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# Rapid Serologic Test for Diagnosis of Yaws in Patients with Suspicious Skin Ulcers

## Appendix

**Appendix Table 1.** Characteristics of patients with TPE-positive and TPE-negative PCRs

Characteristic	Total	PCR result		P-value	% Missing
		Negative	Positive		
N	995	708	287		
Age (mean (SD))	15.86 (14.1)	17.79 (15.2)	11.08 (9.3)	<0.001	2.5
≤7y	252 (26.0)	146 (21.1)	106 (38.0)	<0.001	0
8-12y	250 (25.8)	159 (23.0)	91 (32.6)		
13-18y	245 (25.3)	194 (28.1)	51 (18.3)		
>18y	223 (23.0)	192 (27.8)	31 (11.1)		
Gender, N (%)					
Male	522 (53.5)	361 (51.9)	161 (57.3)	0.148	1.9
Female	454 (46.5)	334 (48.1)	120 (42.7)		
Ulcer duration, in weeks (median [IQR])	4.00 [2.00, 8.00]	3.50 [2.00, 6.00]	4.00 [2.00, 8.00]	0.001	9.6
≤4 wks	561 (62.4)	405 (64.1)	156 (58.4)	0.127	0
>4 wks	338 (37.6)	227 (35.9)	111 (41.6)		
Ulcer size, in cm (median [IQR])	2.00 [1.50, 2.50]	2.00 [1.50, 3.00]	2.00 [1.50, 2.50]	0.853	11.5
≤2cm	592 (67.2)	411 (66.2)	181 (69.6)	0.362	0
>2cm	289 (32.8)	210 (33.8)	79 (30.4)		
First episode, N (%)					
No	209 (21.9)	167 (24.6)	42 (15.3)	0.002	4.1
Yes	745 (78.1)	512 (75.4)	233 (84.7)		
Number of ulcers, N (%)					
1	662 (72.4)	457 (70.2)	205 (77.9)	0.021	8.1
2	147 (16.1)	106 (16.3)	41 (15.6)		
3	46 (5.0)	39 (6.0)	7 (2.7)		
>3	59 (6.5)	49 (7.5)	10 (3.8)		

**Appendix Table 2.** Performance of DPP according to the characteristics of individuals and ulcers, by reader ≥1 and NT ≥28

Characteristic	Category	DPP negative		Specificity (95% CI)	DPP positive (Reader T≥ 1 and NT≥ 28)		Sensitivity (95% CI)	Sum Specificity and Sensitivity
		PCR- detected	PCR- not detected		PCR detected	PCR not detected		
Age	≤7y	15	109	87.9% (80.8-93.1)	68	18	79.1% (69.0-87.1)	167.0%
	8-12y	49	80	62.0% (53.1-70.4)	60	22	73.2% (62.2-82.4)	135.2%
	13-18y	44	113	72.0% (64.3-78.8)	32	12	72.7% (57.2-85.0)	144.7%
	>18y	18	141	88.7% (82.7-93.2)	23	5	82.1% (63.1-93.9)	170.8%
Gender	Male	72	232	76.3% (71.1-81.0)	103	32	76.3% (68.2-83.2)	152.6%
	Female	58	209	78.3% (72.8-83.1)	81	26	75.7% (66.5-83.5)	154.0%
First episode	No	30	96	76.2% (67.8-83.3)	22	8	73.3% (54.1-87.7)	149.5%
	Yes	93	336	78.3% (74.1-82.1)	158	51	75.6% (69.2-81.3)	153.9%

Characteristic	Category	DPP positive (Reader T≥ 1 and NT≥ 28)						Sum Specificity and Sensitivity
		DPP negative			DPP positive (Reader T≥ 1 and NT≥ 28)			
		PCR-detected	PCR-not detected	Specificity (95% CI)	PCR detected	PCR not detected	Sensitivity (95% CI)	
Ulcer Duration	≤4 weeks	67	272	80.2% (75.6-84.3)	105	31	77.2% (69.2-84.0)	157.4%
	>4 weeks	53	133	71.5% (64.4-77.9)	71	25	74.0% (64.0-82.4)	145.5%
Ulcer Number	1	93	277	74.9% (70.1-79.2)	129	46	73.7% (66.5-80.1)	148.6%
	2	12	77	86.5% (77.6-92.8)	29	7	80.6% (64.0-91.8)	167.1%
	3	7	29	80.6% (64.0-91.8)	6	0	100% (54.1-100)	180.6%
	>3	7	33	82.5% (67.2-92.7)	8	1	88.9% (51.8-99.7)	171.4%
Ulcer size	≤2cm	77	257	77.0% (72.1-81.4)	114	41	73.6% (65.9-80.3)	150.5%
	>2cm	39	136	77.7% (70.8-83.7)	53	14	79.1% (67.4-88.1)	156.8%

**Appendix Table 3.** Performance of DPP according to the characteristics of individuals and ulcers, by T and NT, naked eye

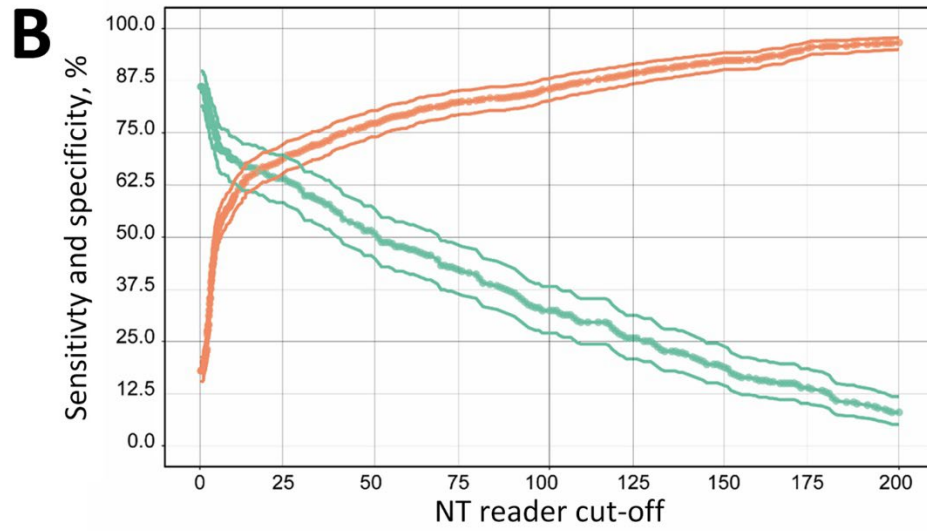
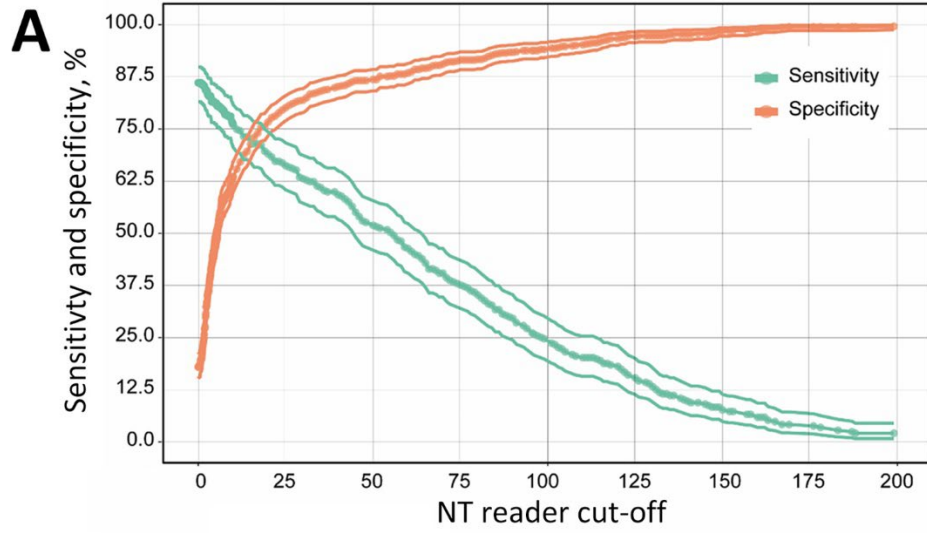
Characteristic	Category	DPP positive (T and NT, naked eye)						Sum Specificity and Sensitivity
		DPP negative			DPP positive (T and NT, naked eye)			
		PCR-detected	PCR-not detected	Specificity (95% CI)	PCR detected	PCR not detected	Sensitivity (95% CI)	
Age	≤7y	32	114	78.1% (70.5-84.5)	76	30	71.7% (62.1-80.0)	149.8%
	8-12y	68	91	57.2% (49.2-65.0)	68	23	74.7% (64.5-83.3)	132.0%
	13-18y	72	122	62.9% (55.7-69.7)	39	12	76.5% (62.5-87.2)	139.4%
	>18y	46	146	76.0% (69.4-81.9)	25	6	80.7% (62.5-92.6)	156.7%
Gender	Male	125	236	65.4% (60.2-70.3)	122	39	75.8% (68.4-82.2)	141.2%
	Female	92	242	72.5% (67.3-77.2)	89	31	74.2% (65.4-81.7)	146.6%
First episode	No	65	102	61.1% (53.2-68.5)	28	14	66.7% (50.5-80.4)	127.7%
	Yes	145	367	71.7% (67.6-75.6)	177	56	76.0% (70.0-81.3)	147.7%
Ulcer Duration	≤4 weeks	99	306	75.6% (71.1-79.7)	114	42	73.1% (65.4-79.9)	148.6%
	>4 weeks	96	131	57.7% (51.0-64.2)	89	22	80.2% (71.5-87.1)	137.9%
Ulcer Number	1	151	306	67.0% (62.4-71.3)	153	52	74.6% (68.1-80.4)	141.6%
	2	23	83	78.3% (69.2-85.7)	31	10	75.6% (59.7-87.6)	153.9%
	3	10	29	74.4% (57.9-87.0)	7	0	100.0% (59.0-100.0)	174.4%
	>3	16	33	67.4% (52.5-80.1)	9	1	90.0% (55.5-99.8)	157.4%
Ulcer size	≤2cm	127	284	69.1% (64.4-73.5)	135	46	74.6% (67.6-80.8)	143.7%
	>2cm	66	144	68.6% (61.8-74.8)	63	16	79.8% (69.2-88.0)	148.3%

**Appendix Table 4.** Estimated DPP and PCR results for 1,000 ulcers tested, according to different prevalence values in the field

Yaws prevalence among ulcers	Type of test (naked eye)	Specificity (95% CI)	Sensitivity (95% CI)	DPP - PCR + cases (95% CI)	DPP + PCR - Cases† (95% CI)	DPP - PCR - cases (95% CI)	DPP + PCR + cases (95% CI)
1%	T and NT positives	68.6% (65.1-72.1)	74.6% (69.1-79.5)	3 (2-3)	311 (276-346)	679 (644-714)	7 (7-8)
8%	T and NT positives	68.6% (65.1-72.1)	74.6% (69.1-79.5)	20 (16-25)	289 (257-321)	631 (599-663)	60 (55-64)
44%	T and NT positives	68.6% (65.1-72.1)	74.6% (69.1-79.5)	112 (90-136)	176 (156-195)	384 (365-404)	328 (304-350)
1%	T line positive	49.6% (45.8-53.3)	79.1% (73.9-83.7)	2 (2-3)	499 (462-537)	491 (453-528)	8 (7-8)
8%	T line positive	49.6% (45.8-53.3)	79.1% (73.9-83.7)	17 (13-21)	464 (430-499)	456 (421-490)	63 (59-67)
44%	T line positive	49.6% (45.8-53.3)	79.1% (73.9-83.7)	92 (72-115)	282 (262-304)	278 (256-298)	348 (325-368)
1%	NT line positive	60.7% (57.0-64.4)	84.0% (79.2-88.0)	2 (1-2)	389 (352-426)	601 (564-638)	8 (8-9)
8%	NT line positive	60.7% (57.0-64.4)	84.0% (79.2-88.0)	13 (10-17)	362 (328-396)	558 (524-592)	67 (63-70)
44%	NT line positive	60.7% (57.0-64.4)	84.0% (79.2-88.0)	70 (53-92)	220 (199-241)	340 (319-361)	370 (348-387)

\*Yaws prevalence among cutaneous ulcers in an endemic region declines from 44% to 8% after one round of azithromycin mass drug administration (7). 1% prevalence is expected in the late phase of eradication.

†These cases might be DPP false positive results, or latent yaws cases that are DPP-positive despite not having yaws-positive ulcers, among others.



**Appendix Figure.** Sensitivity and specificity of the DPP using the reader at different cutoff values for the NT-line and the T-line separately.