows the drug efficacy as (absolute risk= negative events/total events or  
 155 Trichomoniasis negativity/Total patients) negative tests percentage and frequency in treated  
 156 patients. The negative tests are based on combined results of Trichomoniasis rapid test, wet mount  
 157 test, culture (in pouch). Even if one test is positive the combined results were considered as positive  
 158 and when all the 3 tests were negative the tests were considered as negative.

159

**Table 5.**

Absolute Risk (AR)	Metronidazole 2g stat PO;	Metronidazole 400mg bid for 7 days;	Tinidazole 2g stat PO;	Metronidazole Vaginal gel/cream gel/ Twice daily/1 week.
Drug efficacy percentage (AR)	94.4	97.2	90.9	100
Drug efficacy frequency	17/18	35/36	20/22	6/6

#### 160 4. Discussion

161 Nitro-Imidazoles are the mainstay in the treatment of trichomoniasis. Metronidazole is the most  
 162 commonly used drug worldwide and is widely available. Presently different options are available  
 163 for the treatment of Trichomoniasis. It may be noted that over the years there has been gradual  
 164 reduction in the duration of treatment with a single dose of metronidazole or Tinidazole giving  
 165 satisfactory results.

166 The current study compares various treatment regimens used in Trichomoniasis. It compares  
 167 the efficacy of various strategies for the treatment of Trichomoniasis particularly, short versus long  
 168 oral treatment regimens, compliance and side effects. The overall efficacy of treatment options for  
 169 oral Nitro-Imidazoles were satisfactory and compares well with other studies. The cure rates ranged  
 170 from 90-100% and similar cure rates were observed by Csonka (1971), Woodcock (1972) and Morton,  
 171 Sawyer et al (1976)<sup>ix x xi xii xiii</sup>. There was no significant difference between the oral  
 172 Nitro-Imidazoles treatment options<sup>xiv</sup>. Although fewer numbers of cases were studied, the efficacy  
 173 of vaginal application of metronidazole was comparatively high. The results of few previous studies  
 174 have reported that vaginal application and its effectiveness is unsatisfactory and undefined<sup>13</sup>.

175 We observed that the compliance with respect to single dose treatment was significantly better  
 176 than the long duration oral regimen and vaginal application. Advantage of this would be that  
 177 patient receives the drug under supervision or has less risk of missing the dose that may occur with  
 178 long duration regimen. The single dose administration is an advantage in the treatment of  
 179 outpatients and also convenient for patients and their partners<sup>xv xvi</sup>.

180 Side effects of oral Nitro-Imidazoles are previously well documented. They include a bitter  
 181 metallic taste, nausea, and vomiting, a disulfiram-like reaction with ingestion of alcohol and

182 dizziness. Despite the low doses required for treatment of trichomoniasis, side effects occur in more  
183 than half of patients, especially with the metronidazole 2 g dose. This research study reports that  
184 40-55% of patients receiving oral Nitro-Imidazoles had side effects. The common side effects were of  
185 gastrointestinal origin and comprised of metallic taste, nausea, vomiting and anorexia. Metallic  
186 taste was more significant with single oral dose of metronidazole than long duration oral  
187 Metronidazole or Tinidazole. Overall, other side effects were more prominent with Metronidazole  
188 than Tinidazole and compares well with reports and reviews. Some of the studies state that  
189 Tinidazole is curative at lower doses than metronidazole. The therapeutic doses of Tinidazole  
190 result in fewer and milder side effects<sup>xvii xviii xix</sup>. In our study the final tests showed comparative  
191 response with Metronidazole and Tinidazole. The main difference between different treatment  
192 regimens is observed in drug compliance and side effect profile.

193 It is estimated that perhaps as few as 20% of partners receive treatment<sup>xx</sup>. Majority of the  
194 Trichomonas positive patient partners were treated in our study through contact tracing protocol.  
195 Failure to treat partners may lead to apparent lack of therapeutic success and, because  
196 trichomoniasis is a sexually transmitted infection (STI), treatment of sex partners must be part of the  
197 treatment regimen of infected participants. Contact tracing should be undertaken and all resulting  
198 sexual contacts attending should be treated for *Trichomonas vaginalis* regardless of the results of their  
199 investigations.

200 *Treatment Failure:* Only two cases were found to be non-responsive to treatment. They were  
201 confirmed to be drug compliant and followed abstinence for the required period. This problem was  
202 seen with long duration treatment by Metronidazole. Treatment failure in some patients prescribed  
203 the five-day course may have been due to failure to take the treatment as directed. Some cases  
204 classed as re-infections may have been due to treatment failure<sup>xxi xxii</sup>. Metronidazole resistance is an  
205 emerging problem, but its clinical importance is not yet clear<sup>xxiii xxiv</sup>.

206 There is conflicting data on the use of metronidazole during pregnancy. Some studies claim  
207 possible teratogenicity and other adverse effects like prematurity, however others deny the  
208 association<sup>xxv xxvi</sup>. Vaginal application of Metronidazole can be used in those who were pregnant or  
209 possibly pregnant and in those who preferred the method.

210 *Cost effectiveness of various regimens:* Nitro-Imidazoles are inexpensive (the mean cost of generic  
211 Tinidazole is \$0.04/500 mg tablet, or, \$0.16 for a typical 2 gm dose)<sup>xxvii</sup>. This feature, combined with  
212 the fact that short treatment regimens (typically single dose) are highly effective, make treatment of  
213 individual cases or even large-scale interventions quite feasible in under-resourced areas<sup>xxviii xxix</sup>  
214 <sup>xxx</sup>. Tinidazole is more cost effective compared to other treatment regimens for the sponsor but  
215 outcome is not greater than other regimens. Cost effectiveness is not an important factor for the  
216 patients in this trial because the medicines were sponsored by government.

217 **Strengths and weaknesses:** Convenient sampling method was used in recruiting the TV  
218 patients because it is a practical and cheaper way of recruiting study participants and uses an  
219 existing infrastructure such as clinic facilities and staff. This is further supported by the fact that this  
220 study establishes TV prevalence in high risk population coming to STI clinic and did not try to  
221 attempt TV prevalence in the general population. The power of the study calculated is good for high  
222 prevalence in the STI clinic participants. The study chose a quasi-experimental method in placing the  
223 participants according to their choice in treatment groups because we considered strict experimental  
224 method is unethical, especially when there were previous evidence showing the difference in side  
225 effects of treatment options and followed patients' choice. This resulted in unequal number of  
226 participants in treatment groups, but did not affect the quality and power of the study as shown in  
227 the statistics.

228 **Conclusion:** Trichomoniasis is the most common non-viral STI globally and it is not a  
229 reportable disease. Trichomonas Vaginalis is an important source of reproductive morbidity and  
230 may increase risk of acquisition and transmission of HIV. The Nitro-Imidazoles are the only class of  
231 antimicrobial medications known to be effective against *T. vaginalis* infections. Of these drugs,  
232 metronidazole and tinidazole are commonly used in various regimens. In this study, overall results  
233 were comparable in those treated with Tinidazole and in other groups. Side effects of medication

234 were more prominent with Metronidazole than Tinidazole. Tinidazole is more expensive than  
235 Metronidazole and it is not widely available. Only two cases were found to be non-responsive to  
236 treatment. The association between drug compliance and side effects of the various medication were  
237 confirmed in our study. To make the patient more compliant with treatment, it is always better to  
238 use the drug with less side effects and of shorter regimen.

239

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242 **Competing interests:** None declared

243 **Ethical approval:** The study was approved by Medical Ethics Committee, Ministry of Health, Port of Spain.  
244 Informed consent was obtained from all the patients recruited in the study. In the case of minors (persons below  
245 the age of eighteen), informed consent was obtained from the parent or guardian. At the time of obtaining  
246 consent the participant was given the required information regarding the purpose of the study, confidentiality  
247 and rights and responsibilities.

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## 252 **References**

- 
- <sup>i</sup> WHO. Fact sheet on Sexually Transmitted Infections (STIs), August 2016. Available at <http://www.who.int/mediacentre/factsheets/fs110/en/> (accessed on 10 January 2018)
- <sup>ii</sup> Bickley LS, Krisher KK, Punsalang A Jr, Trupej MA, Reichman RC, Menegus MA. Comparison of direct fluorescent antibody, acridine orange, wet mount, and culture for detection of *Trichomonas vaginalis* in women attending a public sexually transmitted diseases clinic. *Sex Transm Dis.* 1989 Jul-Sep; 16(3):127-31
- <sup>iii</sup> Schmid G. Trichomoniasis treatment in women: RHL commentary (last revised: 28 July 2003). The WHO Reproductive Health Library; Geneva: World Health Organization.
- <sup>iv</sup> McClelland RS, Sangare L, Hassan WM, et al. Infection with *Trichomonas vaginalis* increases the risk of HIV-1 acquisition. *J Infect Dis* 2007;195:698–702.
- <sup>v</sup> Van Der Pol B, Kwok C, Pierre-Louis B, et al. *Trichomonas vaginalis* infection and human immunodeficiency virus acquisition in African women. *J Infect Dis* 2008;197: 548–54.
- <sup>vi</sup> 2015 STD Treatment Guidelines <https://www.cdc.gov/std/tg2015/trichomoniasis.htm>
- <sup>vii</sup> Kissinger *BMC Infectious Diseases* (2015) 15:307:
- <sup>viii</sup> Daniel WW, editor. 7th ed. New York: John Wiley & Sons; 1999. *Biostatistics: a foundation for analysis in the health sciences.*
- <sup>ix</sup> Csonka, G. W. Trichomonal vaginitis treated with one dose of metronidazole. *British Journal of Venereal Diseases.* 1971; 47: 456-458.
- <sup>x</sup> Woodcock, K. R. Treatment of trichomonal vaginitis with a single oral dose of metronidazole. *British Journal of Venereal Diseases* 1972; 48: 65-68
- <sup>xi</sup> Morton, R. R. Metronidazole in the single-dose treatment of trichomoniasis in men and women. *British Journal of Venereal Diseases.* 1972; 48: 525-527
- <sup>xii</sup> Sawyer, P. R., Brogden, R. N., Pinder, R. M., Speight, T. M., and Avery, G. S. Tinidazole; A review of its anti-protozoal activity and therapeutic efficacy. *Drugs.* 1976; 11: 423-440
- <sup>xiii</sup> Nancy Malla, Indu Gupta, Mahajan RC. Human Trichomoniasis. *Indian Journal of Medical Microbiology.* 2001; 19 (1): 6-13

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- <sup>xiv</sup> Krieger JN and Alderete JF. *Trichomonas vaginalis* and trichomoniasis. In: K. Holmes, P. Markh, P. Sparling et al (eds). *Sexually Transmitted Diseases*, 3rd Edition. New York: McGraw-Hill, 1999; 587-604
- <sup>xv</sup> Garber GE. The laboratory diagnosis of *Trichomonas vaginalis*. *Can J Infect Dis Med Microbiol.* 2005 Jan–Feb; 16(1): 35–38.
- <sup>xvi</sup> Ann Kurth, William L. H. Whittington, Matthew R. Golden, Katherine K. Thomas, King K. Holmes, and Jane R. Schwebke. Performance of a New, Rapid Assay for Detection of *Trichomonas vaginalis*. *J Clin Microbiol.* 2004 July; 42(7): 2940–2943
- <sup>xvii</sup> H Swygard, A C Seña, M M Hobbs, M S Cohen. Trichomoniasis: clinical manifestations, diagnosis and management. *Sex Transm Infect* 2004; 80:91-95
- <sup>xviii</sup> Nobuo Kawamura. Metronidazole and tinidazole in a single large dose for treating urogenital infections with *Trichomonas vaginalis* in men. *British Journal of Venereal Diseases.*1978; 54: 81-83
- <sup>xix</sup> Sarah L. Cudmore, Kiera L. Delgaty, Shannon F. Hayward-McClelland, Dino P. Petrin, and Gary E. Garber. Treatment of Infections Caused by Metronidazole-Resistant *Trichomonas vaginalis*. *Clinical Microbiology Reviews.*2004, October; Vol. 17, No. 4: 783-793
- <sup>xx</sup> H Swygard, A C Seña, M M Hobbs, M S Cohen. Trichomoniasis: clinical manifestations, diagnosis and management. *Sex Transm Infect* 2004; 80:91-95
- <sup>xxi</sup> Ann Kurth, William L. H. Whittington, Matthew R. Golden, Katherine K. Thomas, King K. Holmes, and Jane R. Schwebke. Performance of a New, Rapid Assay for Detection of *Trichomonas vaginalis*. *J Clin Microbiol.* 2004 July; 42(7): 2940–2943
- <sup>xxii</sup> OSOM® *Trichomonas* Rapid Test [package insert]. Cambridge, MA: Genzyme Corp; 2004
- <sup>xxiii</sup> Schwebke JR. Trichomoniasis care today: A clinician’s guide to timely diagnosis and successful treatment. Genzyme Monograph, 2004 Available at [www.screenmed.pl/pdf%20files/Trichomonas\\_Monograph.pdf](http://www.screenmed.pl/pdf%20files/Trichomonas_Monograph.pdf).
- <sup>xxiv</sup> Ann Kurth, William L. H. Whittington, Matthew R. Golden, Katherine K. Thomas, King K. Holmes, and Jane R. Schwebke. Performance of a New, Rapid Assay for Detection of *Trichomonas vaginalis*. *J Clin Microbiol.* 2004 July; 42(7): 2940–2943
- <sup>xxv</sup> Schmid G. Trichomoniasis treatment in women: RHL commentary (last revised: 28 July 2003). The WHO Reproductive Health Library; Geneva: World Health Organization.
- <sup>xxvi</sup> Spence MR, Hollander DH, Smith J, McCaig L, Sewell D, Brockman M. The clinical and laboratory diagnosis of *Trichomonas vaginalis* infection. *Sex Transm Dis.* 1980; Oct-Dec 7(4): 168-71
- <sup>xxvii</sup> Bickley LS, Krisher KK, Punsalang A Jr, Trupei MA, Reichman RC, Menegus MA. Comparison of direct fluorescent antibody, acridine orange, wet mount, and culture for detection of *Trichomonas vaginalis* in women attending a public sexually transmitted diseases clinic. *Sex Transm Dis.* 1989 Jul-Sep; 16(3):127-31
- <sup>xxviii</sup> OSOM® *Trichomonas* Rapid Test [package insert]. Cambridge, MA: Genzyme Corp; 2004
- <sup>xxix</sup> Schmid G. Trichomoniasis treatment in women: RHL commentary (last revised: 28 July 2003). The WHO Reproductive Health Library; Geneva: World Health Organization.
- <sup>xxx</sup> W. David Hager, MD; Stuart T. Brown, MD; Stephen J. Kraus, MD; George S. Kleris, MD; Goldie J. Perkins, MS; Musetta Henderson, RN. Metronidazole for Vaginal Trichomoniasis Seven-Day vs Single-Dose Regimens. *JAMA* 1980; 244(11):1219-1220.