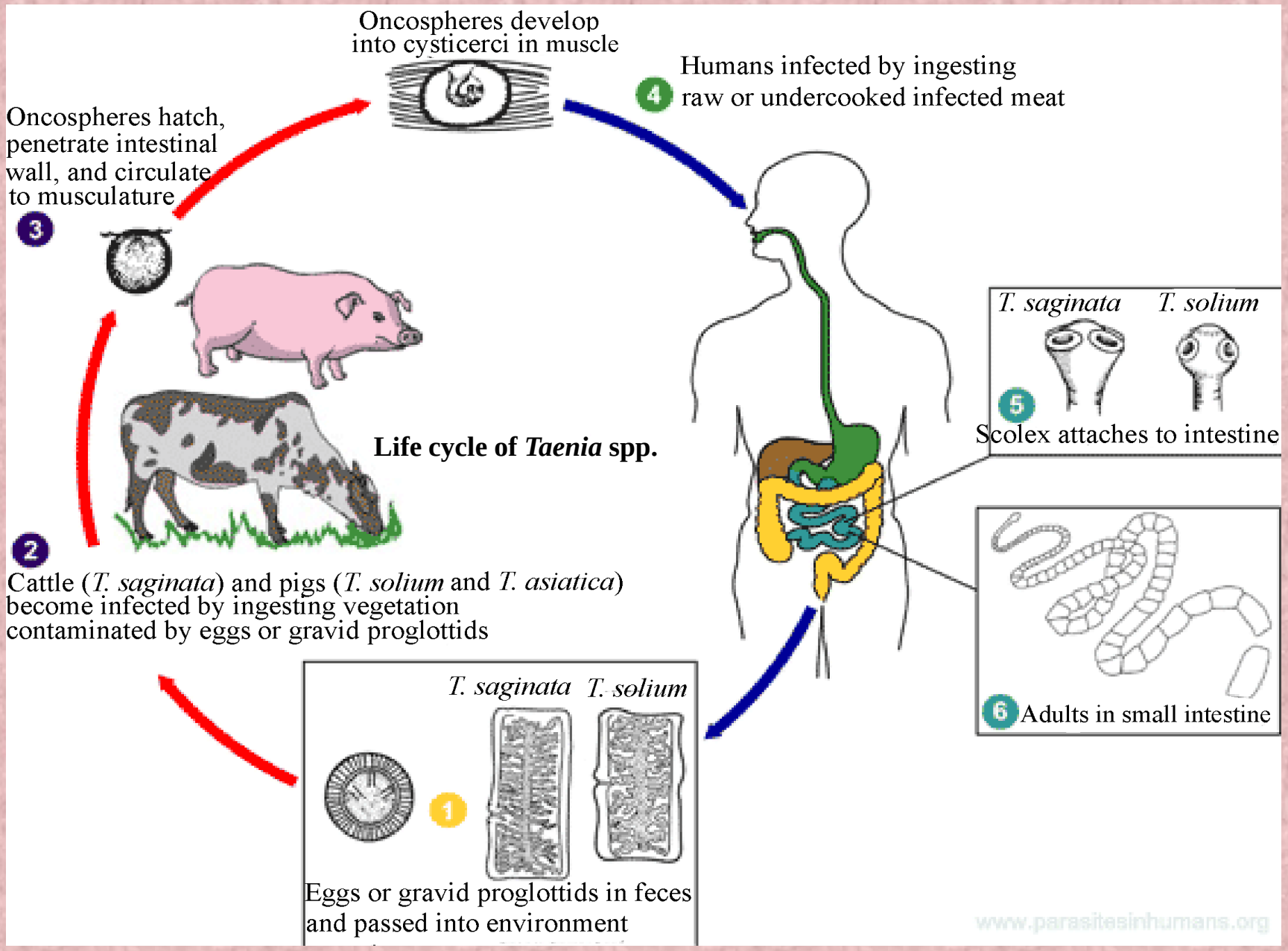
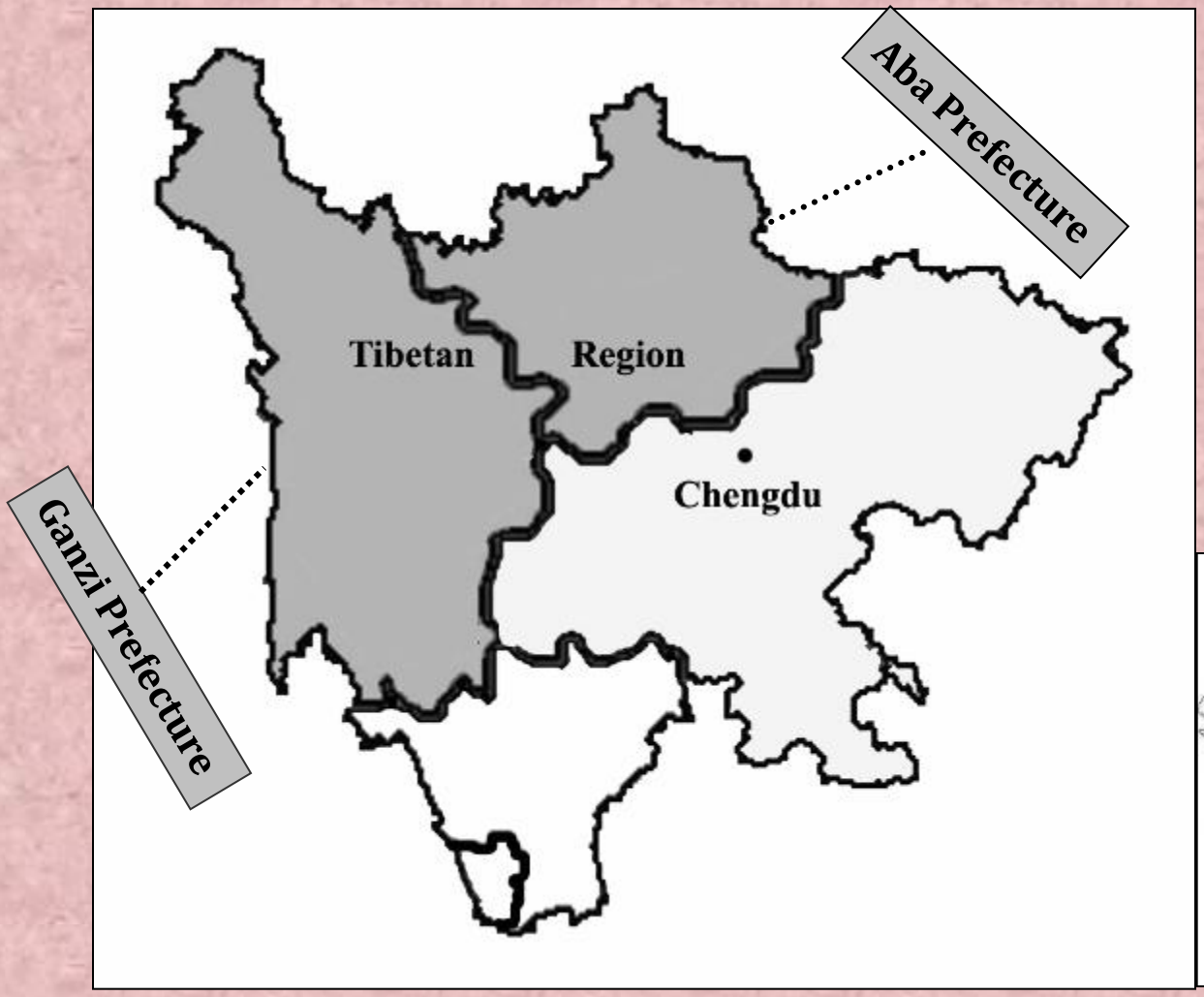
Current status of taeniasis/cysticercosis in Tibetan communities of Sichuan Province, China

Tiaoying Li

Sichuan Centers for Disease Control and Prevention


Oncospheres develop into cysticerci in muscle
Humans infected by ingesting raw or undercooked infected meat
4
Oncospheres hatch, penetrate intestinal wall, and circulate to musculature
3
Life cycle of *Taenia* spp.
T. saginata
T. solium
5
Scolex attaches to intestine
6
Adults in small intestine
2
Cattle (T. saginata) and pigs (T. solium and T. asiatica) become infected by ingesting vegetation contaminated by eggs or gravid proglottids
T. saginata
T. solium
1
Eggs or gravid proglottids in feces and passed into environment
www.parasitesinhumans.org

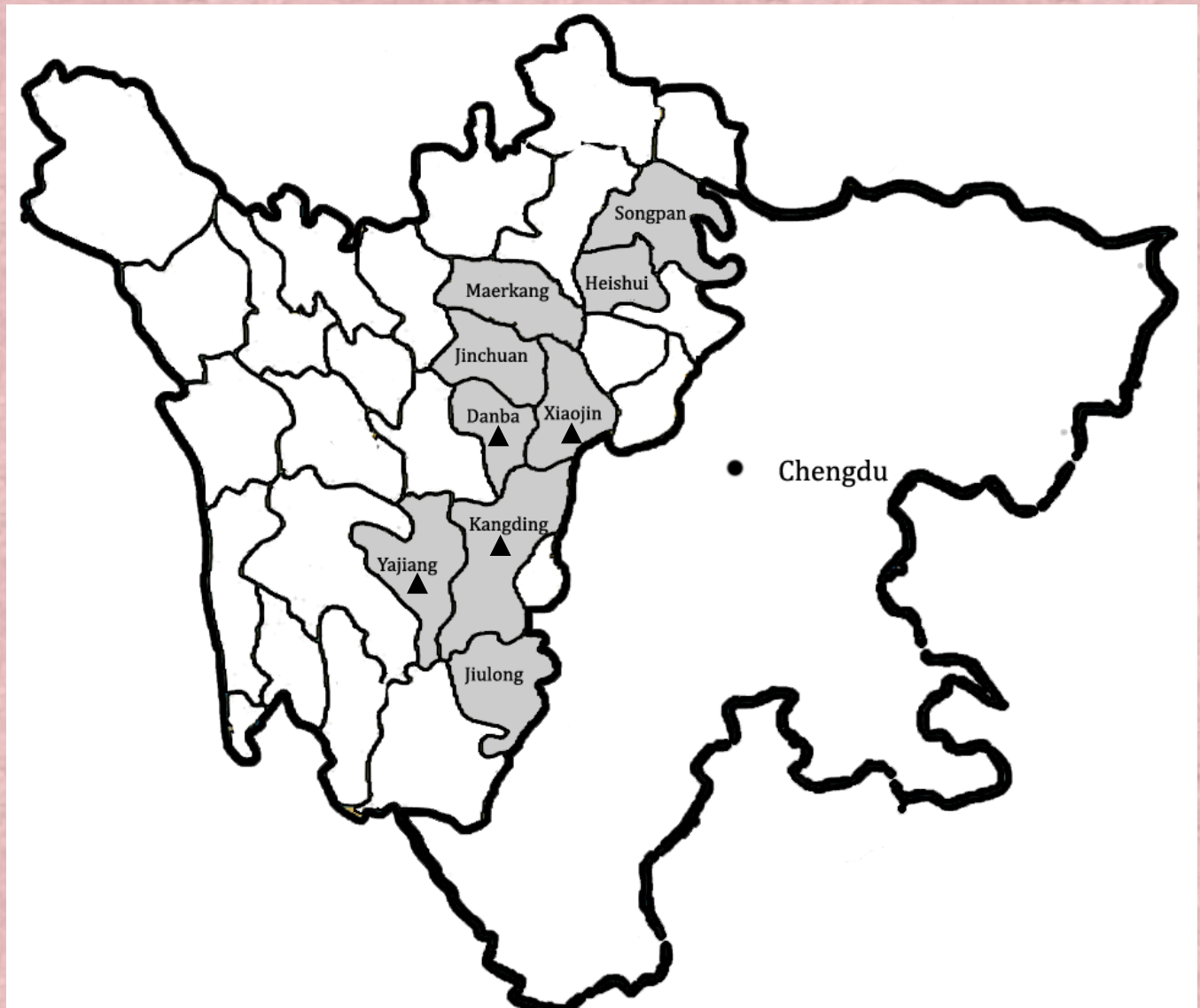
Distribution of Tibetan populations in Sichuan Province



Total population: 2 million

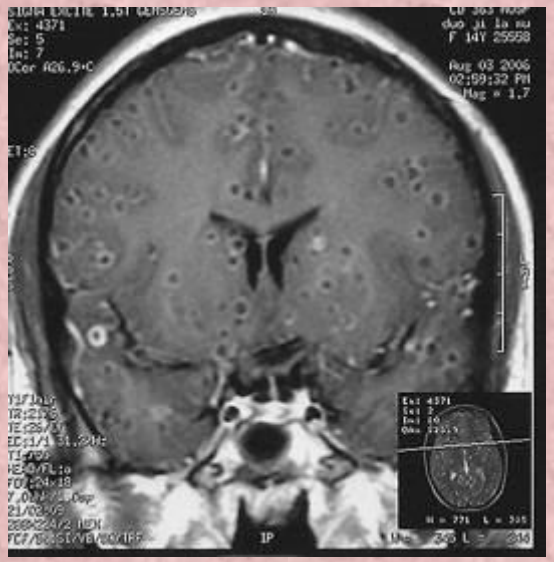
240000 square km

Distribution of confirmed NCC cases in a Chengdu hospital since 2007

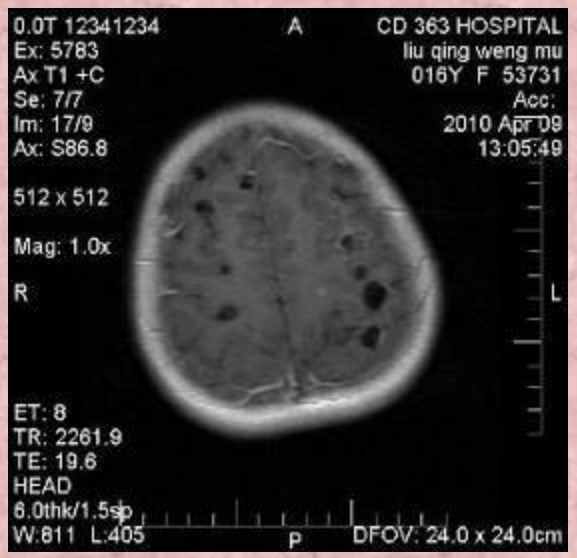


MRI data in some cases with serious NCC infection

Case Ⅰ



Case Ⅱ



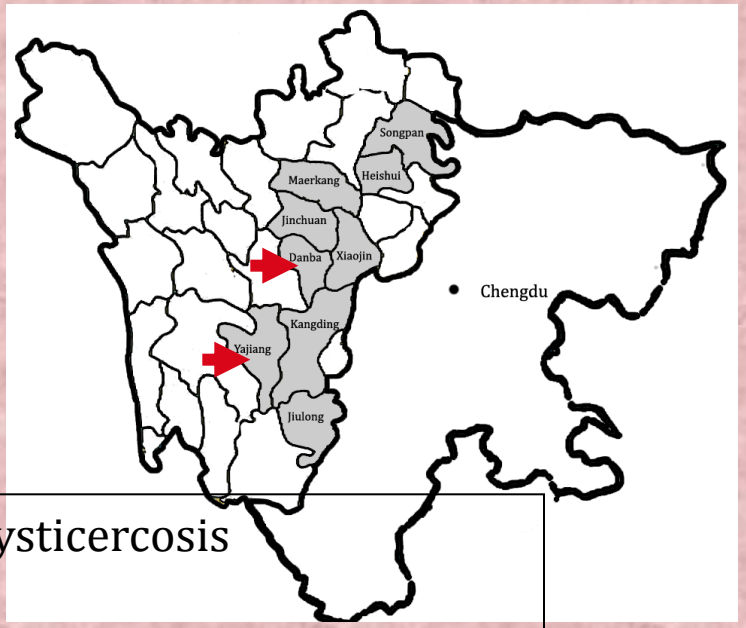
Case Ⅲ

Case Ⅰ: male, 14-year-old, Tibetan, from Kangding, headache with epilepsy seizure diagnosed as NCC in 2008

Case Ⅱ: female, 15-year-old, Tibetan, from Danba, headache diagnosed as NCC in 2007

Case Ⅲ: female, 15-year-old, Tibetan, from Yajiang, headache with blindness diagnosed as NCC in 2010

Human screening programs for taeniasis/cysticercosis in Tibetan farming areas during 2008 to 2012



Objectives

1. To understand the prevalence of taeniasis/cysticercosis in Tibetan populations
2. To undertake the genotyping of *Taenia*
3. To analyze the risk factors for transmission of taeniasis/cysticercosis in this area

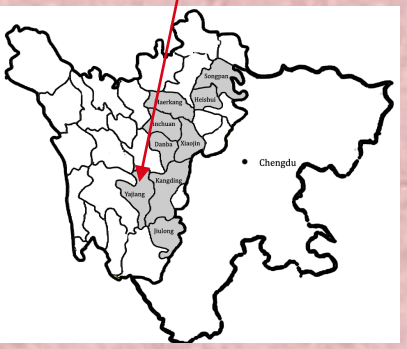
Human screening programs for taeniasis/cysticercosis in Tibetan farming areas during 2008 to 2012

Methods

1. Questionnaire investigations;
2. Fecal examination for presence of *Taenia* eggs by microscopy (three slides for each) and/or coproPCR (*Yamasaki et al., 2004*);
3. Treatment of confirmed/suspected *Taenia* carriers using pumpkin seeds combined with areca nut extract (*Li et al., 2012*);
4. *S*pecies identification of parasite isolates by multiplex PCR (*Yamasaki et al., 2004*);
5. Detection of serum specific IgG antibody against *T. solium* GPs antigen in humans by ELISA (*Ito et al., 1999*).;
6. Criteria for diagnosis of taeniasis: recovery of segments/tapeworms or presence of *Taenia* eggs under microscope.

Results of questionnaire investigation

County	History of proglottids expulsion		Late-onset epilepsy	
	No. examined	**No. positive (%)**	**No. examined**	**No. positive (%)**
Yajiang	679	164 (24.2)	661	66 (10.0)
Danba	812	42 (5.2)	811	14 (1.7)
Total	**1491**	**206 (13.8)**	**1472**	**80 (5.4)**



Infection of *Taenia* spp. in Tibetan populations of Yajiang County

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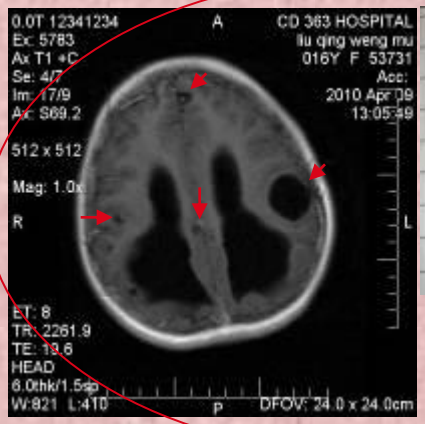
Township	Village	No. examined	No. cases with *Taenia* infection					
			T. solium	*T. saginata*	*T. asiatica*	Dual*	?	Total
Bajiaolou	Wangga	48	1 (2.1)	8	0	0	0	9
	Zhari	48	0	15	0	0	1	16
	Weidi	37	0	7	0	0	0	7
	sub-total	**133**	**1 (0.8)**	**30 (22.6)**	**0 (0.0)**	**0 (0.0)**	**1 (0.8)**	**32 (24.1)**
Malangcuo	Malangcuo	84	4 (4.8)	18	0	2	3	27
	Marihe	92	4 (4.3)	10	0	1	0	15
	Tarihe	56	1 (1.9)	11	0	0	2	14
	Tangzu	73	1 (1.4)	17	1	0	1	20
	sub-total	**305**	**10 (3.3)**	**56 (18.4)**	**1 (0.3)**	**3 (1.0)**	**6 (2.0)**	**76 (24.9)**
Milong	Rangong	24	1 (4.2)	0	0	0	0	1
	Milong	32	3 (9.4)	2	0	0	0	5
	Benzi	47	0	2	0	0	0	2
	Rongba	43	0	6	0	0	0	6
	sub-total	**146**	**4 (2.7)**	**10 (6.8)**	**0 (0)**	**0 (0)**	**0 (0.0)**	**14 (9.6)**
Total		**584**	**15 (2.6)**	**96 (16.4)**	**1 (0.2)**	**3 (0.5)**	**7 (1.2)**	**122 (20.9)**

*both *T. solium* and *T. saginata*

Tapeworms eliminated post-treatment

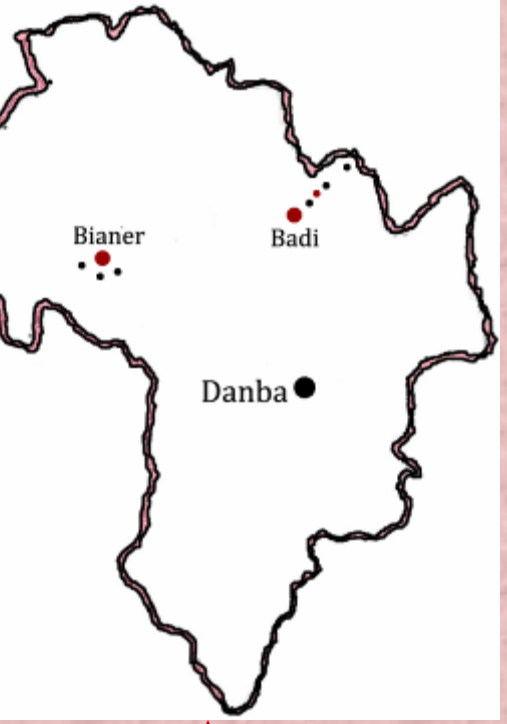
Seroprevalence of cysticercosis in Tibetan populations of Yajiang

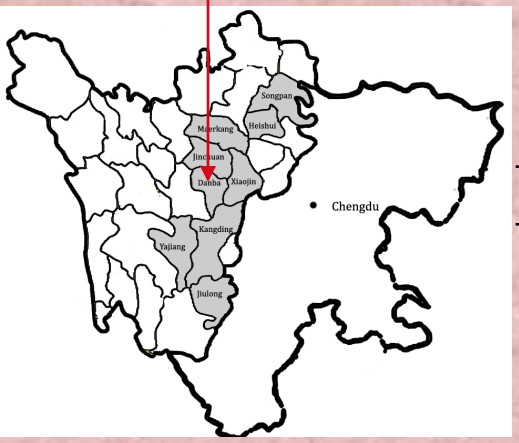


ELISA: strong positive

ELISA: weak positive

Township	Village	ELISA	
		No. examined	No. positive (%)
Bajiaolou	Wangga	53	3 (5.7)
	Zhari	67	1 (1.5)
	Weidi	44	2 (4.5)
	sub-total	**164**	**6 (3.7)**
Malangcuo	Malangcuo	74	2 (2.7)
	Tarihe	51	6(11.8)
	Marihe	76	10 (13.2)
	Tangzu	44	5 (11.4)
	sub-total	**245**	**23 (9.4)**
Milong	Rangong	31	2 (6.5)
	Milong	35	4 (11.4)
	Benzi	34	1 (2.9)
	Rongba	36	4 (11.1)
	sub-total	**136**	**11 (8.1)**
Total		**545**	**40 (7.3)**





Infection of *Taenia* spp. in Tibetan populations of Danba

Township	Village	No. examined	No. cases with *Taenia* infection					
			T. solium	*T. saginata*	*T. asiatica*	Dual	?	Total
Badi	Munan	107	0	1	0	0	0	1
	Daping	78	0	0	0	0	0	0
	Xiaoping	46	1	0	0	0	0	1
	Shenzu	239	0	1	0	0	0	1
	sub-total	**470**	**1 (0.2)**	**2 (0.4)**	**0 (0.0)**	**0 (0.0)**	**0 (0.0)**	**3 (0.6)**
Bianer	Rika	33	0	0	2	0	5	7
	Yake	53	0	0	1	0	0	1
	Dazhai	68	0	1	0	0	0	1
	sub-total	**154**	**0 (0.0)**	**1 (0.6)**	**3 (1.9)**	**0 (0.0)**	**5 (3.2)**	**9 (5.8)**
Total		**624**	**1 (0.2)**	**3 (0.5)**	**3 (0.5)**	**0 (0.0)**	**5 (0.8)**	**12 (1.9)**

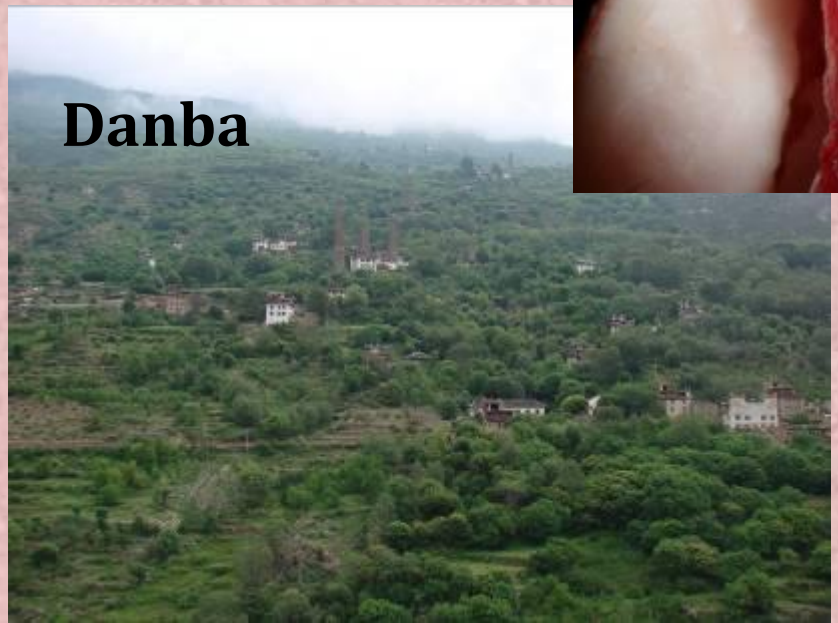
Seroprevalence of cysticercosis in Tibetan populations of Danba County

Township	Village	ELISA	
		No. examined	No. positive (%)
Badi	Munan	124	9 (7.3)
	Daping	90	1 (1.1)
	Xiaoping	64	2 (3.1)
	Shenzu	274	15 (5.5)
	sub-total	**552**	**27(4.9)**
Bianer	Rika	50	5 (10.0)
	Yake	65	1 (1.5)
	Dazhai	93	2 (2.2)
	sub-total	**208**	**8 (3.8)**
Total		**760**	**35 (4.6)**


Yajiang
no latrine


Free roaming pigs


pork with cysticerci


Danba


latrine

Conclusion

- All three species of human *Taenia* (*T. saginata*, *T. solium* and *T. asiatica*) coexist in Tibetan farming communities of Sichuan;

- Both *T. saginata* and *T. solium* are highly transmitted in the study areas, with an overall taeniasis infection rate of 1.9-20.9%;

- A significant occurrence of late-onset epilepsy (1.7-10.0%) and a high seroprevalence of cysticercosis (4.6-7.3%) in local populations indicate neurocysticercosis (NCC), caused by *T. solium,* should be considered as a potential public health concern in this region of Sichuan;

- Risk factors include a high proportion of consumption of raw beef and/or under-cooked beef/pork, the use of free-ranging pigs and yaks, lack of latrine facilities, lack of meat inspection, poor hygiene and poor economy.

Research group members

1. Tiaoying Li, Xingwang Chen, Dongchuan Qiu
   Sichuan Centers for Disease Control and Prevention, Chengdu, PRC;

2. Akira Ito, Tetsuya Yanagida, Nakao Minoru, Yasuhito Sako
   Asahikawa Medical University, Asahikawa, Japan;

3. Munehiro Okamoto
   Kyoto University, Inuyama, Japan

4. Patrick Giraudoux , Francis Raoul
   Université de Franche-Comté, Besancon, France;

5. Changping Long
   Yajiang County Centers for Disease Control and Prevention, Ganzi Prefecture, Sichuan, PRC;

6. Philip S. Craig
   University of Salford, Salford, UK;

7. Ning Xiao
   Chinese Center for Disease Control and Prevention, Shanghai, PRC.

Thanks