

«ECHINOCOCCOSI»:

L'IMPATTO SANITARIO dell' ECHINOCOCCOSI CISTICA ed ALVEOLARE in EUROPA



Adriano Casulli (adriano.casulli@iss.it)



WHO Collaborating Centre for the
Epidemiology, Detection and Control
of Cystic and Alveolar Echinococcosis



DEPARTMENT
INFECTIOUS DISEASES



European Union Reference
Laboratory for Parasites

EDITORIAL

New global targets for NTDs in the WHO roadmap 2021–2030

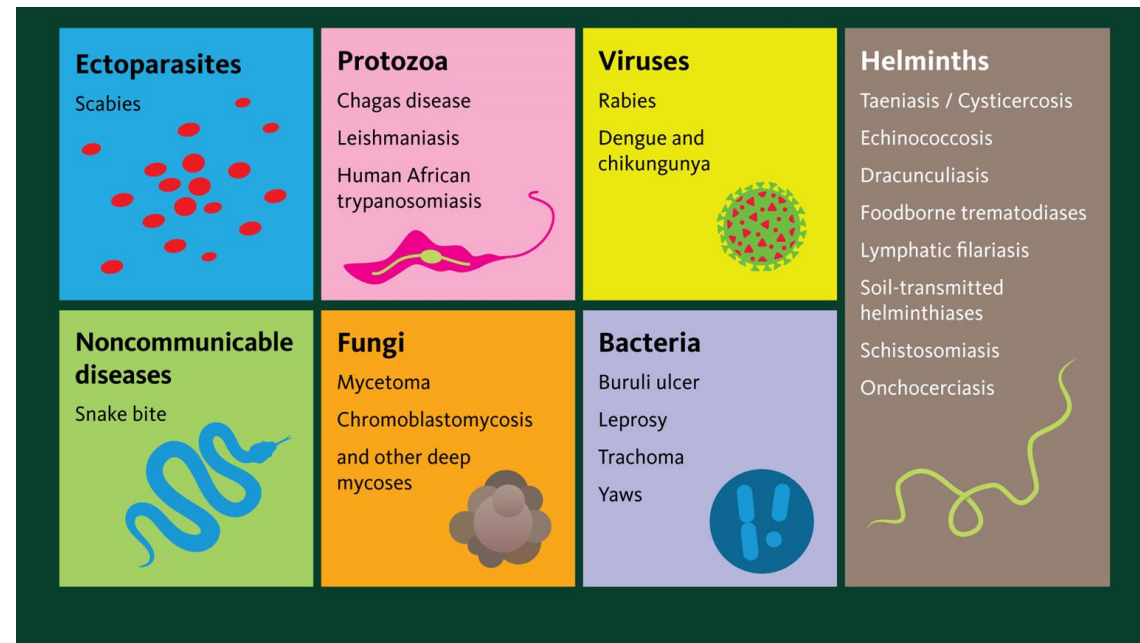
Adriano Casulli^{1,2*}

According to the WHO criteria for classification, NTDs are diseases that:

- Disproportionately affect **poor and marginalized populations**: important morbidity and mortality (justifying global response);
- Mainly affect (but are not limited to) **communities living in tropical and subtropical areas**;
- **Can be prevented and controlled** by public health interventions;
- Are (relatively) **neglected by scientific research & public/private funding** (compared to the magnitude of the health problem).

WHO focuses on a diverse group of 20 disease groups:

- (lyssa- & arbo-) **virus**
- **bacteria**
- **fungi**
- **parasites** (protozoa and helminths)
- **toxins** (snake bite envenoming)

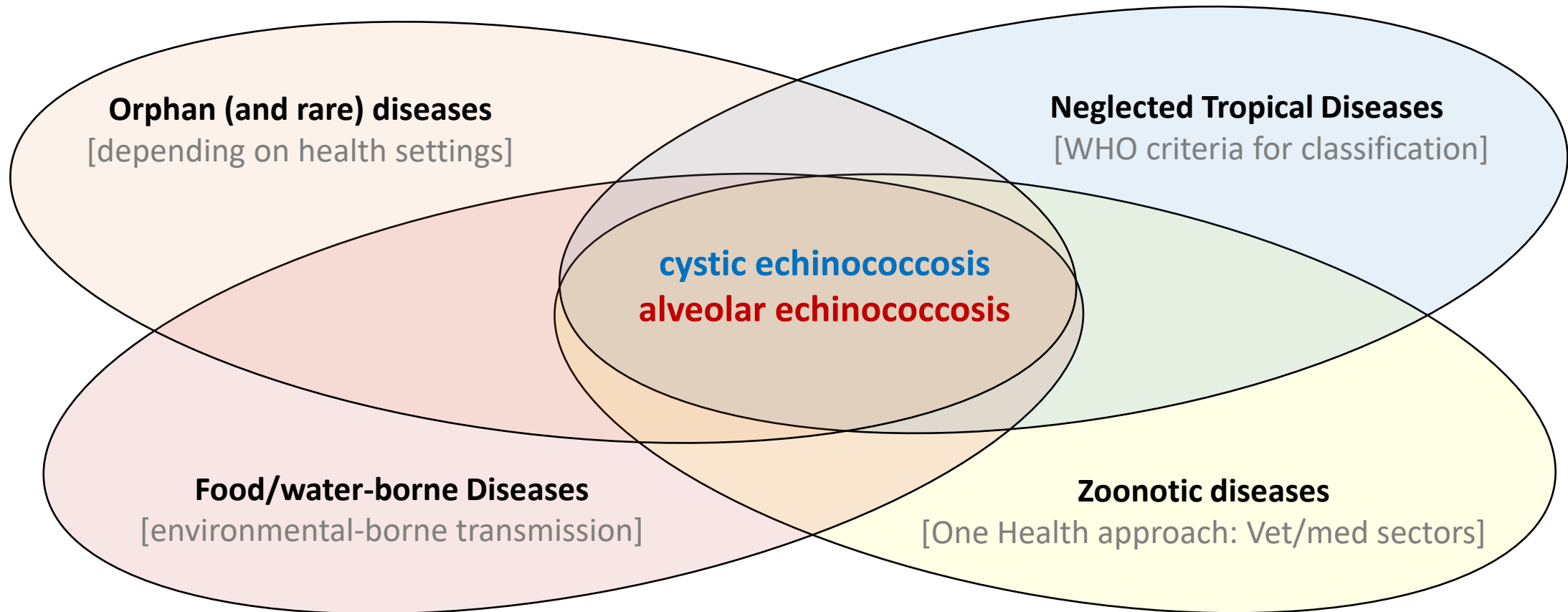
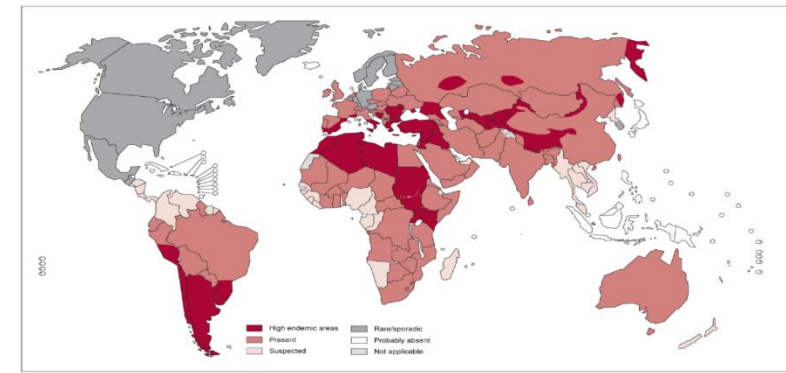




Comment

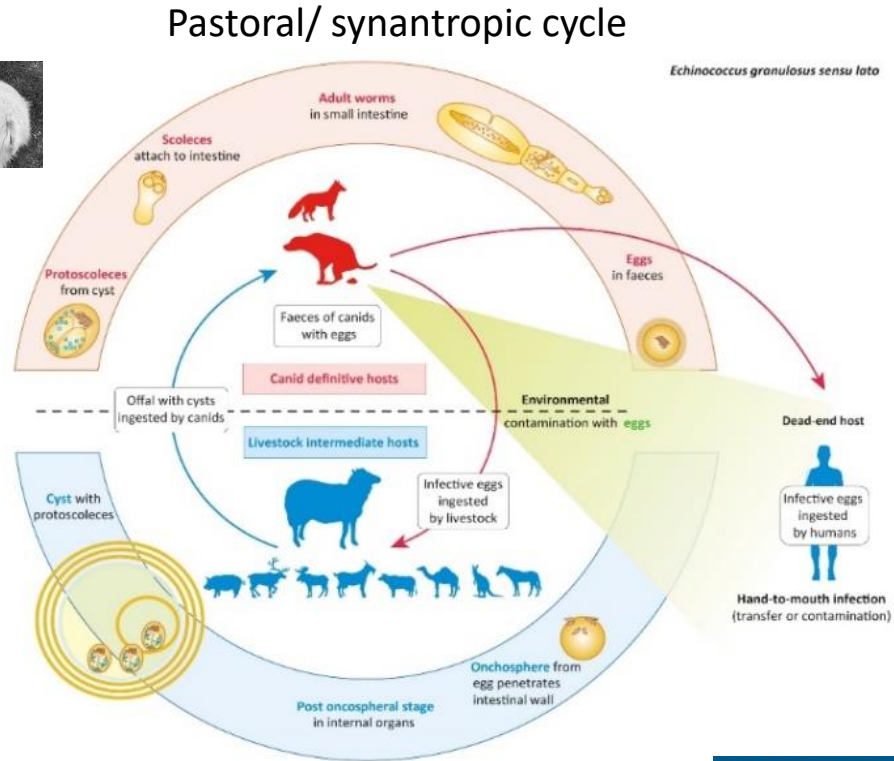
Recognising the substantial burden of neglected pandemics cystic and alveolar echinococcosis

Adriano Casulli 



CASE DEFINITION in Europe = ECHINOCOCCOSIS

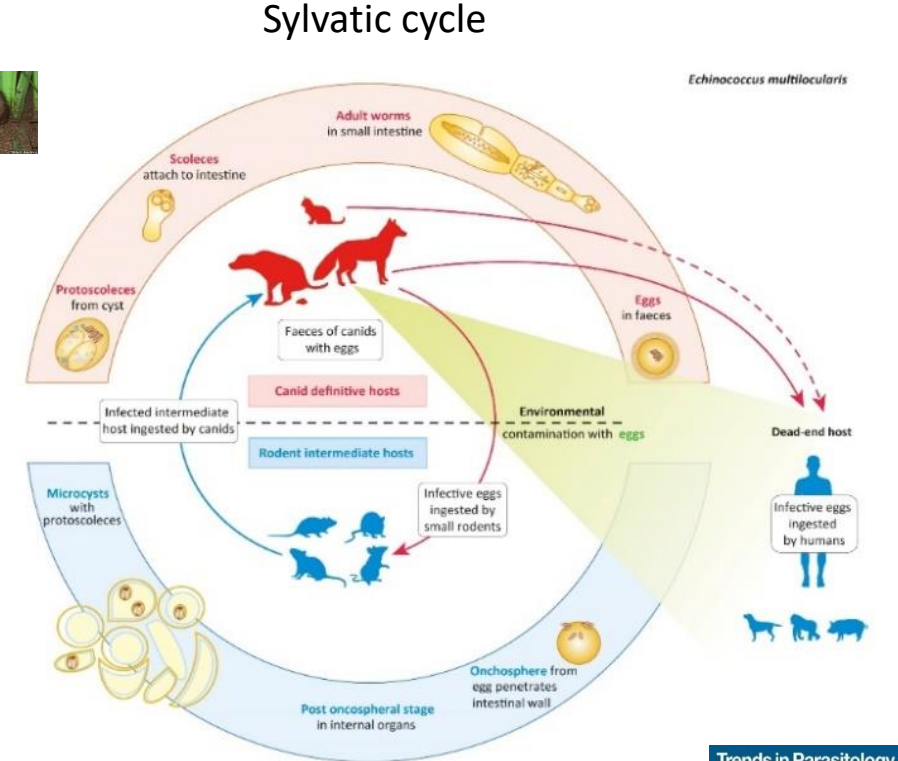
CYSTIC ECHINOCOCCOSIS: *Echinococcus granulosus sensu lato*



Casulli et al. *Trends Parasitol.* 2019;35(8):663-664

Trends in Parasitology

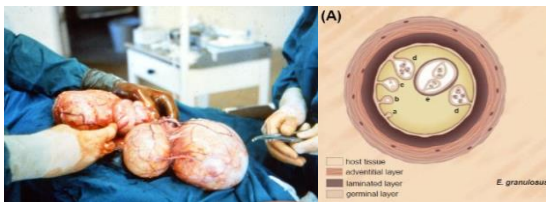
ALVEOLAR ECHINOCOCCOSIS: *Echinococcus multilocularis*



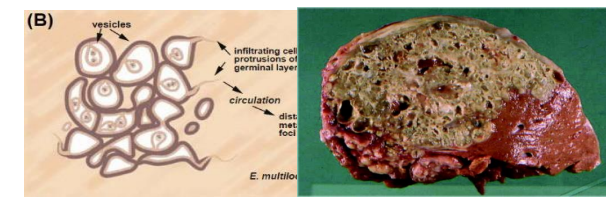
Casulli et al. *Trends Parasitol.* 2019;35(9):738-739

Trends in Parasitology

Generally disabling and proteiform disease
(anatomically isolated cysts)

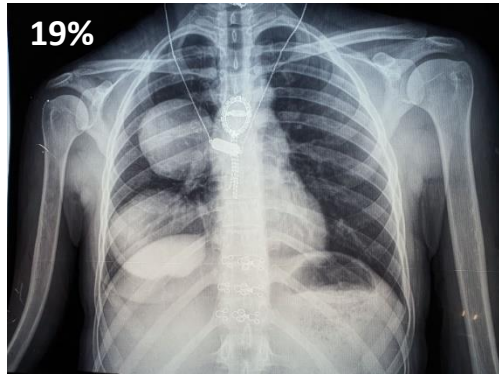


Disease with a high mortality rate
(infiltrative parasitic vesicles that mimics a malignant tumor with metastases)

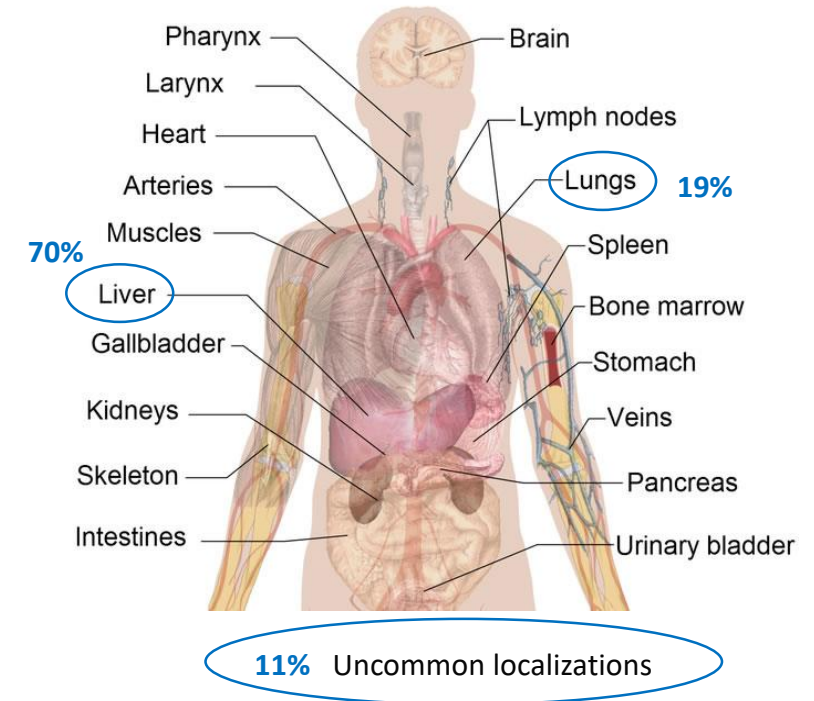
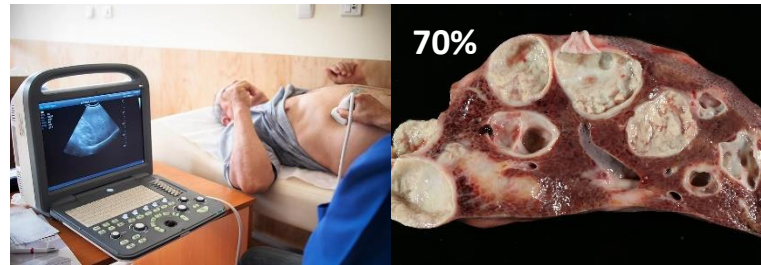
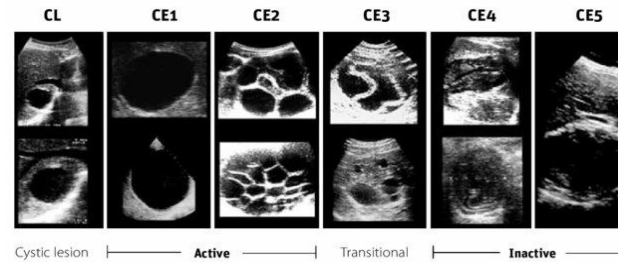


Hints on DIAGNOSIS of CE

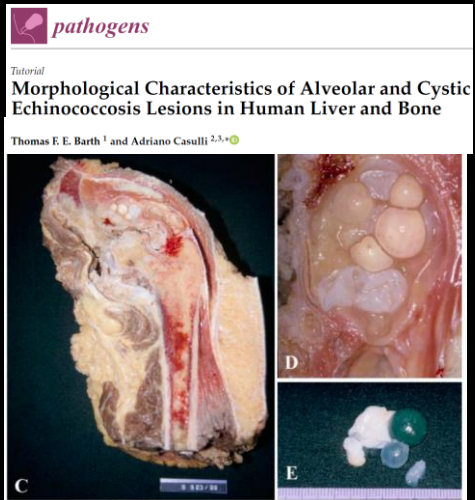
- **Imaging** (US>MRI>CT): gold standard
- **Serology**: Only supportive of imaging
- **Microscopy/histopathology/DNA**: Confirmation



WHO IWGE classification (liver)



Bone CE

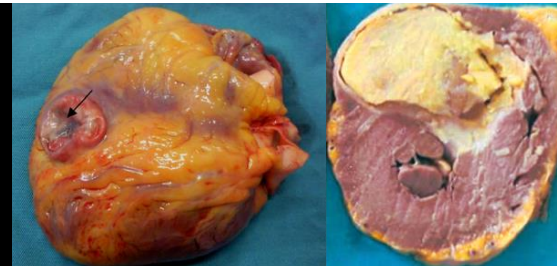


11%

Heart CE

REVISED Case Report: Sudden death related to unrecognized cardiac hydatid cyst [version 3; peer review: 2 approved]

Med Amin Mesrati¹, Yosra Mahjoub¹, Nouha Ben Abdejilil¹, Marwa Boussaid¹, Meriem Belhaj¹, Hiba Limem¹, Ali Chadly¹, Abdelfeteh Zakhama², Abir Aissaoui¹



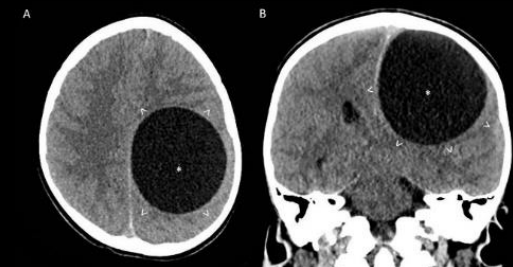
Cerebral CE

PLOS NEGLECTED TROPICAL DISEASES

RESEARCH ARTICLE

Primary cerebral cystic echinococcosis in a child from Roman countryside: Source attribution and scoping review of cases from the literature

Adriano Casulli^{1,2*}, Stefania Pane³, Franco Randi⁴, Paola Scaramozzino⁵, Andrea Carvelli⁶, Carlo Eflisio Marras⁷, Andrea Carai⁸, Azurra Santoro^{1,2}, Federica Santolamazza^{1,2}, Francesca Tamarozzi⁵, Lorenza Putignani⁷



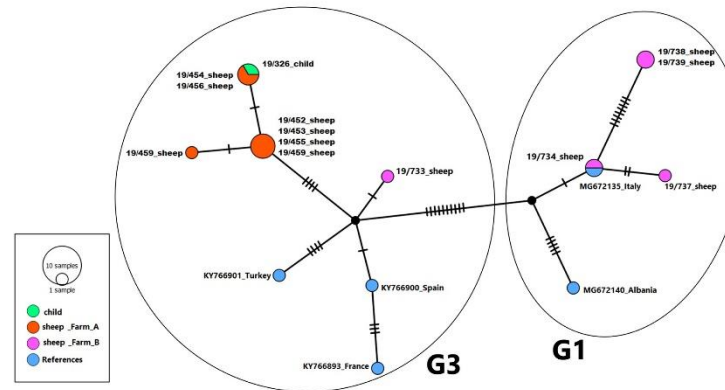
RESEARCH ARTICLE

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SOURCE ATTRIBUTION:

- Comparative molecular analysis: the infection was caused by *E. granulosus* s.s. (G3)
- Infection most likely **acquired in the family farm**

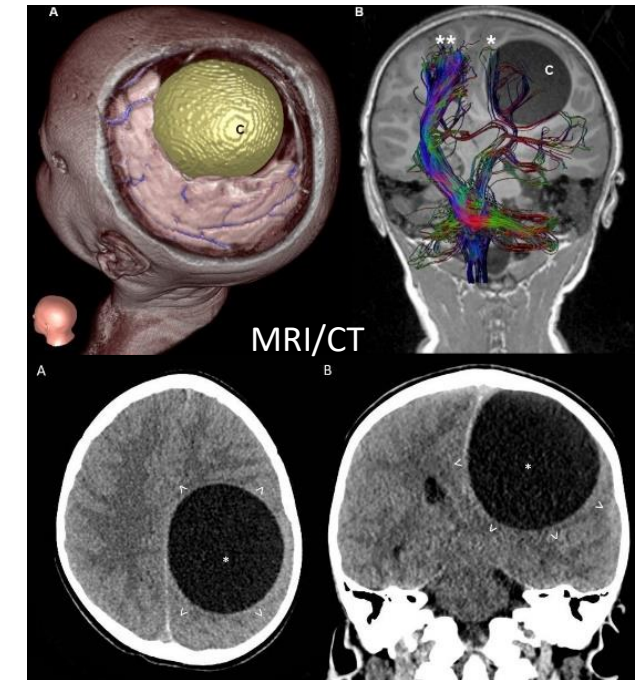


Haplotype network. Concatenated seqs of the mit genes

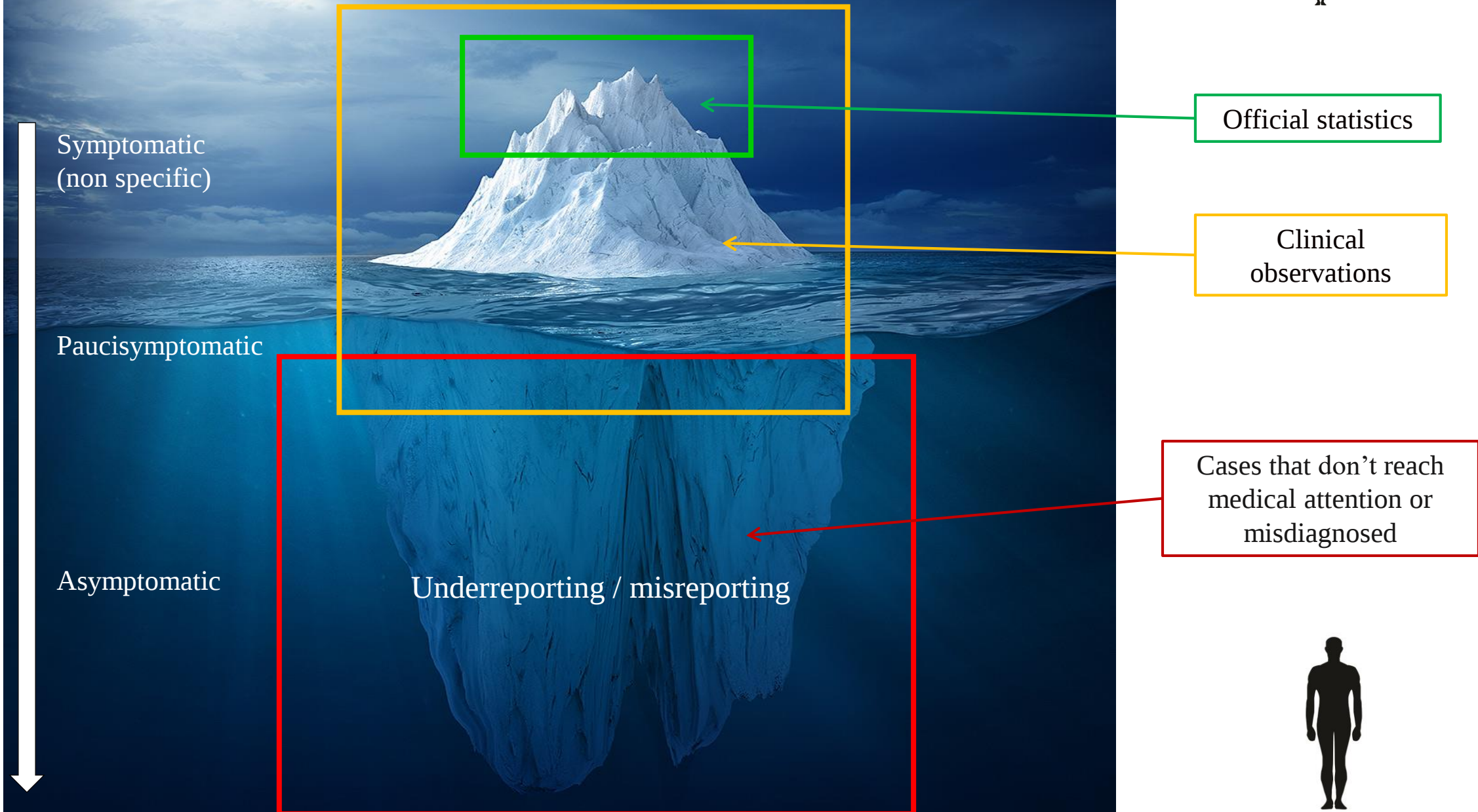
SCOPING REVIEW (2,238 cases of CCE):

- 80.51% primary CCE
- 84.07% single CCE cysts
- Mean age 20 years (70.46% children)
- Recurrence post-treatment: 9.61%
- Permanent disability: 7.86%
- Death: 6.21%

Cerebral CE represents **1.5%** of all CE cases



Unveiling the public health impact of CE and AE



Symptomatic
(non specific)

Paucisymptomatic

Asymptomatic

Underreporting / misreporting

Official statistics

Clinical
observations

Cases that don't reach
medical attention or
misdiagnosed

Official statistics

The image shows a large iceberg floating in the ocean. The tip of the iceberg, which is visible above the water, is highlighted by a green rectangular box. The much larger part of the iceberg is submerged below the water surface. The text 'Official statistics' is written in white at the bottom of the image, suggesting that the visible tip represents the official statistics, while the submerged part represents the hidden reality.

SCIENTIFIC REPORT



APPROVED: 11 November 2022

doi: 10.2903/j.efsa.2022.7666

The European Union One Health 2021 Zoonoses Report

European Food Safety Authority
European Centre for Disease Prevention and Control

Average of **701** **echinococcosis** (2017-2021):

≈ 361 CE cases

≈ 146 AE cases

Country	National coverage ^(a)	Data format ^(a)	2021		2020		2019		2018		2017	
			Confirmed cases and rates		Confirmed cases and rates		Confirmed cases and rates		Confirmed cases and rates		Confirmed cases and rates	
			Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Austria	Y	C	42	0.47	34	0.38	36	0.41	46	0.52	50	0.57
Belgium	Y	C	18	0.16	19	0.16	22	0.19	15	0.13	13	0.11
Bulgaria	Y	A	89	1.29	95	1.37	193	2.76	206	2.92	218	3.07
Croatia	Y	C	3	0.07	3	0.07	3	0.07	4	0.10	15	0.36
Cyprus	Y	C	0	0	1	0.11	0	0	0	0	0	0
Czechia	Y	C	1	0.01	4	0.04	1	0.01	4	0.04	1	0.01
Denmark ^(b)	–	–	–	–	–	–	–	–	–	–	–	–
Estonia	Y	C	4	0.30	1	0.08	2	0.15	0	0	1	0.08
Finland ^(c)	Y	C	6	0.11	4	0.07	8	0.14	1	0.02	5	0.09
France	Y	C	75	0.11	53	0.08	45	0.07	62	0.09	53	0.08
Germany	Y	C	152	0.18	170	0.20	150	0.18	176	0.21	141	0.17
Greece	Y	C	4	0.04	7	0.07	7	0.07	11	0.10	15	0.14
Hungary	Y	C	7	0.07	4	0.04	10	0.10	9	0.09	14	0.14
Ireland ^(c)	Y	C	1	0.02	0	0	0	0	2	0.04	0	0
Italy ^(b)	–	–	–	–	–	–	–	–	–	–	–	–
Latvia	Y	C	6	0.32	5	0.26	6	0.31	10	0.52	6	0.31
Lithuania	Y	C	20	0.72	37	1.32	81	2.90	50	1.78	53	1.86
Luxembourg	Y	C	1	0.16	3	0.48	1	0.16	0	0	2	0.34
Malta ^(c)	Y	C	0	0	0	0	0	0	0	0	0	0
Netherlands	Y	A	0	0	48	0.28	48	0.28	42	0.24	38	0.22
Poland	Y	C	26	0.07	18	0.05	70	0.18	51	0.13	75	0.20
Portugal	Y	C	2	0.02	1	0.01	5	0.05	9	0.09	2	0.02
Romania	Y	C	1	0.01	0	0	1	0.01	4	0.02	14	0.07
Slovakia	Y	C	2	0.04	3	0.05	11	0.20	10	0.18	7	0.13
Slovenia	Y	C	11	0.52	3	0.14	6	0.29	6	0.29	7	0.34
Spain ^(d)	Y	C	33	–	8	–	34	0.07	68	0.15	83	0.18
Sweden	Y	C	25	0.24	23	0.22	26	0.25	29	0.29	34	0.34
EU Total 27			529	0.15	544	0.16	766	0.20	815	0.21	847	0.22
United Kingdom ^(c)	Y	C	–	–	–	–	3	0	–	–	4	0.01
EU Total ^(e)			529	0.15	544	0.16	769	0.17	815	0.21	851	0.19
Iceland	Y	C	0	0	0	0	0	0	0	0	0	0
Norway ^(c)	Y	C	11	0.20	6	0.11	7	0.13	7	0.13	6	0.11
Liechtenstein ^(b)	–	–	–	–	–	–	–	–	–	–	–	–
Switzerland ^(b)	–	–	–	–								



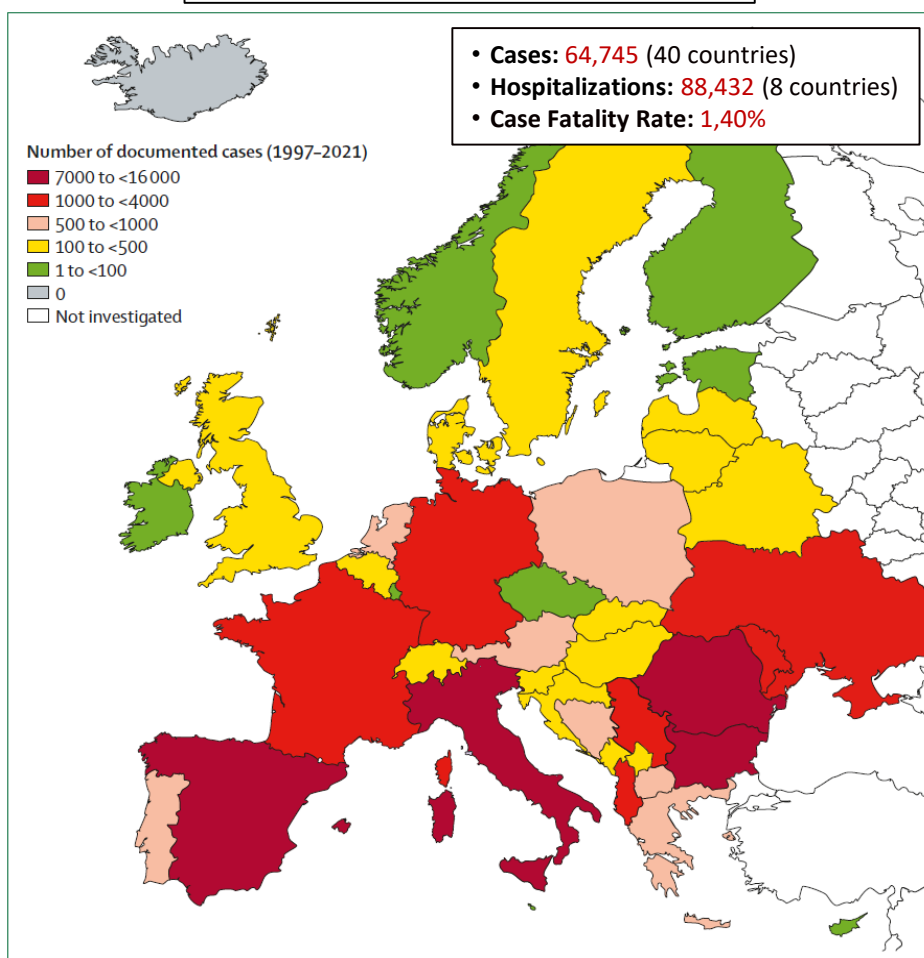
Unveiling the incidences and trends of the neglected zoonosis cystic echinococcosis in Europe: a systematic review from the MEmE project

Adriano Casulli, Bernadette Abela-Ridder, Daniele Petrone, Massimo Fabiani, Branko Bobić, David Carmena, Barbara Šoba, Enver Zerem, Maria João Gargaté, Gordana Kuzmanovska, Cristian Calomfirescu, Iskra Rainova, Smaragda Sotiraki, Vera Lungu, Balázs Dezsényi, Zaida Herrador, Jacek Karamon, Pavlo Maksimov, Antti Oksanen, Laurence Millon, Mario Sviben, Renata Shkjezi, Valbona Gjoni, Ilir Akshija, Urmas Saarna, Paul Torgerson, Viliam Šnábel, Daniela Antolová, Damir Muhovic, Hasan Besim, Fanny Chereau, Moncef Belhassen García, François Chappuis, Severin Gloor, Marcel Stoeckle, Beat Mühlhaupt, Valerio Manno, Azzurra Santoro*, Federica Santolamazza*



- Quantitative research that aims to **decrease the limits of uncertainty** on the impact of human CE in Europe
- Data collected from various data sources to generate a **descriptive model** in Europe (1997-2021)

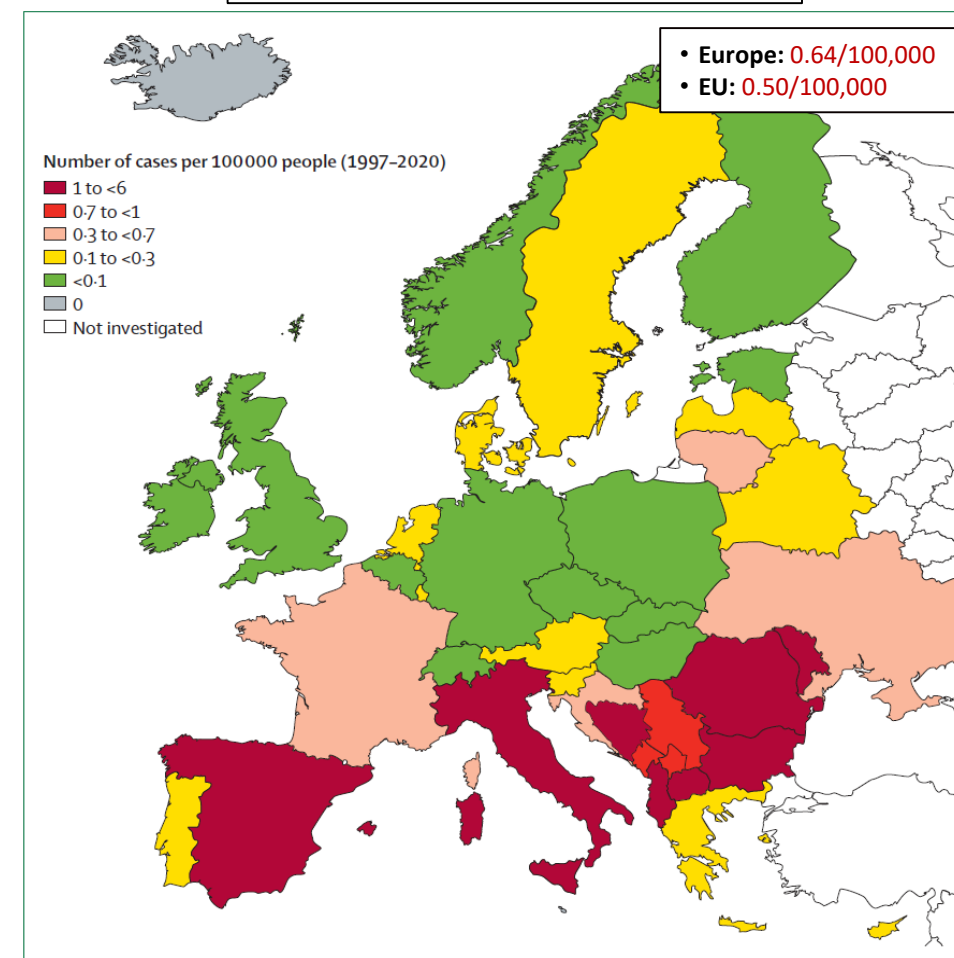
Number of cases (1997-2021)



THE LANCET Infectious Diseases



Annual incidence (1997-2020)



Unveiling the incidences and trends of the neglected zoonosis cystic echinococcosis in Europe: a systematic review from the MEmE project

Adriano Casulli, PhD ✉ • Bernadette Abela-Ridder, DVM • Daniele Petrone, Dstat • Massimo Fabiani, Dstat •

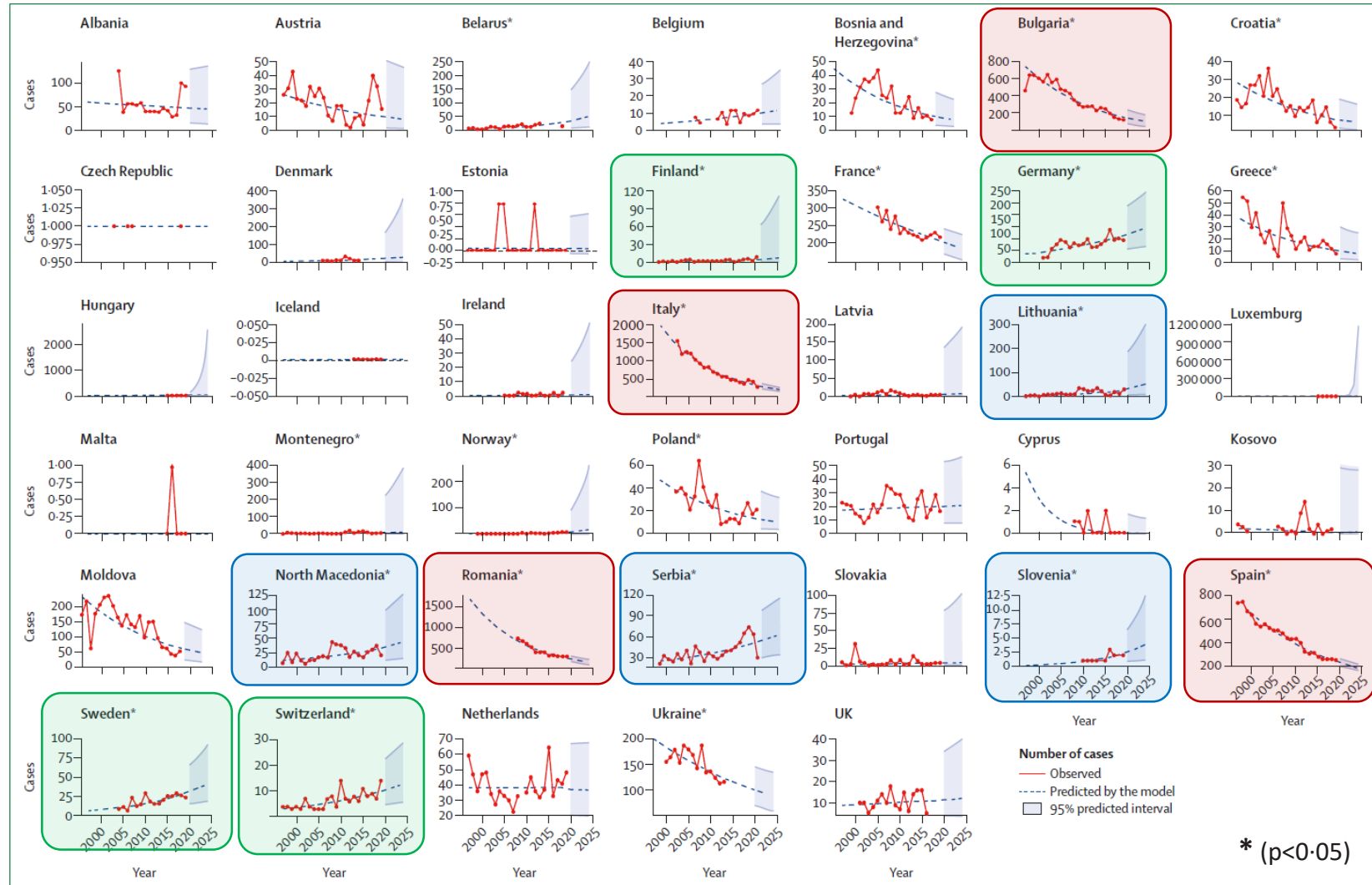
Branko Bobić, PhD • David Carmena, PhD • et al. [Show all authors](#) • [Show footnotes](#)

Published: November 22, 2022 • DOI: [https://doi.org/10.1016/S1473-3099\(22\)00638-7](https://doi.org/10.1016/S1473-3099(22)00638-7)



TIME-TREND ANALYSIS (observed/predicted for 2020-24)

- Estimate for **2023**: **1,756** new CE cases/y in **Europe**
- Estimate for **2023**: **1,361** new CE cases/y in **EU**



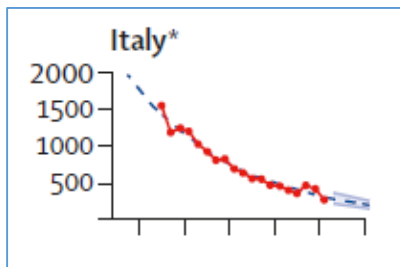


Review
Unveiling the incidences and trends of the neglected zoonosis cystic echinococcosis in Europe: a systematic review from the MEmE project

- **CE remains endemic and neglected** in many regions of Europe
- **Decreasing trends** in endemic areas
- **Increasing trends** in endemic and non-endemic areas
- This study identified a total number of CE cases **four-folds higher** compared to ECDC data (2017-19) (**5,106** vs **1,251**)

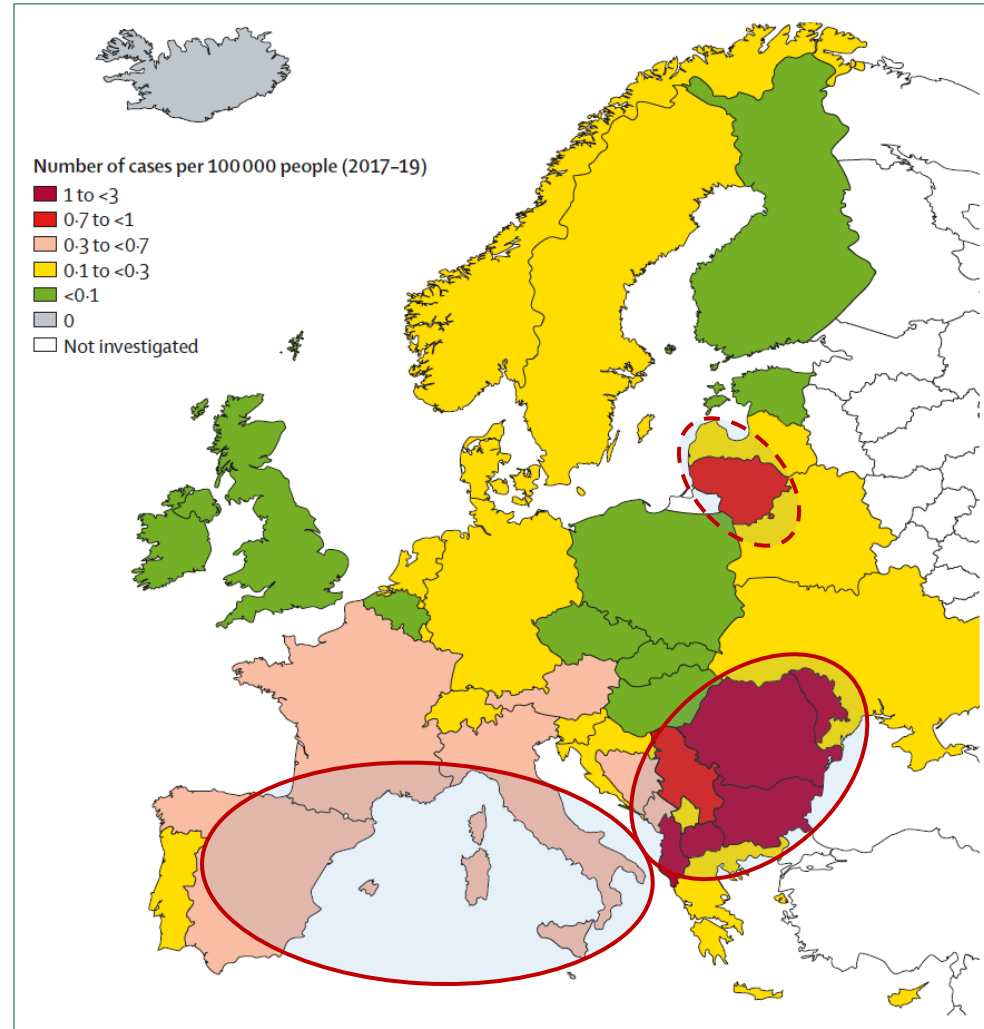
ITALY

- Cases: **15,489** (1997-2021)
- Hospitalizations: **24,651** (1997-2021)
- Deaths: **132** (CFR 0.95%)
- Incidence: **1.21** (2001-20)
- Incidence: **0.64** (2017-19)

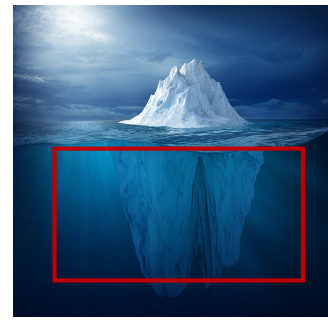


- Based on incidences and trends: **Balkans** should be considered the **current epicentre of CE in Europe**

Annual incidence (2017–19)



HIDDEN BURDEN



Cross-sectional study

- Active search of CE carriers in endemic areas by portable ultrasound machines
(ACTIVE SURVEILLANCE)



- Health education campaigns (population)
- Ultrasound screenings (population)
- Trainings (experts)
- Sampling collection (clinical data)



HEALTH RAPID IMPACT PACKAGE





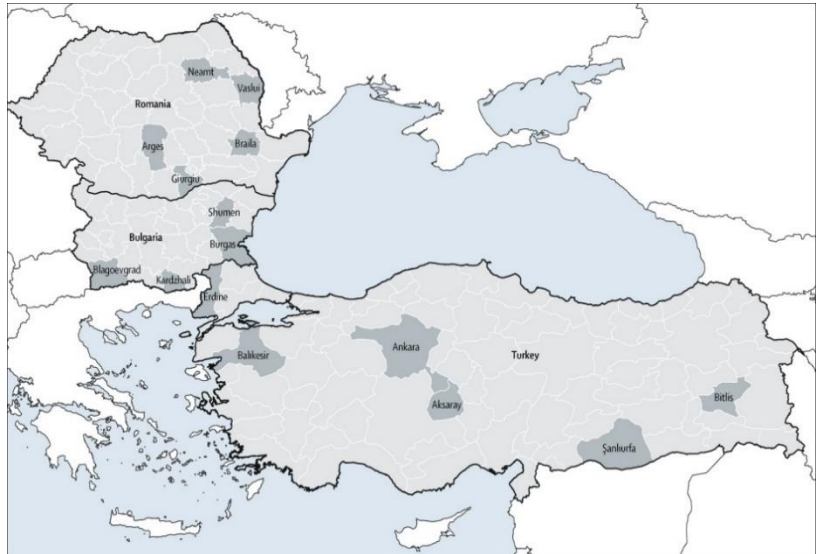
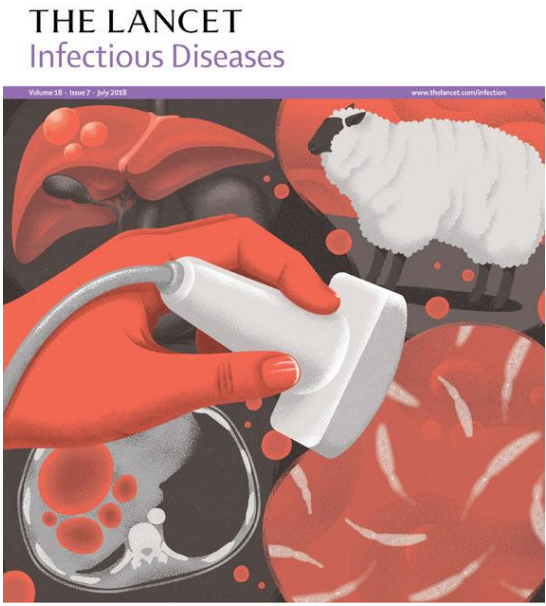
Timing: 2013-2018
Funder: EC (FP7/Helath)
Total cost: 3.784.916,00 €



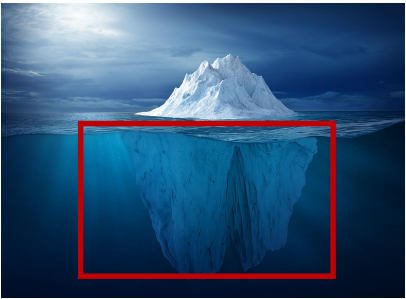
Prevalence of abdominal cystic echinococcosis in rural Bulgaria, Romania, and Turkey: a cross-sectional, ultrasound-based, population study from the HERACLES project

Francesca Tamarozzi*, Okan Akhan*, Carmen Michaela Cretu*, Kamenna Vutova*, Devrim Akinci, Rossitza Chipeva, Turkmen Ciftci, Corina Manuela Constantin, Massimo Fabiani, Branimir Golemanov, Denisa Janta, Patricia Mihailescu, Marin Muhtarov, Serra Orsten, Marius Petrutescu, Patrizio Pezzotti, Alexandru Cosmin Popa, Loredana Gabriela Popa, Mircea Ioan Popa, Valeri Velez, Mar Siles-Lucas, Enrico Brunetti, Adriano Casulli

- First *original research* ever published by THE LANCET Inf Dis
- Biggest ultrasound population-based survey (research-based) (2015-16)



Abdominal US screenings on **24,693** people (in **50** villages and **15** districts/provinces) of Bulgaria, Romania, and Turkey.



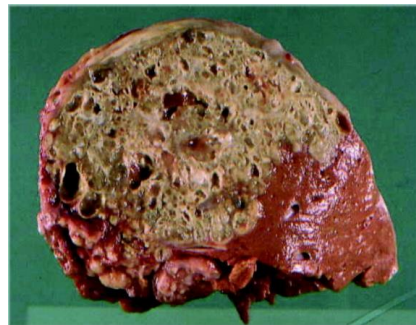
Estimate of **number of individuals** with (abdominal) CE (in the rural population)

	BULGARIA	ROMANIA	TURKEY
Standardized prevalence:	0.41%	0.41%	0.59%
N individuals infected:	7,872 (5,520 - 11,220)	37,229 (23,405 - 59,166)	106,237 (33,829 - 330,751)

Hints on DIAGNOSIS of **ALVEOLAR ECHINOCOCCOSIS**

- Progressive and infiltrative proliferation of parasitic small vesicles (mm) with no clear edge to the lesion mimicking a metastatic tumour.

- Imaging** (US>MRI>CT): gold standard
- Serology**: more reliable
- Microscopy/histopathology/DNA**: Confirmation



WHO IWGE classification

PNM classification

(Parasite mass lesion, Neighbor organs, Metastases)

Stages	I	P1 N0 M0
	II	P2 N0 M0
	IIIa	P3 N0 M0
	IIIb	P1-P3 N1 M0, P4 N0 M0
	IV	P4 N1 M0, any P any N and/or M1



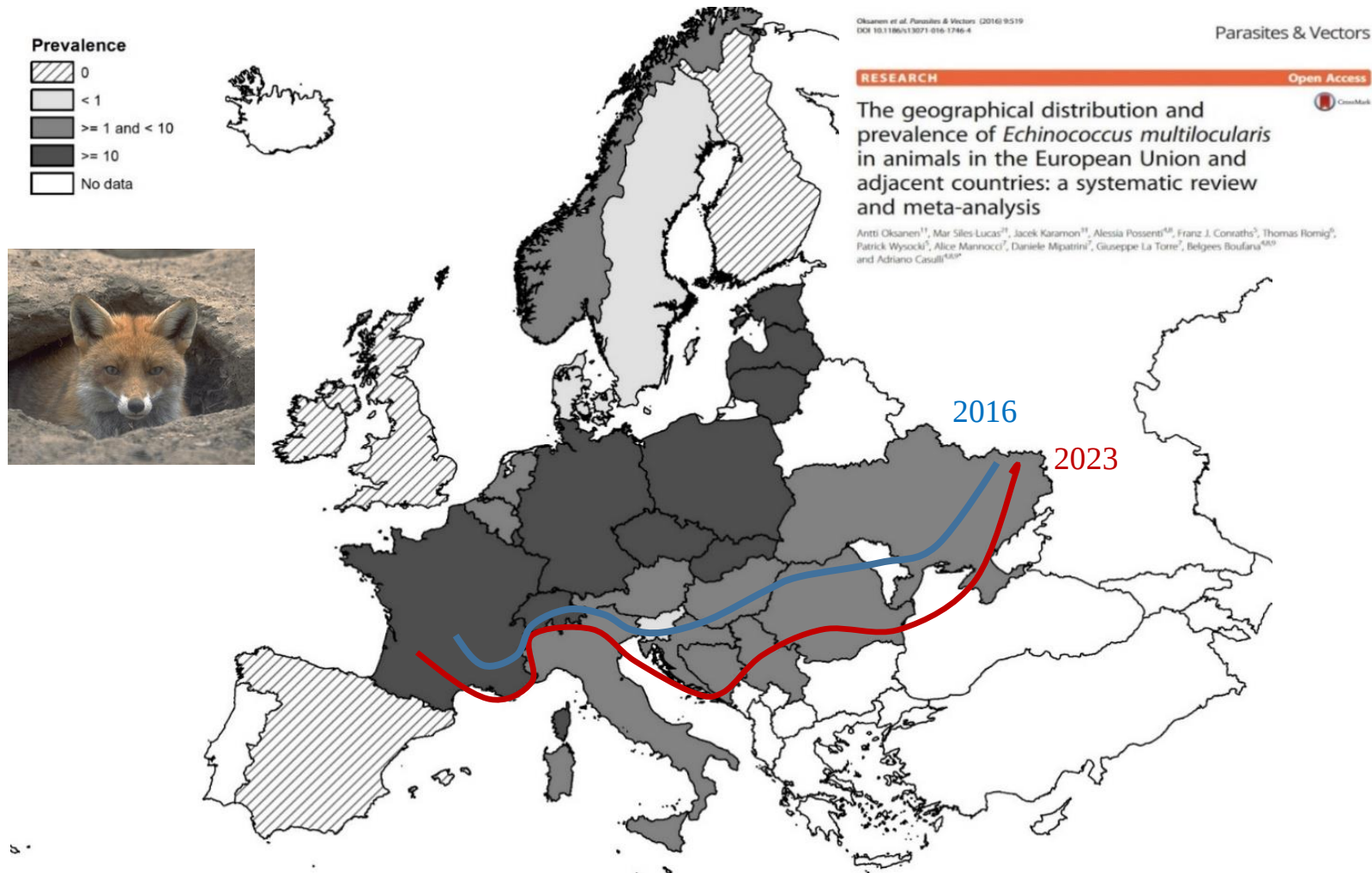
Pitfalls in diagnosis and treatment of alveolar echinococcosis: a sentinel case series

M Stojkovic,¹ C Mickan,¹ TF Weber,² T Junghanss,¹

80 AE patients: 26 (32.5%) wrong treatments based on **misdiagnosis**:

- 12/26 **cystic echinococcosis**
- 5/26 **intrahepatic cholangiocarcinoma**
- 5/26 other malignant tumours
- 3/26 hemangioma
- 1/26 simple cyst

Pooled FOX prevalence of *E. multilocularis* in Europe

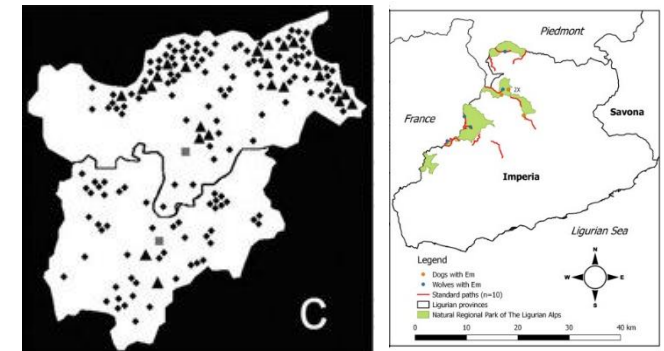


INDEX CASES

- **Croatia** (red foxes, 2015; humans, 2017)
- **Serbia** (red foxes, 2016; humans, 2022)
- **Bosnia and Herzegovina** (red foxes, 2022)

ITALY

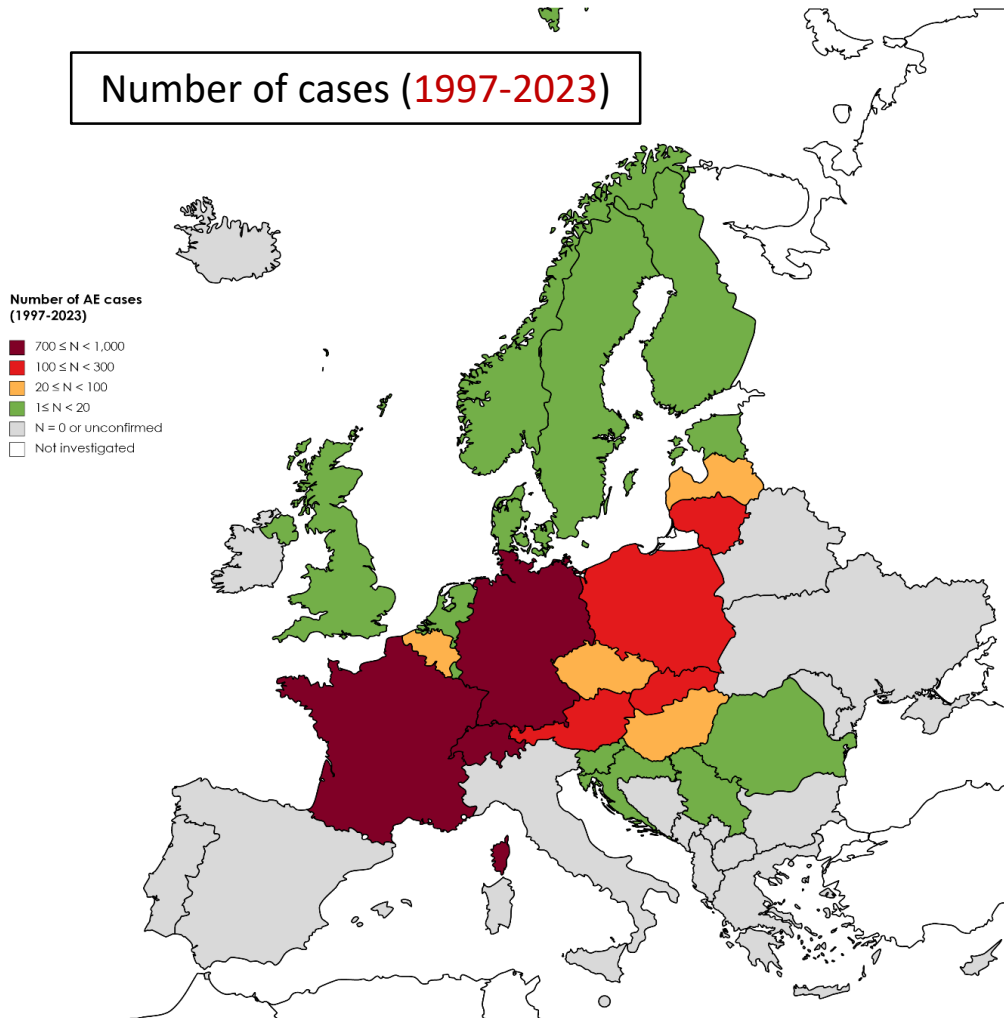
- Trentino-Alto Adige (red foxes, 2000)
- Liguria (wolves and shepherd dogs, 2017)
- Pusteria valley and Tyrol (5 humans, 19th century)



Unveiling the incidence and trends of human **ALVEOLAR ECHINOCOCCOSIS** in Europe (1997-2023)

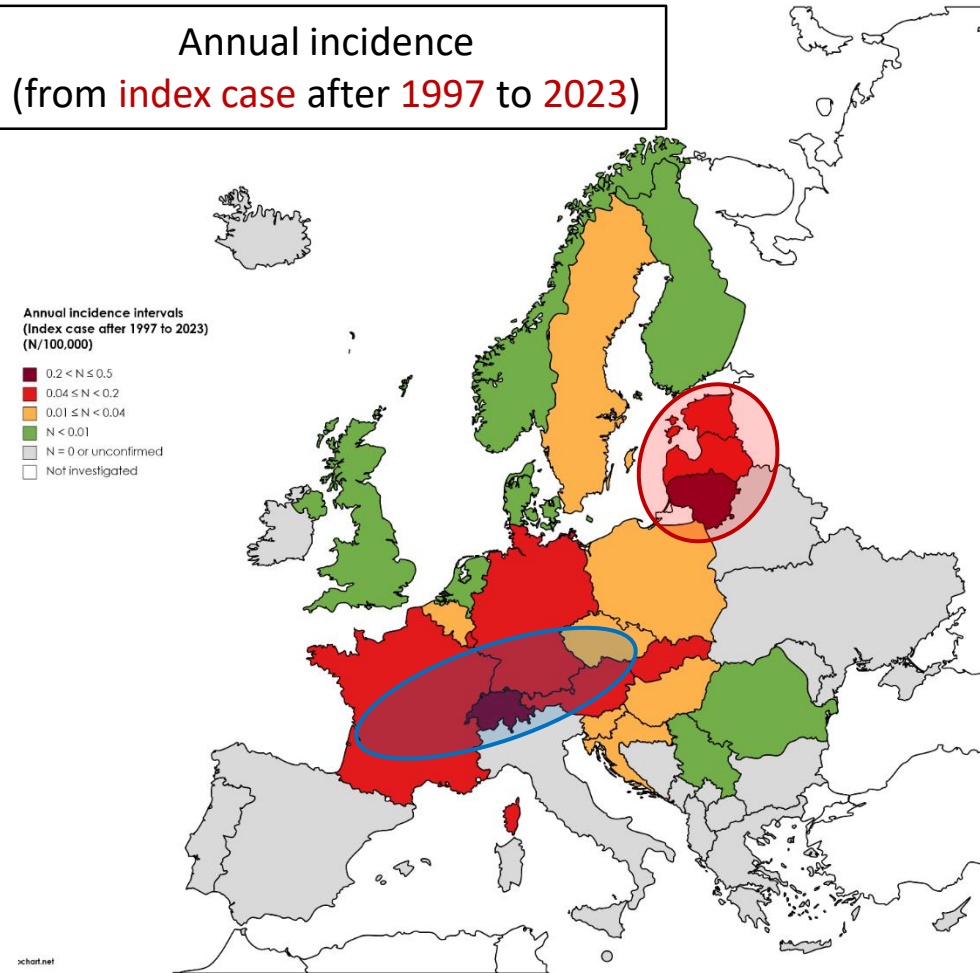


Number of cases (1997-2023)

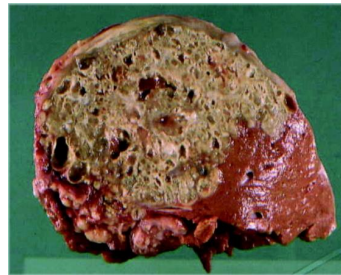


- **3,917** probable/confirmed cases until 2023
- [[Austria](#), [France](#), [Germany](#), [Switzerland](#)]: **70%** of all cases
- Case Fatality Rate (CFR): **9.4%**

Annual incidence
(from **index case** after 1997 to 2023)



- Annual incidence in 23 countries: **0.07/100,000**
- Highest in [Switzerland](#): 0.40/100k; [Lithuania](#) 0.46/100K
- Two major **epicentres**: [Alpine area](#) and [Baltic area](#)
- The ratio of **AE:CE** in Europe: **1:18** (1997-2021)



Thanks for you attention!!



Adriano Casulli (adriano.casulli@iss.it)



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