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The Plague of Thebes, a Historical Epidemic in Sophocles' Oedipus Rex

Technical Appendix

Table. Characteristics of pathogens possibly responsible for the plague of Thebes described by Sophocles in Oedipus Rex*

Pathogen	Disease	Zoonosis in cattle	Stillbirth/ miscarriage	Infertility	Highest reported acute mortality rate	Highly contagious (droplets/aerosol transmission)	Epidemics have been described	Described as early as 5th century BC
Yersinia pestis	Plague	No (reported mainly in rodents, cats, camels) (*1*,*2*)	NA	NA	100% (*1*,*2*)	Yes (*2*)	Yes (*1*,*2*)	Probably yes (1350 BC) (*3*)
Leishmania spp.	Leishmaniasis	Yes (*4*)	Yes (≈10.5% for cutaneous and visceral) (*5*)	NA	70% (*6*)	No (sandfly bite) (*7*)	Yes (*7*)	Probably yes (7th century or possibly as easily as 2500 to 1500 BC) (*8*)
Leptospira spp.	Leptospirosis	Yes (*9*)	Yes (in acute infection) (*9*)	NA (reported in animals)	50–70% (*10*)	No (rarely reported direct transmission between humans) (*9*)	Yes, usually in association with rainfalls, flooding and rodent infestation (*9*)	Probably yes (recognized as an occupational hazard of rice harvesting in ancient China) (*9*)
Lyssavirus spp.	Rabies	Yes (*11*)	NA	NA	100% (*11*)	No (*11*)	Yes (*12*)	Yes (Eshuma Code of Babylon circa 2000 BC) (*11*)
Hepatitis E Virus	Hepatitis E (*13*)	Yes (*13*)	Yes (*13*)	NA	4% (*13*) (73% in pregnancy) (*14*)	No (*13*,*14*)	Yes (*13*,*14*)	No (earliest outbreak attributed to HEV was in Delhi, 1955) (*13*,*15*)
Coronaviridae	Common cold, SARS	Yes (*16*)	NA	NA	15% (55% in persons >60 years of age) (*17*)	Yes (*17*)	Yes (*16*,*17*)	No (first characterized in the 1960s) (*18*)
Influenzavirus A	Influenza	Yes (*19*)	Yes (*20*)	No (*21*)	5–10% (*22*) (may be higher) (*23*)	Yes (*24*)	Yes (*22*,*23*)	Yes (*25*)
West Nile virus	West Nile virus infection	No (*26*,*27*)	No (*26*,*27*)	NA	10% (*26*)	No (*26*–*28*)	Yes (*26*,*27*)	Probably not (molecular dating shows low possibility of human infection before 1000 years ago) (*29*)
DEN 1-4 *Flaviviruses*	Dengue and dengue hemorrhagic fever	Not the same virus in humans and cattle (*30*,*31*)	Not in a high rate (*32*)	NA	47% (*33*)	No (*30*)	Yes (*30*)	No (earliest record of Dengue symptoms found in China, during Chin dynasty, 265-420 A.D.) (*30*)

Pathogen	Disease	Zoonosis in cattle	Stillbirth/ miscarriage	Infertility	Highest reported acute mortality rate	Highly contagious (droplets/aerosol transmission)	Epidemics have been described	Described as early as 5th century BC
Brucella abortus	Brucellosis	Yes (*34*)	Yes (*35*)	No (*34*) (only in natural host) (*36*)	80% in cases in which endocarditis was concurrently present (*37*)	Yes (*38*)	Yes (*39*)	Probably yes (known since the time of Hippocrates) (*40*)
Listeria monocytogenes	Listeriosis	Yes (*41*)	Yes (*42*)	No (*43*)	63% (*42*)	No (*42*)	Yes (*42*)	No (early 20th century) (*44*)
Orthopoxviridae	Smallpox	No (*45*)	Yes (*46*)	Yes (*47*)	30% (*48*)	Yes (*48*)	Yes (*48*)	Yes (observations from 1100-1580 BC, even earlier phylogenic origin) (*49*)
Measles virus	Measles	Yes (not reported in cows) (*50*)	Yes (*51*)	No (*52*)	15% (after encephalitis) (*52*)	Yes (*52*)	Yes (*53*)	No (not described BC, and recent phylogenic analysis showed its origin in 11th–12th century AD) (*54*)
Salmonella typhi	Typhoid fever	No (*55*)	Yes (*56*)	NA	30% (when left untreated) (*57*)	No (*58*)	Yes (*59*)	Yes (*60*)
Francisella tularensis	Tularemia	Yes (mainly on rabbits, ticks, deerflies, squirrels) (*61*)	No (reported in sheep) (*62*)	NA	60% (*63*)	Yes (*63*)	Yes (*63*)	Probably yes (earliest outbreak credited, in 1715 BC Canaan) (*64*)
Yersinia enterocolitica	Gastroenteritis	No (mainly in pigs, dogs, cats, sheep and wild rodent strains) (*65*)	No (reported in sows, cattle) (*66*)	NA	50% (after septicemia) (*67*)	No (*65*)	Yes (*68*)	Probably not (Yersinia spp. is an ancient pathogen (*3*), first recognized reference to *Y. enterocolitica* in the USA in 1934 (*69*))
Rickettsia prowazekii	Epidemic typhus	No (mainly in flying squirrels) (*70*)	NA	NA	60% (*70*)	Yes (*70*)	Yes (*71*)	Yes (may have originated millions of years ago) (*72*)
Lymphocytic Choriomeningitis Virus	Choriomeningitis	No (mainly in rodents, house mice, pet hamsters) (*73*)	Yes (*74*)	NA	30% (among infants diagnosed with congenital infection) (*74*)	Yes (*73*)	Yes (*75*)	Probably yes (LCMV is quite ancient and the extensive diversity of the virus has accumulated over the past 1,000–5,000 years) (*76*)
Aspergillus spp.	Aspergillosis	Yes (*77*)	No (most frequent cause of abortions in cattle) (*77*,*78*)	NA	86% (treated immunocompromised patients) (*77*)	Yes (*77*)	Yes (*79*)	No (first introduced in 1729) (*80*)

*NA, not available; SARS, severe acute respiratory syndrome; LCMV, lymphocytic choriomeningitis virus; HEV, hepatitis E virus; BC, before Christ.

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