



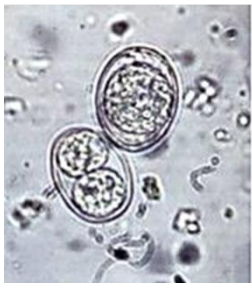
**Genetic Characterization of
Toxoplasma gondii strains isolated from
birds of prey**

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Toxoplasma gondii

- *Toxoplasma gondii* is a protozoan parasite that causes serious health problems in humans
- It has three infective form called sporozoites (oocysts), tachyzoites and bradyzoites (tissue cyst)
- Oocyst is formed during sexual reproduction in definitive host felines while tachyzoite and bradyzoite are formed during asexual reproduction in warm blooded animals

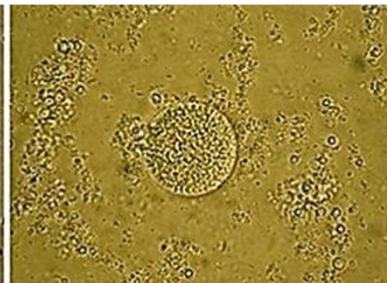
oocysts



tachyzoites



tissue cysts



Toxoplasmosis

- Toxoplasmosis is asymptomatic in immunocompetent people
- It can cause deadly symptoms in immunocompromised patients
 - Toxoplasmic encephalitis
 - Pulmonary toxoplasmosis
 - Less often, Eye, Heart, Liver, Kidney, Spleen, Muscle and Bone Marrow may be involved
- *T. gondii* cause blindness, diarrhea and dyspnea in birds
- It causes abortion and premature birth in goats and sheep
- Pneumonia, encephalitis, anorexia and diarrhea can be detected in dogs



T. gondii Genetic Diversity

In the early studies;

Contrary to expectations; Sexual reproduction of *Toxoplasma* has clonal population structure with low genetic diversity

This results in a clonal population structure;

- 6 enzymatic systems (86 isolates)
- 6 independent single-copy loci, PCR-RFLP (106 isolates)

Results of this studies determined 3 clonal group as genotypes I,II,III.

was obtained from these studies.

Clonal strains show different biological properties

Genotype I

- Virulent for mouse
- Tachyzoite to bradyzoite conversion is less detected in cell culture
- High growth rate in cell culture

Genotype II and III

- Avirulent for mouse
- Tachyzoite to bradyzoite conversion is more detected in cell culture
- Low growth rate in cell culture

Our study-group's previous research

In Turkey;

- Döşkaya M, Caner A, Ajzenberg D, Değirmenci A, Dardé ML, Can H, Erdoğan DD, Korkmaz M, Uner A, Güngör C, Altıntaş K, Gürüz Y., Isolation of *Toxoplasma gondii* strains similar to Africa 1 genotype in Turkey. *Parasitol Int.* 2013, 62(5):471-4.

- *Toxoplasma* strains isolated from two newborn babies were "African genotype 1" using microsatellite genotyping



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Short communication

Isolation of *Toxoplasma gondii* strains similar to Africa 1 genotype in Turkey



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In the other study

- Genetic characterization was performed in stray cats of İzmir
- 32 isolates of *Toxoplasma* were determined by mouse bioassay and RT-PCR
- 22 isolates were genotyped

- ✓ 19 Type II
- ✓ 2 Type III
- ✓ 1 African 1

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 PLOS ONE

Genetic Characterization of *Toxoplasma gondii* Isolates and Toxoplasmosis Seroprevalence in Stray Cats of İzmir, Turkey



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Hypothesis

Our recent studies showed that Africa 1 genotype was first time detected in a country other than Africa

The reasons for detecting Africa 1 in Turkey may be

- Cats or intermediate hosts were brought to Anatolia by ships using ancient trade routes
- Migratory birds of prey coming to Turkey from Africa

Or contrarily, Africa 1 genotype may originate in Turkey and transferred to Africa by birds of prey or trade routes



The aim of the study

Detection of *Toxoplasma* DNA in dead birds

- Determine the presence *T. gondii* REP gene

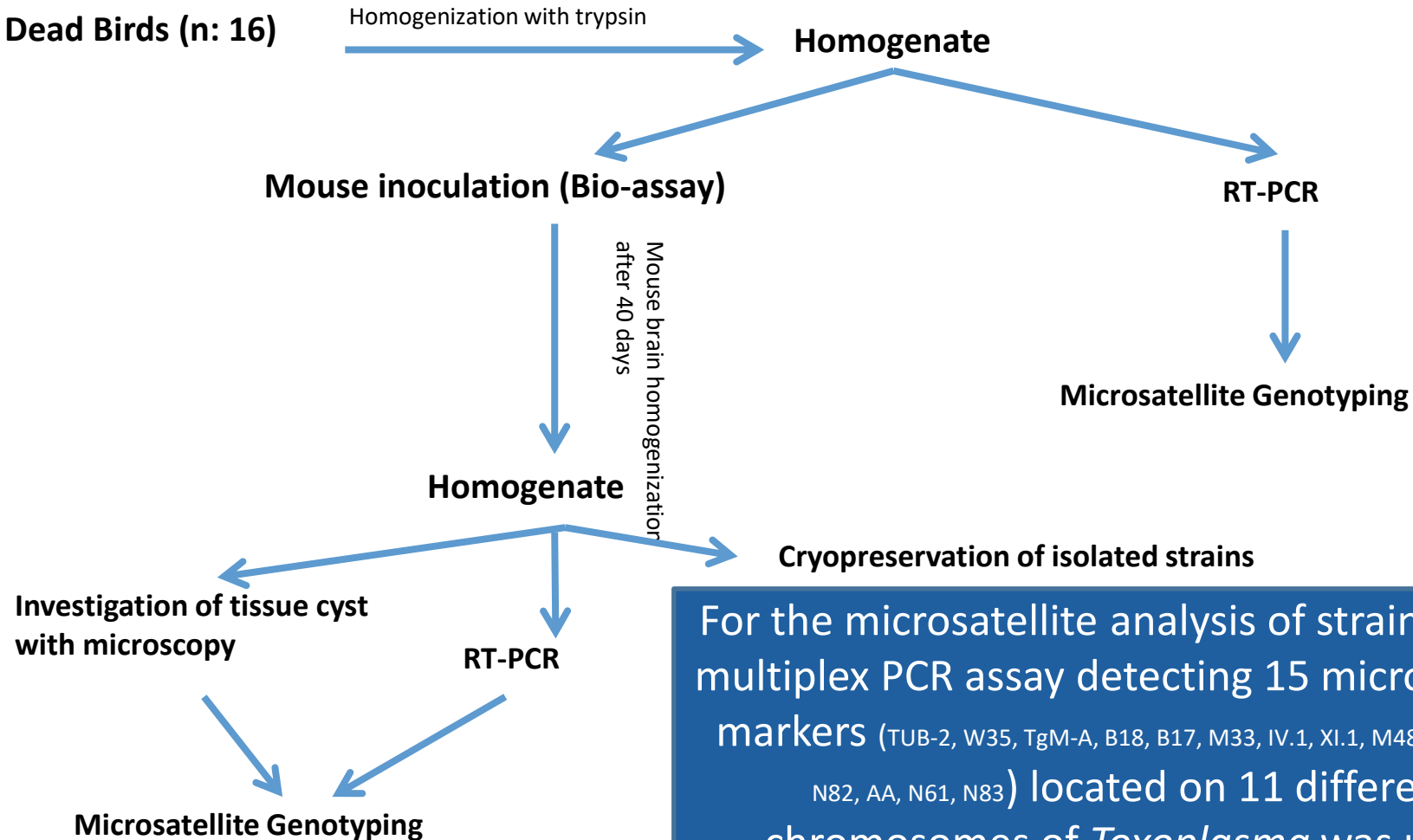
Isolated strains of *Toxoplasma*

- Perform Microsatellite genotyping
- Investigate whether migratory birds of prey are a source of strains isolated in Turkey

This study was supported by Ege University Research Fund
(Project No: 2014 TIP 073)

Methods

The birds of prey used in this study were found dead in Aegean region of Turkey and brought to the Izmir Natural Life Park and Izmir Bird Paradise



For the microsatellite analysis of strains, single multiplex PCR assay detecting 15 microsatellite markers (TUB-2, W35, TgM-A, B18, B17, M33, IV.1, XI.1, M48, M102, N60, N82, AA, N61, N83) located on 11 different chromosomes of *Toxoplasma* was used.

Results

- *Toxoplasma* REP gene was detected in all bird tissues
- 4 live strains were isolated from mice
- Microsatellite analyses genotyped these four live strains as well as two strains from the DNA of bird homogenates
- Among these 6 strains, 3 of them were type II and remaining 3 strains were type III.

Results

Species	RT-PCR	Live Strains	Genotype
Barn owl (<i>Tyto alba</i>)	Positive	No	Type III
Caspian gull (<i>Larus cachinnans</i>)	Positive	No	N/A
Eurasian eagle-owl (<i>Bubo bubo</i>)	Positive	No	N/A
Thrush nightingale (<i>Luscinia luscinia</i>)	Positive	No	N/A
Common wood pigeon (<i>Columba palumbus</i>)	Positive	No	N/A
Caspian gull (<i>Larus cachinnans</i>)	Positive	Yes	Type III
Little Owl (<i>Athene noctua</i>)	Positive	No	N/A
Common buzzard (<i>Buteo buteo</i>)	Positive	No	N/A
Eurasian stone-curlew (<i>Burhinus oedicnemus</i>)	Positive	No	N/A
White stork (<i>Ciconia ciconia</i>)	Positive	No	N/A
Common buzzard (<i>Buteo buteo</i>)	Positive	Yes	Type II
Common buzzard (<i>Buteo buteo</i>)	Positive	No	N/A
Great cormorant (<i>Phalacrocorax carbo</i>)	Positive	Yes	Type II
Common buzzard (<i>Buteo buteo</i>)	Positive	No	N/A
Common buzzard (<i>Buteo buteo</i>)	Positive	No	Type III
Barn owl (<i>Tyto alba</i>)	Positive	Yes	Type II



Conclusion

- The results of the present study revealed
 - The presence of *Toxoplasma* infection in some birds of prey for the first time in Turkey
 - Toxoplasmosis has high prevalence among birds of prey in Aegean region
 - Wild birds can definitely carry these strains to other parts of the world by migration
 - Migratory birds can be source of the genotypes detected in Turkey

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