

Supplementary File 1

1. Objective:

To identify all available literature on the global prevalence of co-infection with *Borrelia burgdorferi* and *Anaplasma phagocytophilum* in Ixodes tick populations.

2. Filters and Limits Applied:

No language restrictions

No publication date restrictions

Article type: All article types were included to ensure the inclusiveness of the search results

3. Additional Notes:

Preliminary searches were conducted using the advanced search functions across multiple platforms, including PubMed, EMBASE, Web of Science, Scopus, and additional relevant databases. All records identified through these preliminary searches were exported to citation management software for deduplication and screening.

Following the preliminary searches, manual searches of the reference lists of all studies and reviews selected for inclusion will be conducted to ensure the identification of additional relevant studies.

Table 1: Database Search Framework for PubMed

Step	Search algorithm	Items found
#1	"ixodes"[MeSH Terms]	5516
#2	"Ixodes"[Title/Abstract]	8644
#3	"ticks"[MeSH Terms]	24688
#4	"tick*"[Title/Abstract]	41853
#5	"ixodidae"[MeSH Terms]	11861
#6	"ixodidae*"[Title/Abstract]	4394
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	45187
#8	"borrelia burgdorferi"[MeSH Terms]	4235
#9	"borrelia burgdorferi*"[Title/Abstract]	9366
#10	"lyme disease spirochete"[Title/Abstract]	617
#11	"borrelia burgdorferi sensu stricto"[Title/Abstract]	482
#12	#8 OR #9 OR #10 OR #11	10286
#13	"anaplasma phagocytophilum"[MeSH Terms]	1419
#14	"anaplasma phagocytophilum*"[Title/Abstract]	2148
#15	#13 OR #14	2291
#16	"coinfection"[MeSH Terms]	15909
#17	"coinfection*"[Title/Abstract]	32269
#18	"dual infection*"[Title/Abstract]	1805
#19	"mixed infection*"[Title/Abstract]	8737
#20	#16 OR #17 #18 OR #19	47568
Final Combination	#7 AND #12 AND #15 AND #20	176

Table 2: Database Search Framework for Web of Science

Step	Search algorithm	Items found
#1	TS=(Tick* OR Ixodes OR Ixodidae)	57988
#2	TS = (Borrelia burgdorferi OR Borrelia OR lyme disease spirochete OR borrelia burgdorferi sensu stricto)	16539
#3	TS=(Anaplasma phagocytophilum)	3450
#4	TS=(Coinfection* OR "Co-infection*" OR dual infection* OR mixed infection*)	95483
Final Combination	#1 AND #2 AND #3	359

Table 3: Database Search Framework for Embase

Step	Search algorithm	Items found
#1	'tick'/exp	30458
#2	tick:ab,ti	36521
#3	'ixodes'/exp	7785
#4	ixodes:ab,ti	9144
#5	'ixodidae'/exp	15874
#6	ixodidae:ab,ti	4413
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	46923
#8	'borrelia burgdorferi'/exp	12289
#9	'borrelia burgdorferi':ti,ab	10236
#10	'lyme disease spirochete':ab,ti	631
#11	'borrelia burgdorferi sensu stricto':ab,ti	497
#12	#8 OR #9 OR #10 OR #11	14349
#13	'anaplasma phagocytophilum'/exp	2687
#14	'anaplasma phagocytophilum':ab,ti	2292
#15	#13 OR #14	3047
#16	'coinfections'/exp	69182
#17	'coinfection*':ti,ab	43958
#18	'dual infection*':ti,ab	2186
#19	'mixed infection*':ti,ab	10870
#20	#16 OR #17 #18 OR #19	89678
Final Combination	#7 AND #12 AND #15 AND #20	213

Table 4: Database Search Framework for Scopus

Step	Search algorithm	Items found
#1	TITLE-ABS-KEY (tick*)	75778
#2	TITLE-ABS-KEY (ixodes)	11940
#3	TITLE-ABS-KEY (ixodidae)	13609
#4	#1 OR #2 OR #3	58775
#5	TITLE-ABS-KEY ("Borrelia burgdorferi")	15100
#6	TITLE-ABS-KEY ("lyme disease spirochete")	956
#7	TITLE-ABS-KEY ("borrelia burgdorferi sensu stricto")	539
#8	#5 OR #6 OR #7	15173
#9	TITLE-ABS-KEY ("anaplasma phagocytophilum")	3268
#10	TITLE-ABS-KEY ("coinfection*")	34621
#11	TITLE-ABS-KEY ("dual infection*")	2111
#12	TITLE-ABS-KEY ("mixed infection*")	38725
#13	#10 OR #11 OR #12	60389
Final Combination	#4 AND #8 AND #13	213

Table 5: Database Search Framework for Cochrane Library

Step	Search algorithm	Items found
#1	"Ixodes"[MeSH Terms]	5516
#2	Ixodes[Title/Abstract]	8630
#3	"Ticks"[Mesh]	24648
#4	Tick*[Title/Abstract]	41773
#5	"Ixodidae"[Mesh]	11824
#6	Ixodidae[Title/Abstract]	4389
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	45106
#8	"Borrelia burgdorferi"[Mesh]	4235
#9	Borrelia burgdorferi[Title/Abstract]	9341
#10	"lyme disease spirochete"[Title/Abstract]	616
#11	"borrelia burgdorferi sensu stricto"[Title/Abstract]	480
#12	#8 OR #9 OR #10 OR #11	10262
#13	"Anaplasma phagocytophilum"[Mesh]	1413
#14	Anaplasma phagocytophilum[Title/Abstract]	2144
#15	#13 OR #14	2287
#16	"Coinfection"[Mesh]	15852
#17	"Coinfection*"[Title/Abstract]	32173
#18	"Dual infection*"[Title/Abstract]	1805
#19	"Mixed infection*"[Title/Abstract]	8721
#20	#16 OR #17 #18 OR #19	47451
Final Combination	#7 AND #12 AND #15 AND #20	175

Table 6: Database Search Framework for SinoMed

Step	Search algorithm	Items found
#1	"蜱"[不加权:扩展]	2761
#2	"硬蜱属"[不加权:扩展]	442
#3	"硬蜱科"[不加权:扩展]	949
#4	#1 OR #2 OR #3	2761
#5	"伯氏疏螺旋体"[不加权:扩展]	4390
#6	"狭义包柔氏疏螺旋体"[不加权:扩展]	4390
#7	"莱姆病螺旋菌"[不加权:扩展]	4390
#8	#5 OR #6 OR #7	4390
#9	"嗜吞噬细胞无形体"[不加权:扩展]	153
#10	"同时感染"[不加权:扩展]	3848
#11	"多重细菌感染"[不加权:扩展]	3848
#12	"协同感染"[不加权:扩展]	3848
#13	"混合感染"[不加权:扩展]	3848
#14	"继发感染"[不加权:扩展]	3848
#15	#10 OR #11 OR #12 OR #13 OR #14	3848
Combine	#16 #4 AND #8 AND #9 AND #15	0

Final Combination #1 AND #5 AND #9 AND #13 7

Table 7: Database Search Framework for CNKI

Step	Search algorithm	Items found
#1	SU%='蜱'	9466
#2	SU%='硬蜱属'	78
#3	SU%='硬蜱科'	102
#4	#1 OR #2 OR #3	151
#5	SU%='伯氏疏螺旋体'	650
#6	FT%='狭义包柔氏疏螺旋体'	20
#7	FT%='莱姆病螺旋菌'	95
#8	#5 OR #6 OR #7	748
#9	SU%='嗜吞噬细胞无形体'	125
#10	SU%='同时感染'	365
#11	SU%='复合感染'	4877
#12	SU%='共感染'	1378
#13	SU%='混合感染'	23706
#14	SU%='继发感染'	14619
#15	#10 OR #11 OR #12 OR #13 OR #14	39322
Combine #16	#4 AND #8 AND #9 AND #15	5
#17	FT%='蜱'	97641
#18	FT%='硬蜱属'	740
#19	FT%='硬蜱科'	1261
#20	#17 OR #18 OR #19	1568
#21	FT%:'伯氏疏螺旋体'	3190
#22	#21 OR #7 OR #7	1568
#23	FT%='嗜吞噬细胞无形体'	1316
#24	FT%='复合感染'	3265
#25	FT%='共感染'	12685
#26	#23 OR #24	17493
Combine #27	#20 AND #22 AND #25	0
Final Combination	#1 AND #21 AND #23 AND #24	79

Table 8: Database Search Framework for VIP

Step	Search algorithm	Items found
#1	蜱+tick+草爬子+壁虱+蜱虫+硬蜱+伯氏疏螺旋体 +borrelia burgdorferi+莱姆病螺旋体	7476
#2	伯氏疏螺旋体+borrelia burgdorferi+莱姆病螺旋体	589
#3	嗜吞噬细胞无形体	64
#4	合并感染+co-infection+complicated infection+complicated with infection+共感染	267875
Final Combination	#1 AND #2 AND #3	3

Table 9: Database Search Framework for WANFANG DATA

Step	Search algorithm	Items found
#1	题名或关键词:(蜱虫)	504
#2	题名或关键词:(硬蜱属)	132
#3	题名或关键词:(硬蜱科)	38
#4	#1 OR #2 OR #3	83467
#5	题名或关键词:(伯氏疏螺旋体)	3780
#6	题名或关键词:(莱姆病螺旋体)	5611
#7	#5 OR #6	5745
#8	题名或关键词:(嗜吞噬细胞无形体)	2746
#9	题名或关键词:(共感染)	9778
#10	题名或关键词:(复合感染)	2215
#11	题名或关键词:(混合感染)	14197
#12	#8 OR #9 OR #10 OR #11	25930
Final Combination	#4 AND #7 AND #12	4

Table 10: Database Search Framework for Global Index Medicus (English)

Step	Search algorithm	Items found
#1	(mh:(Ixodes))	73
#2	(tw:(Ixodes))	211
#3	(mh:(Tick))	563
#4	(tw:(Tick*))	2203
#5	(mh:(Ixodidae))	152
#6	(tw:(Ixodidae*))	366
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	2243
#8	(mh:(Borrelia burgdorferi))	0
#9	(tw:(Borrelia burgdorferi*))	347
#10	(tw:(lyme disease spirochete*))	149
#11	(tw:(borrelia burgdorferi sensu stricto*))	132
#12	#9 OR #10 OR #11	348
#13	(mh:(Anaplasma phagocytophilum))	0
#14	(tw:(Anaplasma phagocytophilum*))	151
#15	(mh:(Coinfection))	979
#16	(tw:(Coinfection*))	11182
#17	(tw:(Dual infection*))	1168
#18	(tw:(Mixed infection*))	5229
#19	#15OR#16 OR #17 #18	9363
Final Combination	#7 AND #12 AND #14 AND #19	6

Table 11: Database Search Framework for Global Index Medicus (Portuguese)

Step	Search algorithm	Items found
#1	(mh:(Ixodes))	73
#2	(tw:(Ixodes))	211
#3	(tw:(Carrapato Ricino))	73
#4	(tw:(Carrapato de Mamoneira))	73
#5	(tw:(Ixodes ricinus))	101
#6	(tw:(Ixodes scapularis))	75
#7	(tw:(Carrapato de Patas Pretas))	73
#8	(tw:(Carrapato do Veado))	77
#9	(tw:(Ixodes dammini))	75
#10	(tw:(Ixodes persulcatus))	98
#11	#1 OR #2 OR #3 OR #4 OR #5 OR #6OR#7OR#8OR#9OR#10	130
#12	(mh:(Ixodidae))	152
#13	(tw:(Ixodidae))	366
#14	(tw:(Carrapatos de Dorso Duro))	152
#15	(tw:(Carrapatos de Costas Duras))	152
#16	(tw:(Carrapatos Providos de Escudo Dorsal))	152
#17	(tw:(Carrapatos Duros))	154
#18	#12 OR #13 OR #14 OR #15 OR #16 OR #17	368
#19	(mh:(Carrapatos))	563
#20	(tw:(Carrapatos))	1259
#21	(tw:(Ixodida))	577
#22	#19 OR #20 OR #21	1268
#23	#11 OR #18 OR #22	1413
#24	(mh:(Borrelia burgdorferi))	0
#25	(tw:(Borrelia burgdorferi))	346
#26	(tw:(Espiroqueta Causadora da Doença de Lyme))	125
#27	(tw:(borrelia burgdorferi sensu stricto))	132
#28	(tw:(Espiroqueta da Doença de Lyme))	137
#29	#24 OR #25 OR #27OR#28	346
#30	(mh:(Anaplasma phagocytophilum))	0
#31	(tw:(Anaplasma phagocytophilum))	151
#32	(tw:(Agente da HGE))	23
#33	(tw:(Ehrlichia phagocytophila))	24
#34	(tw:(Ehrlichia equi))	27
#35	(tw:(Cytoecetes phagocytophila))	22
#36	(tw:(Agente da Ehrlichiose Granulocítica Humana))	22
#37	(tw:(Agente da EGH))	22
#38	#14 OR #15 OR #16 OR #17 OR #18 OR #19OR#20	157
#39	(mh:(Coinfecção))	979

#40	(tw:(Coinfecção))	9449
#41	(tw:(Infecção Mista))	1242
#42	#39OR #40 OR #41	9699
Final Combination	#23AND #29 AND #38 AND #42	10

Table 12: Database Search Framework for Global Index Medicus (French)

Step	Search algorithm	Items found
#1	(mh:(Ixodes))	73
#2	(tw:(Ixodes*))	211
#3	(mh:(tique*))	1361
#4	(tw:(tique*))	1938
#5	(mh:(Ixodidae*))	152
#6	(tw:(Ixodidae*))	366
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	2126
#8	(mh:(Borrelia burgdorferi))	0
#9	(tw:(Borrelia burgdorferi*))	347
#10	(tw:(Spirochète de la maladie de Lyme*))	135
#11	(tw:(borrelia burgdorferi sensu stricto*))	132
#12	#9 OR #10 OR #11	347
#13	(mh:(Anaplasma phagocytophilum*))	0
#14	(tw:(Anaplasma phagocytophilum*))	151
#15	(mh:(coinfection*))	8953
#16	(tw:(coinfection*))	11182
#17	(tw:(infection double*))	4251
#18	(tw:(Mixed infection*))	5229
#19	#15 OR #16 #17 OR #18	19158
Final Combination	#7 AND #12 AND #14 AND #19	4

Table 13: Database Search Framework for Global Index Medicus (Spanish)

Step	Search algorithm	Items found
#1	(mh:(Ixodes*))	73
#2	(tw:(Ixodes*))	211
#3	(mh:(garrapata*))	781
#4	(tw:(garrapata*))	1263
#5	(mh:(Ixodidae))	152
#6	(tw:(Ixodidae*))	366
#7	#1 OR #2 OR #3 OR #4 OR #5 OR #6	1415
#8	(mh:(Borrelia burgdorferi*))	0
#9	(tw:(Borrelia burgdorferi*))	347
#10	(tw:(espiroqueta de la enfermedad de Lyme*))	140
#11	(tw:(borrelia burgdorferi sensu stricto*))	132
#12	#9 OR #10 OR #11	347
#13	(mh:(Anaplasma phagocytophilum))	0
#14	(tw:(Anaplasma phagocytophilum*))	151
#15	(mh:(coinfeción*))	8953
#16	(tw:(coinfeción*))	9431
#17	(tw:(infección dual*))	424
#18	(tw:(infección mixta*))	1312
#19	#15 OR #16 #17 OR #18	10117
Final Combination	#7 AND #12 AND #14 AND #19	1

Table 14: Search Framework for PROSPERO Registry

Step	Search algorithm	Items found
#1	Tick	145
#2	Ticks	72
#3	Ixodes	14
#4	Ixodidae	2
#5	borrelia burgdorferi	27
#6	anaplasma phagocytophilum	12
#7	Coinfection	254
#8	Coinfections	77
#9	Co-infection	617
#10	Co-infections	230
Final Combination	#1OR #2 OR #3 AND #4 #1AND #5 AND #6 AND #7 AND#8AND #9 AND #10	3