

OUTBREAKS OF HUMAN TRICHINELLOSIS CAUSED BY CONSUMPTION OF DOG MEAT IN CHINA

CUI J.* & WANG Z.Q.*

Summary :

Dog meat has become an important source of *Trichinella* infection for humans in China. The first documented outbreak of human trichinellosis resulting from the consumption of dog meat occurred in China in 1974. Until 1999, the outbreaks with this source of infection occurred mostly in Northeast of China (81 cases in five outbreaks in Jilin and two in Liaoning), Beijing (six cases) and Henan provinces (two cases). The epidemiological surveys were performed in nine Provinces or Autonomous Regions of China among 19,662 dogs samples. Dogs trichinellosis prevalence ranged from 7 % in Henan to 39.5 % in Heilongjiang, with an overall prevalence of 21.1 %. Based on random amplified polymorphic DNA fingerprint (RAPD), some dog isolates of Heilongjiang and Jilin provinces were recently identified as *Trichinella nativa*, suggesting that this parasite is widely distributed among dogs in Northeast of China, while *Trichinella spiralis* in swine appears to be a common parasite throughout China. Since the *Trichinella* larvae in dog meat is resistant to freezing, caution should be paid to the consumption of dog meat even if it had been frozen.

KEY WORDS : trichinellosis, *T. spiralis*, *T. nativa*, dog meat, prevalence, China.

Trichinellosis is an important public health problem in China. Since the first patient with trichinellosis was reported in Xizang (Tibet) Autonomous Region (Huang, 1965), many outbreaks and sporadic cases have been reported in this country (Cud *et al.*, 1997; Wang *et al.*, 1997). Only in Yunnan province in Southwest of China, 442 outbreaks of trichinellosis, with 20,334 cases and 217 deaths, were recorded from 1964 to 1999 (Pang *et al.*, 1999). The majority of cases were caused by the ingestion of raw or inadequately cooked pork products (Wang *et al.*, 1998). Therefore, pork are usually examined at abattoirs to detect *Trichinella* larvae. However, outbreaks of trichinellosis associated with eating dog meat have been reported regularly but there is not nationwide epidemiological data about the prevalence of canine trichinellosis. Therefore, in this short report the authors review the epidemiological data of the outbreaks of human trichinellosis associated with dog meat consumption and canine trichinellosis in China. The materials used were the literature published up to date in China.

* Department of Parasitology, Henan Medical University, Zhengzhou 450052, China. Tel: (86) 371-6975190 – E-mail: jingcui@371.net

OUTBREAKS OF TRICHINELLOSIS ASSOCIATED WITH EATING DOG MEAT

The first outbreak of trichinellosis resulting from the consumption of dog meat occurred during November 1974, with nine cases, in Jilin province. Between 1974 and 1999, seven outbreaks related to this source of infection occurred in the Northeast of China (81 cases), but a small outbreak (six cases) also occurred in Beijing in 1987 and Henan (two cases) in 1998 (Table I).

PREVALENCE OF CANINE TRICHINELLOSIS IN CHINA

By direct microscopic examination and/or artificial digestion method, the epidemiological survey on the prevalence of canine trichinellosis was carried out in nine Provinces or Autonomous Regions of China from 1950 to 1998. The prevalence differs with the regions from 0.8 % to 54 %, but globally the infection rate may be as high as 21.3 % in the dogs of these regions (Table II). Dog meats sold at markets showed similar rates of infection. In Kunming city of Yunnan province 102 dog meats were examined for *Trichinella* larvae and four (3.9 %) were infected (Zhang, 1985). The prevalence of canine trichinellosis differs widely in the different areas, even in the same province. The prevalence in Heilongjiang province varies from 9 % to 61.8 %, as determined by microscopical examination of 30 g diaphragm muscle of dog carcasses (Yang *et al.*, 1997; Zhou *et al.*, 1990).

IDENTIFICATION OF *TRICHINELLA* SPECIES FROM DOGS IN NORTHEAST CHINA

Since the *Trichinella* larvae were first found in swine muscle in 1881 in China (Manson, 1881), it has been considered that only *T. spiralis* was the

Outbreak	Year	No. cases	Location	Preparation of dog meat	Reference
1	1974	9	Jilin	Raw	Yuan, 1980
2	1980	9	Jilin	Semi-cooked	An, 1982
3	1981	33	Jilin	Roasted	Hou <i>et al.</i> , 1985
4	1979	8	Liaoning	Semi-cooked	Xu <i>et al.</i> , 1989
5	1987	9	Jilin	Raw and semi-cooked	Jiang <i>et al.</i> , 1989
6	1987	8	Jilin	Scalded	Wei & Song, 1991
7	1987	6	Beijing	Scalded	Wang <i>et al.</i> , 1989
8	1989	5	Liaoning	Raw	Xu <i>et al.</i> , 1989
9	1998	2	Henan	Semi-cooked	Wang <i>et al.</i> , 1998

Table I. – Outbreaks of trichinellosis associated with dog meat consumption in China during 1974-1999.

Location	Year	No. examined	No. infected	(%)	Reference
Liaoning	1950	21	6	28.6	Chin <i>et al.</i> , 1950
	1973	2,705	349	12.9	Zhang, 1983
	1996	101	16	15.8	Chen, pers. comm., 1999
	1997	655	5	0.8	Li <i>et al.</i> , 1997
Jilin	1992	1,375	135	9.8	Wang & Wang, 1992
Heilongjiang	1980	35	19	54.3	Wang, pers. comm., 1999
	1981	6,231	2,792	44.8	Yang <i>et al.</i> , 1997
	1990	137	47	34.3	Zhou <i>et al.</i> , 1990
	1996	950	47	4.9	Liu <i>et al.</i> , 1996
Hebei	1996	4,281	485	11.3	Liu <i>et al.</i> , 1996
Gansu	1960	22	6	27.2	Liu & Yu, 1960
	1996	100	9	9.0	Liu <i>et al.</i> , 1996
Henan	1977	2,136	149	7.0	Deng, 1978
	1983	21	2	9.0	Gong, pers. comm., 1996
Hubei	1998	43	8	18.6	Ye <i>et al.</i> , 1998
Guangxi	1995	9	3	33.3	Meng & Wang, 1995
Yunnan	1979	318	23	7.2	Zheng, pers. comm., 1996
	1991	522	50	9.6	Yang, 1991
Total		19,662	4,151	21.1	

Table II. – Prevalence of canine trichinellosis in nine Provinces or Automomous Regions of China.

aetiological agent of human and swine trichinellosis in China. All isolates of *Trichinella* from domestic swine in China (ISS78, 79, 80, 81, 82, 533, 534, 535) have been identified as *T. spiralis* by allozyme analysis (La Rosa *et al.*, 1992) or RAPD. However, some isolates of *Trichinella* in dogs of Heilongjiang & Jilin (ISS529, 530, 531, 532) were recently identified as *T. nativa* by RAPD (Liu *et al.*, 1997; Xu, Cui *et al.*, 1997; Xu, Liu *et al.*, 1997). Thus, there are at least two species of *Trichinella* in China: *T. spiralis* which appears in pigs and dogs (ISS407), probably in most parts of China and *T. nativa*, which has been found in dogs in the Northeast China and also in cats (ISS532). Unfortunately, no muscle biopsy from the patients during outbreaks caused by dog meat was available, it is still unknown if the implication of both species in human trichinellosis where the source of infection is dog meat.

DISCUSSION

Although canine trichinellosis was firstly reported in the Northeast of China sixty years ago (Yugawa, 1934), outbreaks of human trichinel-

losis related to dog meat consumption were not recorded before the 1970s. The consumption of dog meat (particularly during the winter season) used to be quite rare in China, but increased recently especially among the Chaoxian (Korean) people located in the Northeast of China (Liaoning, Jiling & Heilongjiang), but also among the Han race (the commonest in China). Human trichinellosis caused by eating dog meat is rare in other countries (Kim, 1991). During an outbreak of trichinellosis occurred in 1981 in Petchaboon province of Thailand, 15 dogs were examined, and eight were founded to be infected with *Trichinella*. In the northeastern part of Thailand, a survey showed seven infected dogs out of 421 in a dog meat market in 1981 (Khamboonruang, 1991). However, high rates of *Trichinella* infection have also been detected in wild dogs (prevalence of 18.3 %) or domestic dogs (prevalence of 8.9 %) in Lithuania (Rochiene, 1993) and in sledge dog of Greenland (prevalence of 71 %) (Kapal *et al.*, 1996).

Transmission of canine trichinellosis has several origins. It was speculated that the dogs might acquire the infection mainly by eating discarded infected swine scraps in China and in Thailand. In Greenland, the

dogs become infected by uncooked scraps from hunted polar bear and walrus, but scavenging of other dog carcasses can play an important role in the epidemiology (Kapel *et al.*, 1996).

Trichinella larvae present in dog meat from the Northeast of China was resistant to freezing in most cases. One outbreak of trichinellosis (nine cases) occurred in Jilin in 1987 and was due to dog meat frozen outdoors from -15°C to -22°C for 11-39 days (Jiang *et al.*, 1989). Under laboratory condition, the isolates of *Trichinella* from dogs of Heilongjiang survived at -15°C for 12 months or at -25°C for 16 days, while the isolates of *Trichinella* from swine of Henan (central China) died at -15°C for 12 months or at -25°C within nine days (Xu, Cui *et al.*, 1997). This suggest that *T. nativa* is a predominant species in dogs in the Northeast of China since their main biological characteristic is the resistance to freezing (Pozio & La Rosa, 1991). Consequently, caution should be paid to the consumption of dog meat even if it had been frozen. Sufficient cooking of dog meat appears highly recommended to avoid transmission of trichinellosis to human.

REFERENCES

- AN J.G. Report of an outbreak of trichinosis with nine cases. *Journal of Yianbian Medical College*, 1982, 5 (suppl.), 20.
- CHIN Y.T. *Trichinella* infection in dogs, cats, rats, mice and pigs in Mukien, China. *Peking National History Bulletin*, 1950, 19, 297-300.
- CUI J., WANG Z.Q., WU F. & JIN X.X. Epidemiological and clinical studies on an outbreak of trichinosis in Central China. *Annals of Tropical & Medical Parasitology*, 1997, 91, 481-488.
- DENG Y.C. A survey of *Trichinella* infection of dog meats in Luoyang city. *Henan Journal of Health and Anti-epidemic*, 1978, 1, 38-40.
- HOU H.W., JIN Z.J., SUN J.F., ZHENG M.G., FU D.X., LANG W.Q., MA J.X., WANG M.Y., ZHENG Y.Y., LU S.X. & BI N.S. A survey of an outbreak of trichinosis caused by eating roast dog meat. *Chinese Journal of Preventive Medicine*, 1983, 17, 109-110.
- HUANG F.C. Report of one case of human trichinosis. *Chinese Journal of Internal Medicine*, 1965, 13, 392.
- JIANG H.F., BAI Y.T., WANG J.W., MENG Y.L., GAO F.L., YU J.S. & YANG X.W. Report of nine cases of trichinosis caused by eating dog meat. *Journal of Postgraduates of Medicine*, 1989, 9, 9.
- KAPEL C.M.O., HENRIKSEN S.A. & NANSEN P. Prevalence of *Trichinella nativa* in Greenland according to zoogeography, in: *Trichinellosis*. Ortega-Pierres A., Gamble H.R., van Knapen F. & Wakelin D. (eds). Proceedings of the 9th International Conference on *Trichinellosis*. Centro de Investigacion y Estudios Avanzados del Instituto Politecnico Nacional, Mexico, D.F. Mexico, 1996, 591-597.
- KHAMBOONRUANG C. The present status of trichinellosis in Thailand. *Southeast Asia Journal of Tropical Medicine and Health*, 1991 (suppl), 312-315.
- KIM C.M. The significance of changing trends in trichinellosis. *Southeast Asia Journal of Tropical Medicine and Health*, 1991 (suppl), 316-320.
- LA ROSA G., POZIO E., ROSSI P. & MURRELL K. D. Allozyme analysis of *Trichinella* isolates from various host species and geographical regions. *Journal of Parasitology*, 1992, 78, 641-646.
- LI J.Z., MA W.C. & LI C.X. A survey of dog trichinellosis in Chaoyang Region of Liaoning province. *Chinese Journal of Veterinary Science and Technology*, 1997, 27, 33.
- LIU D.S. & YU J.G. The discovery of *Trichinella* in Gansu province and the experimental study. *Journal of Lanabou Medical College*, 1960, 1, 93-98.
- LIU M.Y., SONG M.X., YANG R.F., CHEN P.H., AN C.L., LIU Z.S., GUO Z.B., HOU S.L., LU Y.X. & ZHU X.P. Identification of some China isolates of *Trichinella* by means of RAPD. *Chinese Journal of Veterinary Science and Technology*, 1997, 27, 18-20.
- LIU S.H., LU S.N., YU Z. & MENG Z.L. Study on the most suitable location for *Trichinella* inspection in frozen dog carcass. *Chinese Journal of Animal Quarantine*, 1996, 13, 49-50.
- MANSON P. *Trichina spiralis* in Chinese pork. *China Imperial Maritime Customs Medicine*, 1880-1881, Report.
- MENG D.G. & WANG M. Brief description of an outbreak of trichinosis. *Chinese Journal of Preventive Medicine*, 1995, 19, 305.
- PANG Y.K. & ZHANG L.L. Data analysis of human trichinosis epidemic in Yunnan province from 1964 to 1997. *Chinese Journal of Parasitology & Parasitic Diseases*, 1999, 17, 58-59.
- POZIO E. & LA ROSA G. General introduction and epidemiology of trichinellosis. *Southeast Asia Journal of Tropical Medicine and Health*, 1991 (suppl.), 291-294.
- ROCKIENE A. The Epidemiology of trichinellosis in Lithuania 1969-1992, in: *Trichinellosis*. Campbell W.C., Pozio E. & Bruschi.F. (eds.), Proceedings of the Eighth International Conference on Trichinellosis. Istituto Superiore di Sanita Press, Rome, 1993, 539-544.
- WANG H.J. & WANG Q.Y. A survey of *Trichinella* infection in dogs. *Chinese Journal of Animal Quarantine*, 1992, 9, 28.
- WANG P.S., GENG G.Y., LAI Z.M., ZHANG J.S. & YU E.D. An outbreak of trichinellosis caused by eating dog meat. *Chinese Journal of Epidemiology*, 1989, 10, 69.
- WANG Z.Q., CUI J., WU F. & JIN X.X. Seven outbreaks of trichinosis in China during 1992-1996. *Journal of Egyptian Society of Parasitology*, 1997, 27, 529-538.
- WANG Z.Q., CUI J., WU F., MAO FR. & JIN X.X. Epidemiological, clinical and serological studies on trichinellosis in Henan province, China. *Acta Tropical*, 1998, 71, 255-268.
- WEI T.T. & SONG L.P. Treatment of 17 cases of trichinosis with albendazole. *Chinese Journal of Zoonoses*, 1991, 7, 49.
- XU B.L., CUI Z.L., ZHANG Y.L., LIN X.M. & XIA S.L. Research report of the first finding of *Trichinella nativa* in China. *Chinese Journal of Parasitology & Parasitic Diseases*, 1997, 15, 257-262.

- XU J.T., WANG J.Q., GE L.M., CHEN F.Y., MENG .F.R. & ZHAN S.Y. Investigation of an outbreak of trichinosis in a community. *Chinese Journal of Parasitic Disease Control*, 1991, 4, 234.
- XU K.C., LIU M.Y., SONG M.X., CHEN P.H., AN C.L., ZHENG M.G, ZHOU Z.J. & CHEN Q.C., Identification on *Trichinella* from China by polymerase chain reaction. *Chinese Journal Veterinary Science*, 1997, 17, 467-469.
- YANG GY., YANG H. & YANG X. Veterinary examination of dog trichinellosis. *Chinese Journal of Meat Hygiene*, 1997, 2, 18-19.
- YANG H.M. Studies on epidemiology and control of trichinosis in Yunnan province. *Chinese Journal of Parasitology & Parasitic Diseases*, 1991, (Special Issue of Nationwide Survey on the Distribution of Parasites), 79-82.
- YE J.J., ZHANG S.Q., CHEN S.L., SHENG X.D. & PEI S.J. Investigation on infection of the human *Trichinella spiralis* in Hubei province. *Chinese Journal of Parasitic Disease Control*, 1998, 11, 111-113.
- Yuan H.J. Investigation of an outbreak of human trichinosis. *People's Military Surgeon*, 1980, 4, 32-34.
- YUGAWA T. *Trichina* found in dogs in South Manchuria. *Journal of Oriental Medicine*, 1934, 21, 88.
- ZHANG G.H. Investigation on *Trichinella spiralis* infection of meats sold at markets in Kunming. *Journal of Parasitology & Parasitic Diseases*, 1985, 3, 275.
- ZHANG Z.S. *Trichinella spiralis*, in: Human Parasitology. Zhao W.X. (eds), People's Health, Beijing, 1983, 585-599.
- ZHOU Y.C., WANG Y.Q., XU S.K., ZHENG J.X. & LI S.S. A survey of parasitic helminthes of dogs and cats in Heilongjiang. *Chinese Journal of Zoonoses*, 1990, 6, 61-62.