Parasitic Zoonoses in Animals in Turkey

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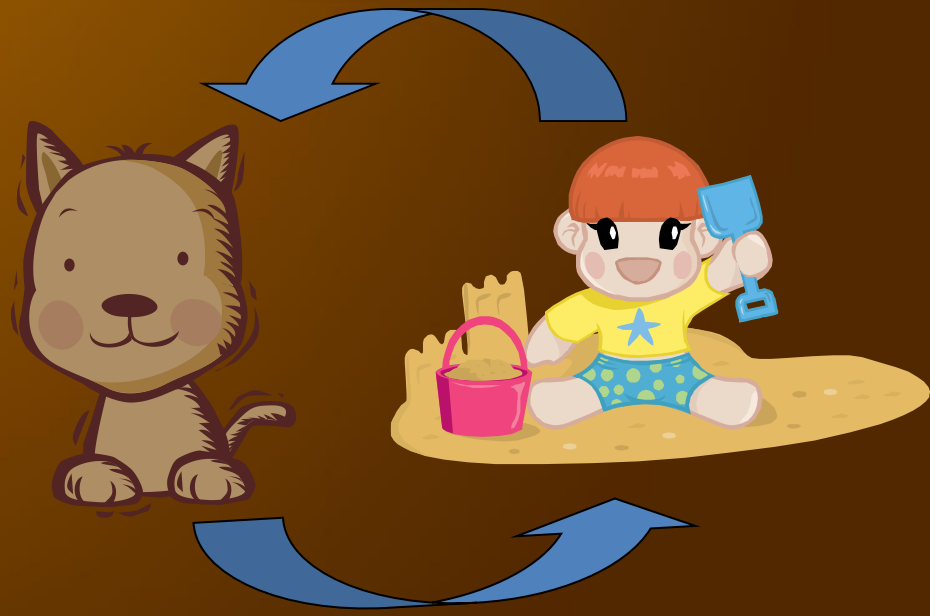
What are zoonotic diseases?

- Zoonoses refer to diseases that pass between people and animals.
- Recently, researchers have determined that more than 70% of emerging infectious diseases in people actually come from animals.
  - Some of these diseases start in wildlife that is being displaced by deforestation in remote areas of the world.
  - Diseases can move around the globe quickly because people and products, such as animals and food supplies, are constantly crossing borders.



History?

- Interactions between animals and humans have occurred since the beginning of time.

- As animals became domesticated and a close bonds developed between animals and humans, the occurrence of zoonotic diseases increased.

Parasite transmission?

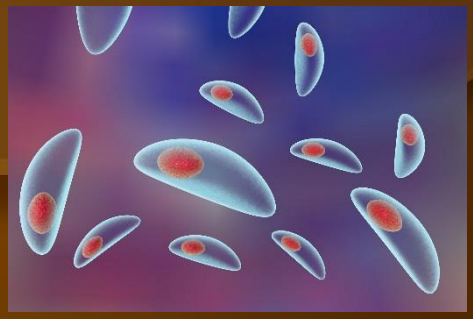
- Insect bites
- Animal feces
- Handling raw meat and fish
- Handling cat litter boxes
- Contaminated fruits and vegetables
- Infected food handlers
- Contaminated water
- Contact with an infected person

Turkey perspective

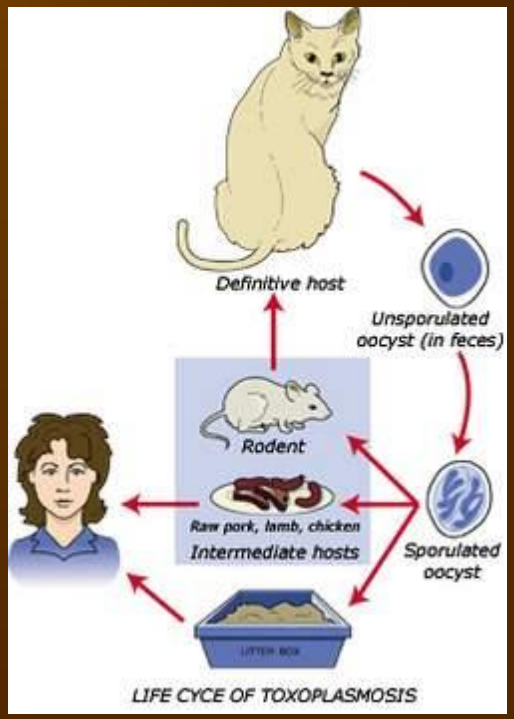
- Zoonoses of parasitic origin are common throughout Turkey at varying rates.

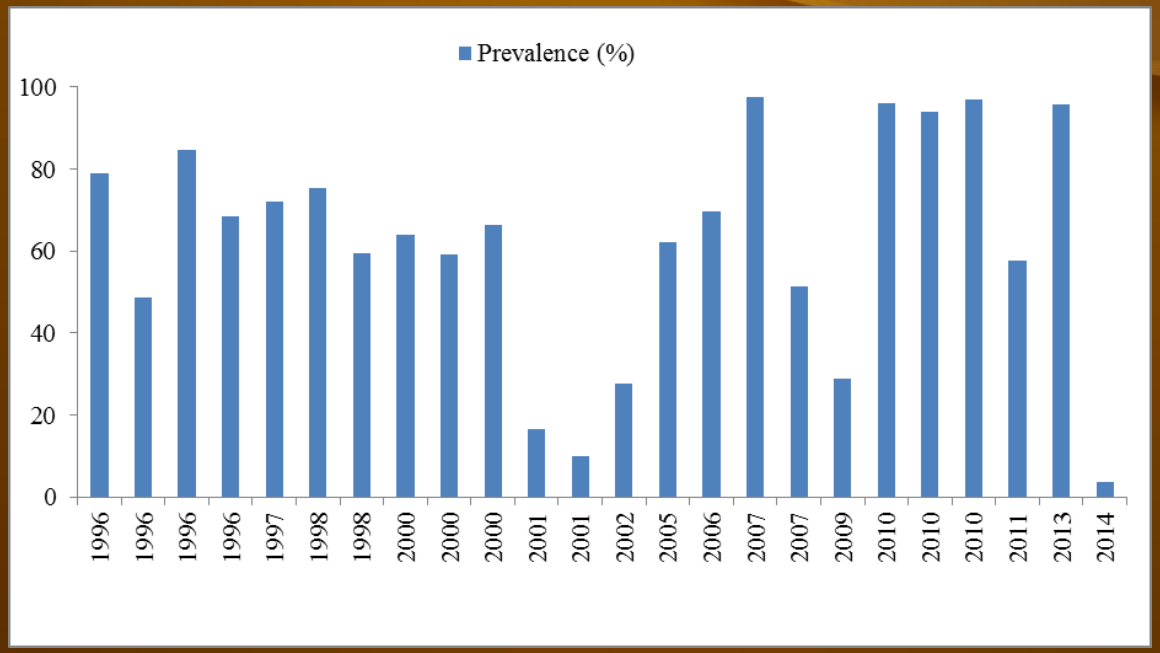
- Factors such as poverty, lack of personal hygiene, abundance of stray animals, and certain culinary habits are responsible for the rising prevalence of zoonoses in Turkey.

Toxoplasmosis



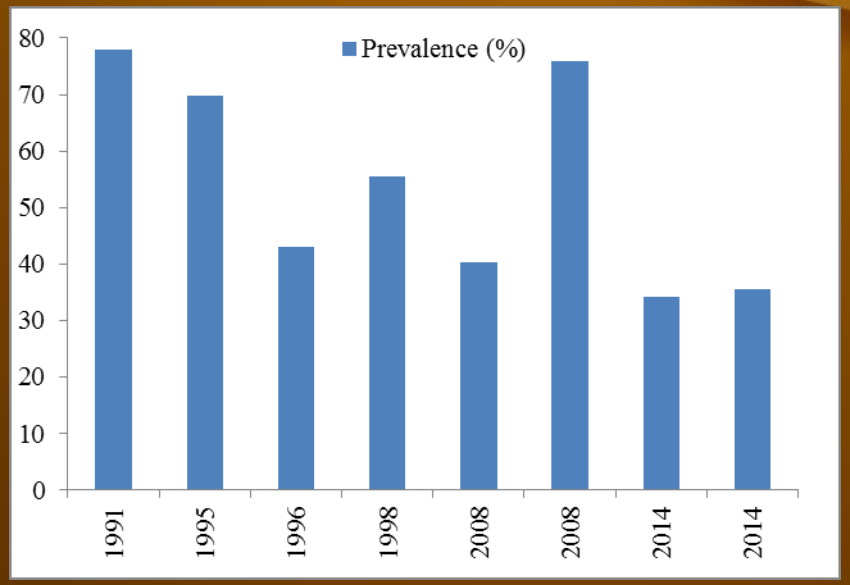
- Toxoplasmosis is an important parasitic zoonosis in humans and many species of birds and mammals, which is caused by the protozoan *Toxoplasma gondii*.
- It has been estimated that up to one third of the world's population has been infected with toxoplasmosis.





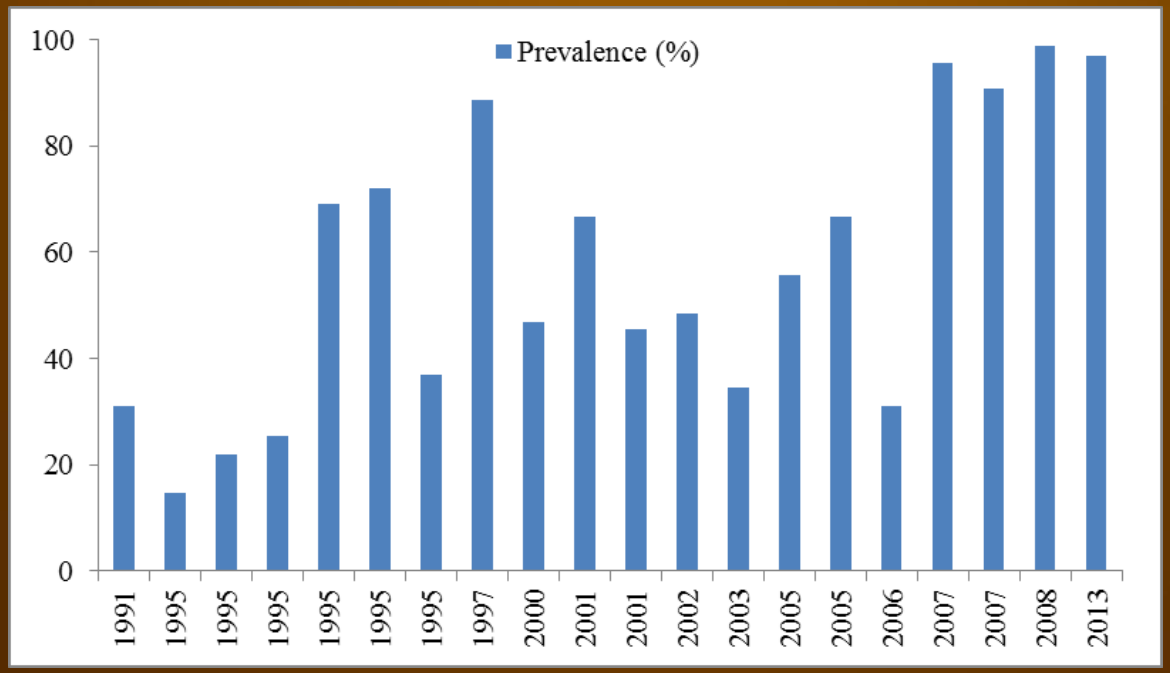
Year	Test	Province	Prevalence (%)
1996	SF	Ankara	78.84
1996	LAT	Ankara	48.7
1996	IFAT	Ankara	84.61
1996	SF	Bursa	68.57
1997	SF	İstanbul	72
1998	SF	Elazığ	75.4
1998	SF	Aydın	59.5
2000	SF	Konya	64.02
2000	MAT	Konya	59.14
2000	IFAT	Konya	66.46
2001	IFAT	Bursa	16.67
2001	ELISA	Van	10
2002	IFAT)	Aydın	27.6
2005	SF	Ankara	62.06
2006	SF	Kocaeli	69.8
2007	SF	Şanlıurfa	97.5
2007	IFAT	İstanbul	51.3
2009	IFAT	Kırıkkale	28.9
2010	SF	Diyarbakır	94
2010	SF	Erzurum	97
2011	SF	Nevşehir	57.8
2013	SF	Sivas	95.8
2014	Real Time PCR	Kayseri	3.8

Prevalence of Toxoplasmosis in dogs



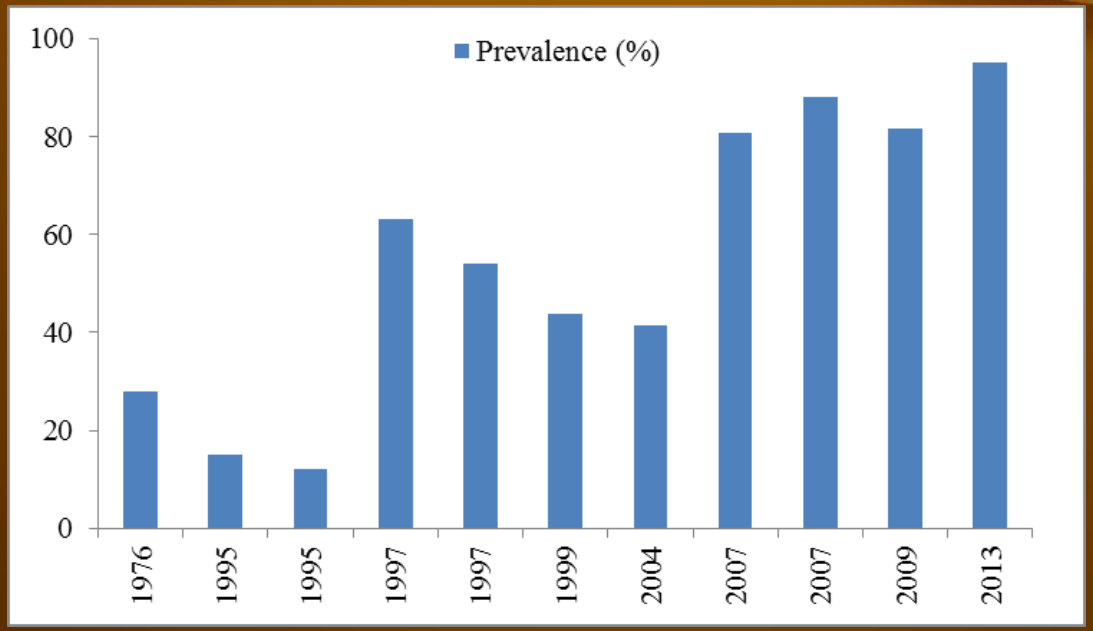
Year	Test	Province	Prevalence (%)
1991	IHA	Sivas	78
1995	IHA	Kırıkkale	69.8
1996	SF	Ankara	43
1998	SF	Elazığ	55.5
2008	SF	Ankara	40.3
2008	SF	Niğde	76
2014	IFAT	İzmir	34.2
	in house-ELISA		35.6

Prevalence of Toxoplasmosis in cats.



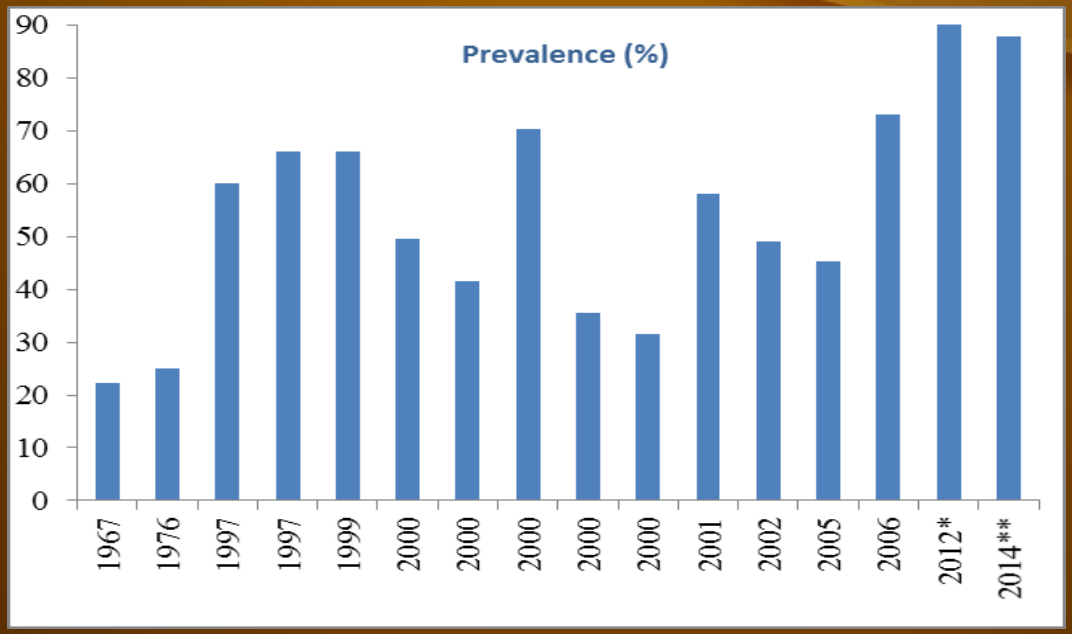
Year	Test	Province	Prevalence (%)
1991	IHA	Elazığ	30.97
1995	LAT	Ankara	14.66
1995	ELISA	Adana	22
	IHA		25.5
1995	SF	Ankara	69
	IFAT		72
	LAT		37
1997	SF	Çankırı	88.7
2000	SF	Elazığ	46.8
2001	SF	Amasya	66.6
2001	SF	Yozgat	45.4
2002	SF	Mersin	48.43
2003	IHA	Van	34.6
2005	SF	Şanlıurfa	55.66
2005	SF	Yalova	66.6
2006	ELISA	İstanbul	31
2007	ELISA	Kars	95.7
	SF		90.9
2008	SF	Afyon	98.92
2013	IFAT	Silopi	97

Table 3: Prevalence of Toxoplasmosis in sheep.



Year	Test	Province	Prevalence (%)
1976	SF	Diyarbakır	27.9
1995	IHA	Adana	15
	ELISA		12.1
1997	SF	Çankırı	63.15
1997	SF	Ankara	54
1999	SF	Eskişehir	43.87
2004	SF	Niğde	41.30
2007	SF	Van	80.61
2007	SF	Hatay	88.17
2009	SF	Ankara	81.75
2013	SF	Kilis	95.24

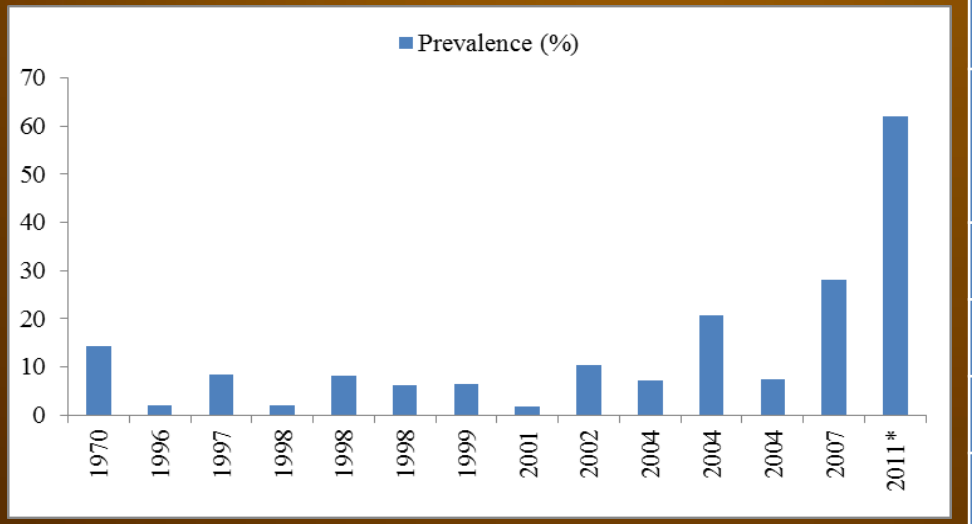
Prevalence of Toxoplasmosis in goats



Prevalence of Toxoplasmosis in cattle, water buffaloes and camel.

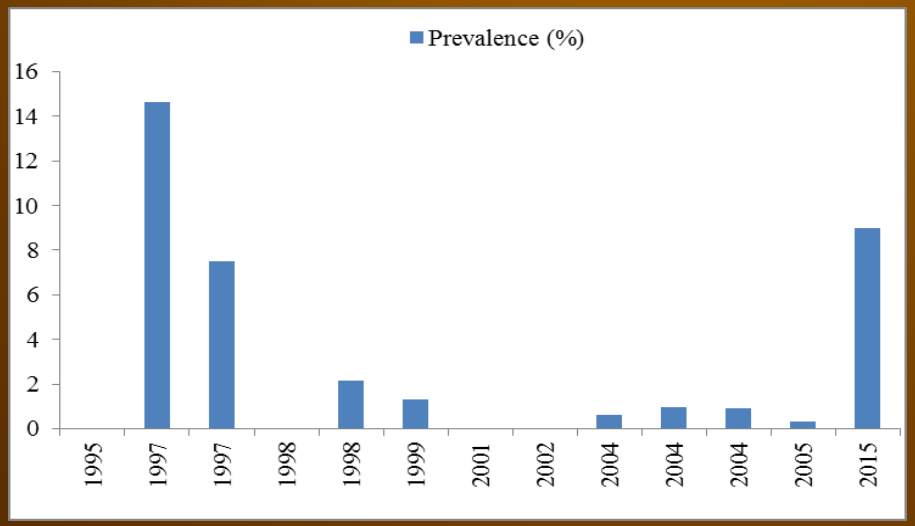
Year	Technique	Province	Prevalence (%)
1967	SF	Ankara	22.3
1976	SF	Diyarbakır	25
1997	SF	Ankara	60.2
1997	SF	Aydın	66
1999	SF	Kayseri	66.03
2000	SF	Kars	49.56
2000	SF	Kırıkkale	41.6
2000	SF	Elazığ	70.4
2000	IHA	Konya	35.5
	IFA		31.52
2001	SF	Amasya	58
2002	SF	Şanlıurfa	49.13
2005	ELISA	Aydın	45.2
2006	SF	Bursa	73
2012*	SF	Nevşehir	90.9
2014**	SF	Afyon-Samsun	87.79

*: Camel
**: Water buffalo



Prevalence of Toxoplasmosis in horses and donkey

Year	Technique	Province	Prevalence (%)
1970	SF	Different provinces	14.3
1996	SF	Bursa	1.9
1997	SF	Ankara	8.33
1998	SF	Ankara	2
1998	SF	Different provinces	8.2
	LAT		6.18
1999	SF	Malatya	6.4
2001	IHA	Van	1.74
2002	SF	Kayseri	10.44
2004	SF	Niğde	7.2
2004	SF	Kars	20.6
2004	SF	Şanlıurfa	7.5
2007	SF	Ankara	28
2011*	SF	Erzurum	62
*: Donkey			



Prevalence of Toxoplasmosis in birds

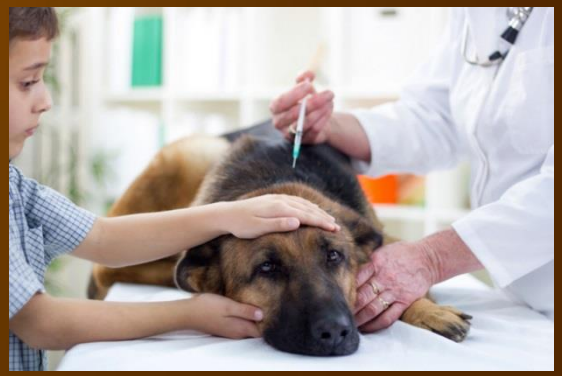
Year	Species	Technique	Province	Prevalence (%)
1995	Chicken	SF	Ankara	0
1997	Chicken	SF	Ankara	14.66
		LAT		7.5
1998	Pigeon	SF	Ankara	0
1998	Chicken	SF	Different provinces	2.14
1999	Pigeon	SF	İzmir and Manisa	1.29
2001	Quails	SF	Kayseri	0
2002	Chicken	SF	Marmara Region	0
2004	Chicken	SF	Afyon	0.6
2004	Domestic pigeon	SF	Niğde	0.95
2004	Wild pigeon	SF	Niğde	0.90
2005	Chicken	SF	Konya	0.34
2015	Wild Birds	PCR (brain tissue)	Hatay	9

Toxoplasmosis

- To prevent risk of toxoplasmosis from the environment:
- Avoid untreated drinking water.
- Wear gloves when gardening and during any contact with soil or sand because it might be contaminated with cat feces that contain *Toxoplasma*. Wash hands with soap and warm water after gardening or contact with soil or sand.
- Teach children the importance of washing hands to prevent infection.
- Keep outdoor sandboxes covered.
- Feed cats only canned or dried commercial food or well-cooked table food, not raw or undercooked meats.
- Change the litter box daily if you have own a cat.
- If you are pregnant or immunocompromised:
  - Avoid changing cat litter if possible.
  - Do not adopt or handle stray cats, especially kittens.
  - Do not get a new cat while you are pregnant.

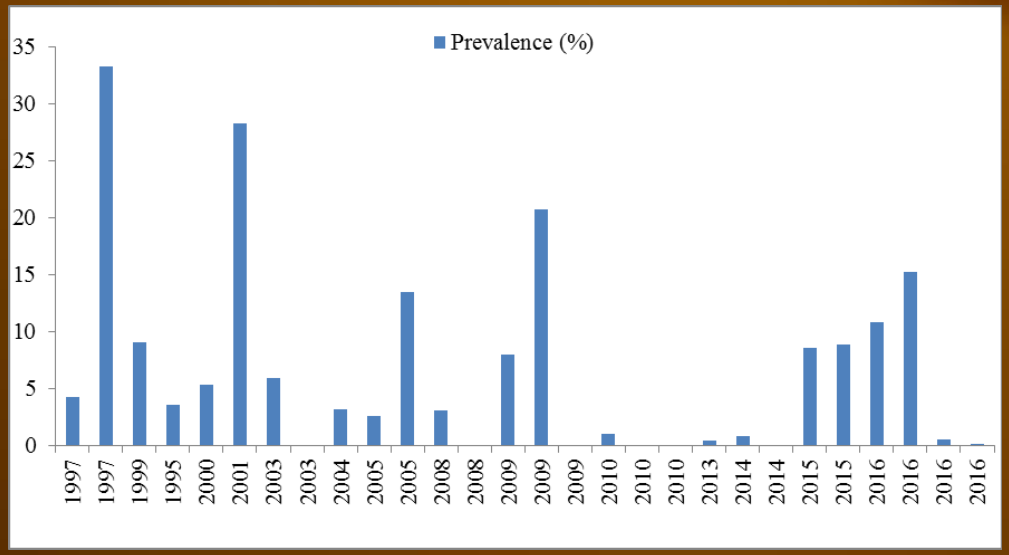
Leishmaniasis

- Leishmaniasis is a complex of mammalian diseases caused by protozoans of the genus *Leishmania*.
- It affect man and domestic and wild animals worldwide.
- Sand flies are the only arthropod vectors that are adapted for the transmission of *Leishmania* species.



Risk?

- The domestic dog is the only reservoir host of canine leishmaniasis (CanL) caused by *L. infantum*.
- Domestic cats might be secondary reservoir hosts of *L. infantum*, because they are experimentally infectious to sandflies and natural infections can be associated with feline retroviruses.



Prevalence of Leishmaniasis in dog and cats

Year	Species	Province	Test	Prevalence (%)
1997	Dog	Bursa	Serology	4.3
		Muğla		33.3
1999	Dog	Kuşadası	IFAT and ELISA	9.1
1995	Dog	Şanlıurfa, Manisa, Karabük	ELISA	3.6
2000	Dog	Manisa	IFAT and DAT	5.3
2001	Dog	Çorum	IFAT and DAT	28.26
2003	Dog	İstanbul, Bursa, Çorlu	Serology	5.9
2003	Dog	İstanbul	IFAT	0
2004	Dog	İzmir and Aydın	Serology	3.2
2005	Dog	Ankara	Serology	2.58
2005	Dog	Eskişehir, Afyon, Bilecik	Serology	13.51
2008	Dog	Kocaeli	Serology	3.07
2008	Dog	Kayseri	Nested PCR	0
2009	Dog	Antalya	Serology	7.95
2009	Dog	Denizli	Serology	20.7
2009	Dog	Çanakkale	Serology	0
2010	Dog	Kırıkkale	Serology	1
2010	Dog	Erzurum	Serology	0
2010	Dog	Diyarbakır	Serology	0
2013	Dog	Black Sea region	ELISA and PCR	0.41
2014	Dog	Hatay	Serology (IFAT)	0.8
		Burdur		0
2015	Dog	İstanbul	PCR	8.54
2015	Cat	Ege region	Real-time PCR	8.84
2016	Cat	İzmir	ELISA	10.8
			IFAT	15.2
			Nested-PCR	0.54
			Real-time PCR	0.001

Figure. The environments where canine leishmaniosis is endemic. (Left) Rural hilly areas of middle Anatolian where shepherd and hunting dogs live in close contact with humans. (Right) Typical shelter where hundreds of stray dogs live throughout their life and are exposed to sand fly bites.

Cats as a risk factor

- Although epidemiological position of cats in leishmaniasis is debated, cats are considered as secondary, alternative or incidental reservoir host for Leishmania species.
- In addition, different experimental studies have showed that cats may act as an additional domestic reservoir for L. infantum.
- Especially the stray cats can be source in transmission of leishmaniasis to human and other reservoir animals.

Control

- Insecticides can be expected to reduce the incidence of human leishmaniasis caused by L. infantum even more effectively than they reduce the incidence of canine lesihmaniasis.
- However a dog vaccine is highly desirable for control, because sandfly vectors are less accessible to insecticide treatment.

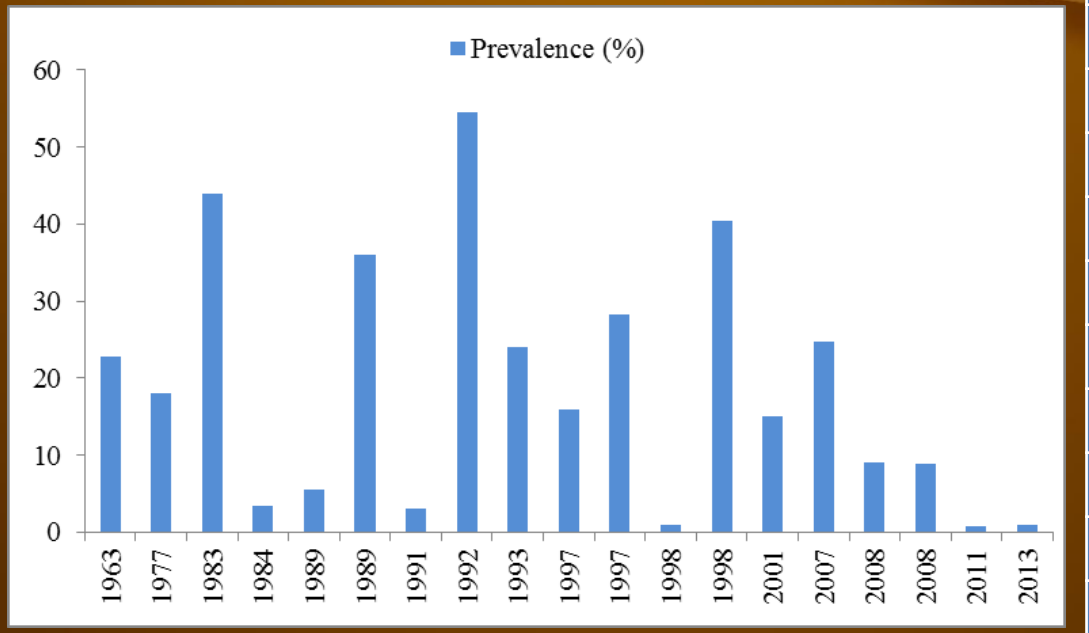
Control

- A high percentage of asymptomatic infections may occur in dogs and evidence indicates that it may potentially serve as a source of infection to sand fly vectors.
- The use of repellents in different formulations may induce a high degree of protection in dogs at individual and population levels.

Echinococcosis

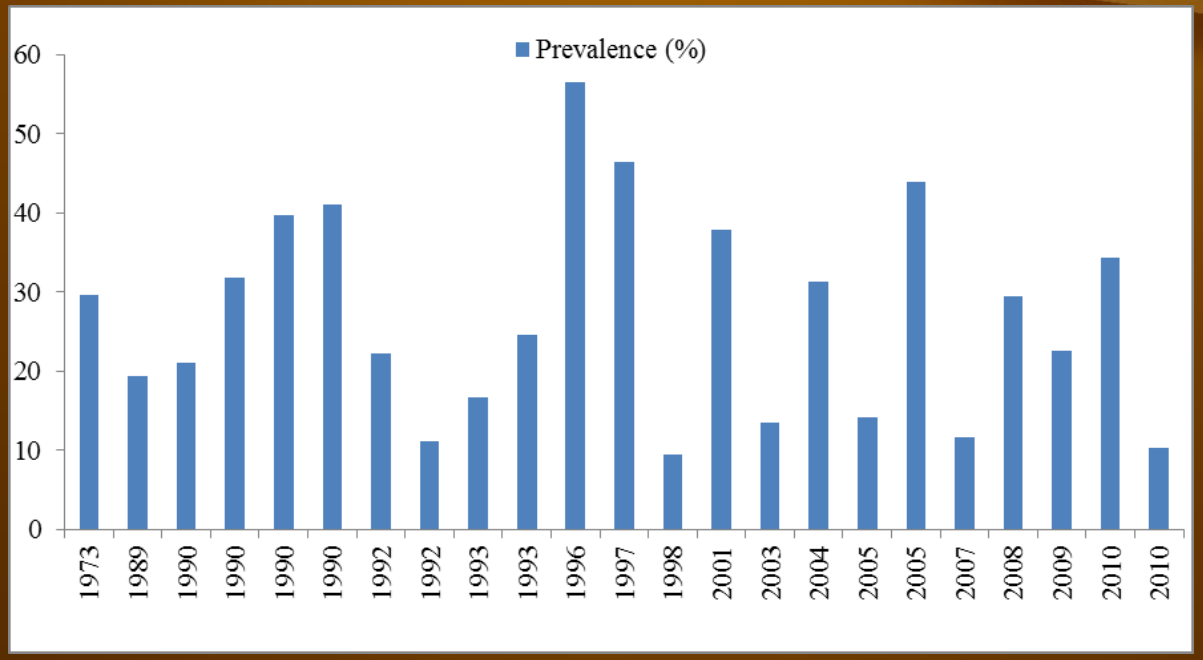
- Cystic echinococcosis (CE) is a zoonotic disease caused by larval stage of the tapeworm, genus Echinococcus. Its adult forms are seen in carnivores.

- Although CE was frequently observed in human and livestocks worldwide, however, its occurence is mainly in underdeveloped and developing countries.



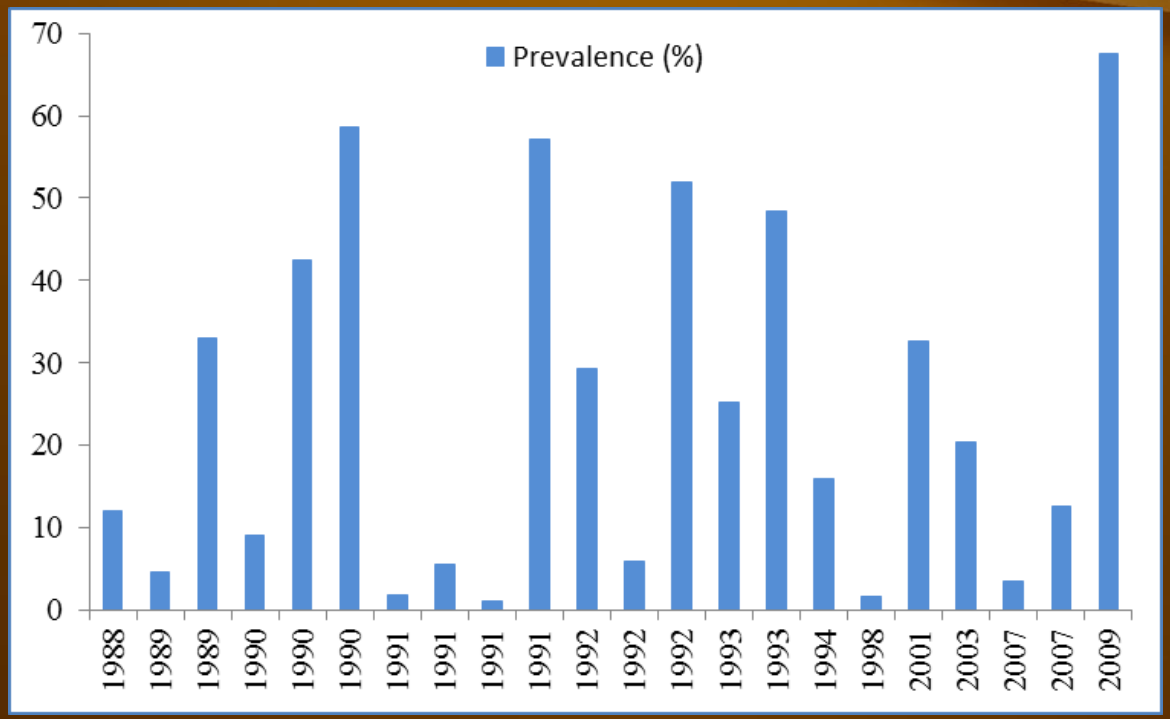
Prevalence of Echinococcosis in dogs

Year	Species	Province	Test	Prevalence (%)
1963	Dog	İstanbul	Necropsy	22.73
1977	Dog	Elazığ	Necropsy	18.09
1983	Dog	Ankara	Necropsy	44
1984	Dog	Elazığ	Necropsy	3.33
1989	Dog	İzmir	Necropsy	5.5
1989	Dog	Bursa	Necropsy	36
1991	Dog	İstanbul	Necropsy	3
1992	Dog	Ankara	Necropsy	54.5
1993	Dog	Kayseri	Necropsy	24
1997	Dog	Sivas	Necropsy	16
1997	Dog	Konya	Necropsy	28.33
1998	Dog	Ankara	Necropsy	0.94
1998	Dog	Kars	Necropsy	40.5
2001	Dog	İzmir	Coproantigen	15
2007	Dog	Adana	Coproantigen	24.72
2008	Dog	Muş	PCR	9
2008	Dog	Antakya	Coproantigen	8.86
2011	Dog	İstanbul	Stool examination	0.8
2013	Dog	Aydın	PCR	1



Prevalence of Echinococcosis in cattle and water buffaloes

Year	Species	Province	Test	Prev (%)
1973	Water Buffalo	Samsun	Necropsy	29.6
1989	Cattle	Van	Necropsy	19.4
1990	Cattle	Samsun	Necropsy	21.1
1990	Cattle	Ankara	Necropsy	31.8
1990	Cattle	Sivas	Necropsy	39.7
1990	Water Buffalo	Ankara	Necropsy	41.1
1992	Water Buffalo	İstanbul	Necropsy	22.32
1992	Cattle	Konya	Necropsy	11.2
1993	Water Buffalo	Kars	Necropsy	16.66
1993	Cattle	Kars	Necropsy	24.65
1996	Cattle	İzmir	Necropsy	56.5
1997	Cattle	Erzurum	Necropsy	46.4
1998	Cattle	Ankara	Necropsy	9.4
2001	Cattle	Van	Necropsy	37.82
2003	Cattle	Burdur	Necropsy	13.5
2004	Cattle	Kars	Necropsy	31.25
2005	Cattle	Kırıkkale	Necropsy	14.16
2005	Cattle	Erzurum	ELISA	43.9
2007	Cattle	Thrace	Necropsy	11.6
2008	Cattle	Afyon	Necropsy	29.47
2009	Cattle	Van	Necropsy	22.63
2010	Cattle	Erzurum	Necropsy	34.3
2010	Water Buffalo	Samsun, Ordu, Amasya	Necropsy	10.24



Prevalence of Echinococcosis in sheep and goats

Year	Species	Province	Test	Prevalence (%)
1988	Sheep	Erzurum	Necropsy	12
1989	Goat	Van	Necropsy	4.5
1989	Sheep	Van	Necropsy	32.9
1990	Goat	Ankara	Necropsy	9
1990	Sheep	Ankara	Necropsy	42.4
1990	Sheep	Sivas	Necropsy	58.6
1991	Sheep	Edirne	Necropsy	1.83
		Tekirdağ		5.58
		Kırklareli		1.06
1991	Sheep	Konya	Necropsy	57.11
1992	Goat	Konya	Necropsy	29.3
1992	Goat	Konya	Necropsy	5.9
1992	Sheep	Konya	Necropsy	51.9
1993	Goat	Kars	Necropsy	25.1
	Sheep			48.35
1994	Sheep	Manisa	Necropsy	15.98
1998	Goat	Ankara	Necropsy	1.6
2001	Goat	Van	Necropsy	32.6
2003	Goat	Hakkari	Necropsy	20.4
2007	Sheep	Thrace	Necropsy	3.5
2007	Goat	Hakkari	IHA	12.5
2009	Sheep	Van	Necropsy	67.57

Echinococcosis

- Zoonotic Transmission?
- Humans act as intermediate hosts and are infected when they ingest tapeworm eggs from the definitive host.
- The eggs may be eaten in foods such as vegetables, fruits or herbs, or drunk in contaminated water.
- They can also stick to the hands when a person pets an infected dog or touches contaminated soil and vegetation.

Echinococcosis

- Control of echinococcosis?
  - Don’t feed livestock entrails to dogs
  - Don’t allow dogs to hunt
  - Regularly test and/or treat animals allowed outside
  - Wash fruits and vegetables
  - Avoid untreated water sources
  - Teach children the importance of washing hands to prevent infection
  - Restrict home slaughter of sheep and other livestock

Taeniosis (bovine cysticercosis):

- Bovine cysticercosis is a parasitic infection of cattle caused by the larval stage (*Cysticercus bovis*) of the cestode *Taenia saginata*.
- Humans are the definitive host and harbour the adult form of the parasite in their intestines.

Prevalence of bovine cysticercosis in cattle

Province	Prevalance of *Cysticercus bovis*
Bursa	0.7
İstanbul	1-10
Kocaeli	-
İzmir	0.5-4
Manisa	1.13
Afyonkarahisar	0.46
Burdur	0.09
Ankara	0.3-9.7
Sivas	4.7
Konya	2.6-14
Samsun	2.1
Erzurum	10-20
Kars	4
Ağrı	5
Elazığ	0.55-4.3
Van	0.34
Şanlıurfa	25-30

Control?

- The best way to prevent bovine cysticercosis is to practice good biosecurity.

- You should do everything you can to prevent human feces from contaminating your pasture or animal feed system.

How Can You Protect Yourself?

- Always wash your hands
- Keep sand boxes covered
- Wear shoes
- Pick up animal feces when possible
- Don’t drink untreated water
- Cook meat thoroughly