A BRIEF TIMELINE OF THE HISTORY OF TRICHINELLOSIS CONTROL

Jean DUPOUY-CAMET*

MD, PhD, D Trop Med & Hyg, Emeritus Prof,
Former President of the International Commission on Trichinellosis (2004-2007),
Paris Cité University & French Veterinary Academy.

jean.dupouy-camet@orange.fr

1862-1865 Impressive lethality in Saxony caused by a recently identified parasitic disease : trichinosis

- Calbe, 1862 38 cases, 8 deaths 21 %
- Hettstedt, 1863 158 cases, 27 deaths 17 %

- Hedersleben, 1865 337 cases, 101 deaths 30 %

1835 **Paget** & **Owen** (UK) identified a new Entozoon: *Trichina spiralis*

XXXV. *Description of a Microscopic Entozoon infesting the Muscles of the Human Body.*
By Richard Owen, Esq., F.R.S. & Z.S., *Assistant Conservator of the Museum of the Royal College of Surgeons in London.*

1846 **Leidy** found *Trichina* in pork (USA)

1858 **Virchow** (Berlin) deciphered the biological cycle & recommended heating to destroy the parasite

1860 **Zenker** (Dresden) identified the pathogenic effect in humans

Ueber die Trichinen-Krankheit des Menschen.

Von Prof. F. A. Zenker in Dresden.

Die Trichina spiralis ist nach ihrer ersten Beschreibung durch Owen während mehr als 20 Jahren zwar von einer Reihe von Beobachtern gesehen worden, es blieben aber doch die Fälle so vereinzelt, dass der Parasit allgemein für einen sehr seltenen gehalten wurde, und man kann wohl annehmen, dass die Zahl der während jener Zeit in der Literatur aufgezeichneten Fälle ziemlich vollständig auch die

Archiv für pathologische Anatomie und Physiologie und für klinische Medizin, Berlin, 1860, 18: 561-572.

1866 The French Ministry of Health sent to Germany:

- a professor of veterinary medicine (Alfort) **Reynal**
- a professor of human medicine **Delpech**

to study how such outbreaks were emerging and how they could be controled

Jean Reynal

Auguste Delpech

« already a *One health* approach »

Meetings with the prominent German scientists of the time...

Hanover	**Pr A Gerlach** 	**DVM**
Magdeburg	Dr J Niemeyer	MD
Berlin	**Dr CF Muller**  Pr R Virchow	**DVM** MD
Halle	Pr J Kuhn	PhD
Dresden	**Pr T Leisering**  Dr C Fiedler Dr F Kuchenmeister	**DVM** MD MD
Leipzig	Pr K A Wunderlich Pr Wagner	MD MD

Rudolf Virchow (1821-1902) who deciphered the biological cycle of *Trichinella,* coined the word *zoonosis* and the concept « *One health* »

« *Es gibt* ***keine wissenschaftliche Barriere zwischen Veterinär- und Humanmedizin****, noch sollte es eine geben; die Erfahrung der einen muß gebraucht werden für die Entwicklung der andere* ».

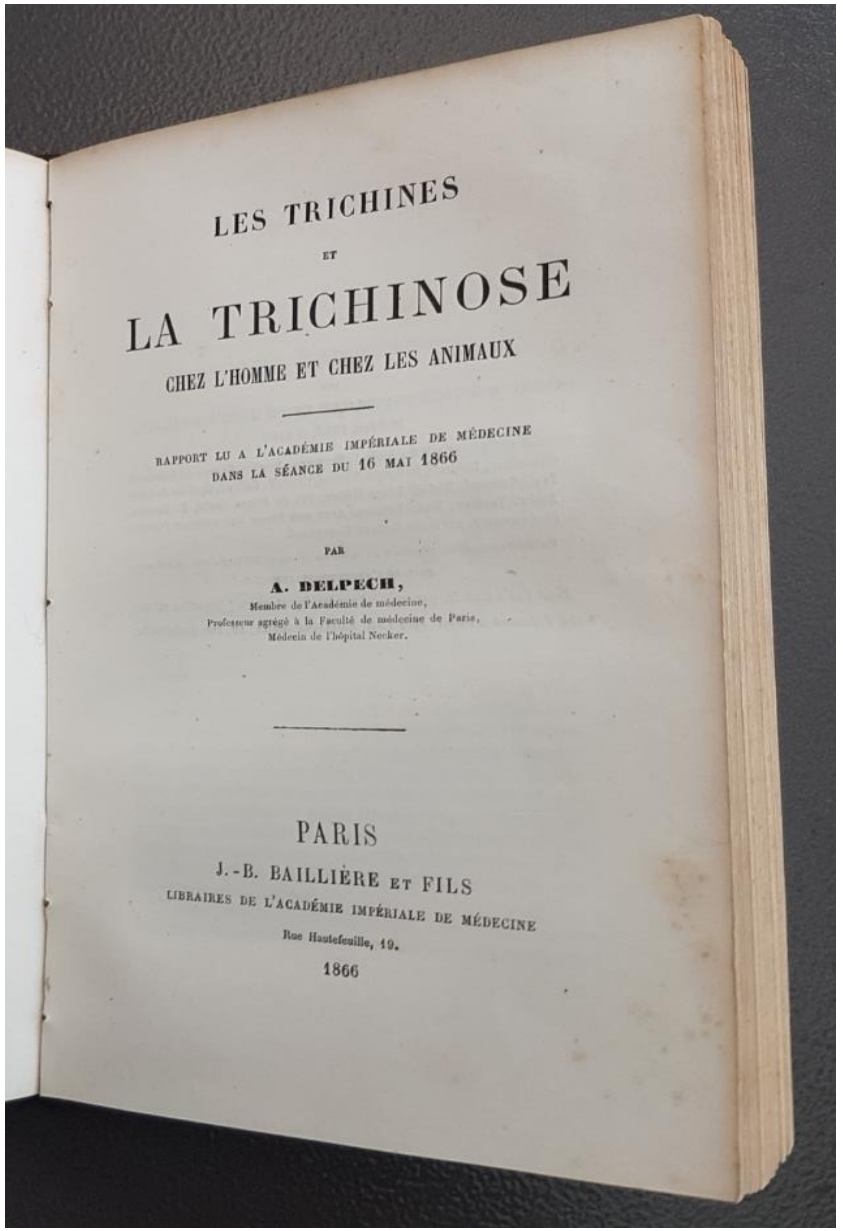
Delpech & Reynal gave in their final report the main points of control

1. Heating to destroy the larvae

"it is more than ever necessary to insist on the advice to persist in this salutary custom".

2. Importance of the microscopic inspection of meat to detect larvae

3. Protection of farms *"conditions of rearing …may exert a great influence on the development of trichinosis in pigs, it would be advisable to spread in agricultural populations the knowledge to be taken to guarantee them from the infection".*



LES TRICHINES

ET

LA TRICHINOSE

CHEZ L'HOMME ET CHEZ LES ANIMAUX

RAPPORT LU A L'ACADÉMIE IMPÉRIALE DE MÉDECINE
DANS LA SÉANCE DU 16 MAI 1866

PAR

A. DELPECH,

Membre de l'Académie de médecine,
Professeur agrégé à la Faculté de médecine de Paris,
Médecin de l'hôpital Necker.

PARIS

J.-B. BAILLIÈRE ET FILS

LIBRAIRES DE L'ACADÉMIE IMPÉRIALE DE MÉDECINE

Rue Hautefeuille, 19.

1866

Jean Dupouy-Camet

LA MISSION D'ÉTUDE FRANÇAISE DE 1866 SUR LA TRICHINOSE EN ALLEMAGNE

Avec la participation de
Thierry Hueber & Mohamed Gharbi

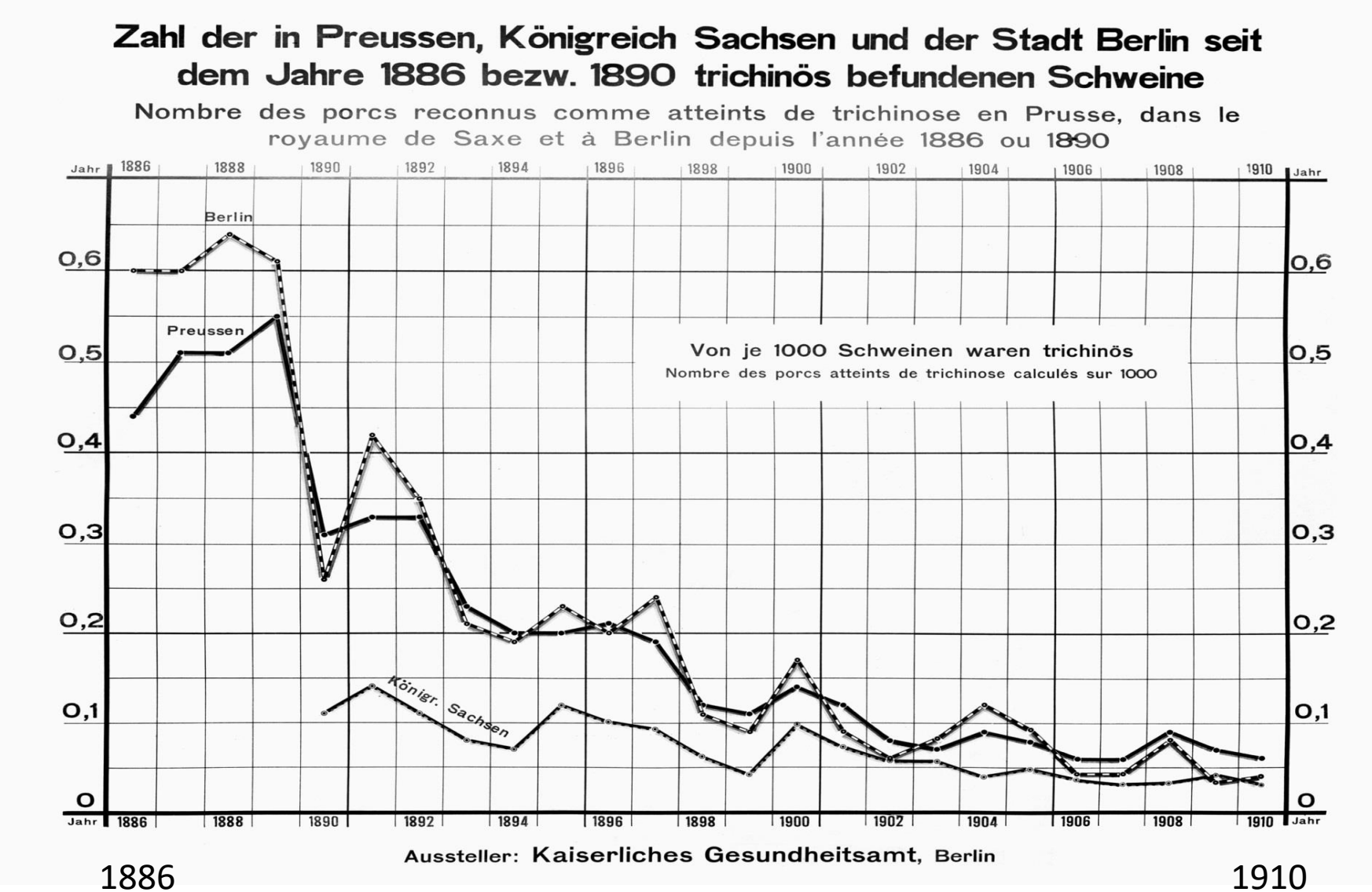
Préface de Fabrizio Bruschi

Médecine à travers les siècles

L'Harmattan

amazon

1886-1910 Implementation of this control had an outstanding efficiency in Germany on the number of pigs infected with trichinellosis



1886

1910

1879-1888 USA-European pork war

Many European countries banned the importation of American pork alleging the presence of trichinae.

Frank Leslie's Illustrated Newspaper1884

AMERICAN PORK IN EUROPE.

AN UNDERHAND WARFARE CARRIED ON AGAINST UNITED STATES PRODUCTS.

WASHINGTON, April 13.—The March volume of consular reports, which has just been issued by the State Department, contains some interesting facts in relation to the determined efforts now being made in Europe to create a prejudice against American pork and ham.

The New York Times
Published: April 14 1881

1892 Bureau of Animal Industry's Meat Inspection began **microscopic examination in pork to be exported** to countries requiring such inspection.

First concern of the USDA by trichinosis

1897 **Thornbury** (supervising microscopist at the USDA) described a **digestion method** to obtain free larvae

all sorts of contortions are seen until the parasites become dead and motionless. Meat may be digested artificially and the trichinæ liberated from their capsules by submerging it in water at 98°, to which hydrochloric acid and pepsin are added in the proportions found in the gastric juice. This is an efficient means of observing their motion. The capsules occupied by the trichinæ are usually

University of Pennsylvania Press (Univ Med mag). 1897:10 ; 64-79

USDA

1911 First **serodiagnosis of trichinellosis** developped by the German scientist **Ströbel**

Complement fixation test

Aus der medizinischen Klinik Erlangen.
Ambulatorium: Prof. Dr. Schittenhelm.

Die Serodiagnostik der Trichinosis.

Von Dr. H. Ströbel.

Die von Ghedini zuerst für die Diagnostik der Wurmkrankheiten mit Erfolg angewandte Methode der Komplementfixation hat seitdem zahlreiche Nachprüfungen erfahren. Von klinischem Interesse erschien vor allem die Diagnostik der Echinokokkeninfektion, die Zahl der mit Komplementbindungsmethode untersuchten Fälle beträgt zurzeit schon weit über hundert. Bei der eigenartigen Natur dieses Parasiten ist ein zweckmässiges Antigen in der von demselben produzierten Zystenflüssigkeit von selbst gegeben. Ausserdem zeigten sich wie bei den übrigen Wurmkrankheiten vor allem alkoholische Extrakte aus den Parasiten selbst als brauchbare Antigene.

Versuch 5. Antigen: Frisch bereiteter Antiformextrakt.
Titration ergibt:
0,8 (0,5 und 0,3) Extrakt + Compl. + Häm. System = 0.
0,8 (0,5 und 0,3) Extrakt + Hämolytisches System = + + +.
Sera:
St Trichinoseserum Mensch.
Stt Trichinoseserum Mensch, sehr schwerer Verlauf.
Sttt Trichinoseserum Mensch.
Sw Menschliches Serum, Wassermann pos.
Sn Menschliches Normalserum.
Kontrollproben ergaben normales Verhalten.

Tabelle V.

Extrakt	St	Stt	Sttt	Sw	Sn
0,4	+++	+++	+++	0	0
0,3	++	+++	+++	0	0
0,2	++	+++	+	0	0
0,1	0	+	0	0	0
0,075	0	0	0	0	0
0,05	0	0	0	0	0

Ströbel. — Die Serodiagnostik der Trichinosis. *Münch. Med. Wochenschr.*, LVIII, 1911, p. 672.

1913

Ransom (1879-1925)
parasitologist at the USDA discovers that **deep freezing destroy** *Trichinella* larvae

USDA National Agricultural Library
U.S. DEPARTMENT OF AGRICULTURE

1920-1940

1920

Schwartz demonstrated that trichinae were **destroyed by massive doses of x-rays**.

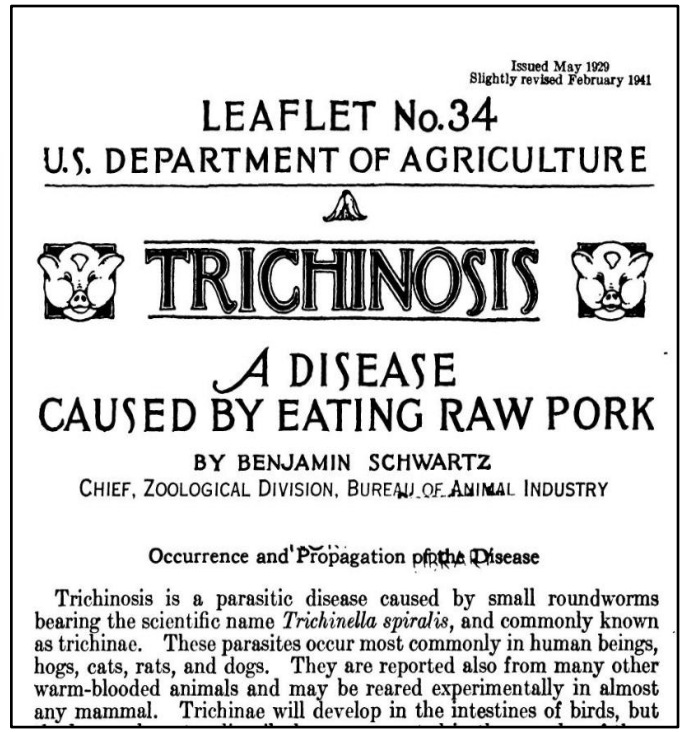
1930

Schwartz **prepared antigen** from muscle larvae and tested it on experimentally infected pigs

SCHWARTZ, MC. INTOSH et MITCHEL. — Non specific skin reactions in pigs to the injections of Trichinella extracts. *Proc. Amer. Soc. Parasitologists, Journ. Parasitology*, XVII, 1930, p. 114.

1938

Investigations of trichinae in hogs confirmed that garbage-fed hogs were more infected than grain-fed hogs.



Issued May 1929
Slightly revised February 1941

LEAFLET No.34

U.S. DEPARTMENT OF AGRICULTURE

TRICHINOSIS

A DISEASE CAUSED BY EATING RAW PORK

BY BENJAMIN SCHWARTZ

CHIEF, ZOOLOGICAL DIVISION, BUREAU OF ANIMAL INDUSTRY

Occurrence and Propagation of the Disease

Trichinosis is a parasitic disease caused by small roundworms bearing the scientific name *Trichinella spiralis*, and commonly known as trichinae. These parasites occur most commonly in human beings, hogs, cats, rats, and dogs. They are reported also from many other warm-blooded animals and may be reared experimentally in almost any mammal. Trichinae will develop in the intestines of birds, but

Table 1. Reported morbidity and mortality from trichinosis in the United States 1947–1968

Year	Cases	Deaths
1947	451	14
1948	487	15
1949	353	9
1950	327	9
1951	393	10
1952	367	10
1953	395	7
1954	277	1
1955	264	4
1956	262	5
1957	178	4
1958	176	4
1959	227	3
1960	160	3

Shumaker et al. J Infect Dis. 1969;120(3):396-8

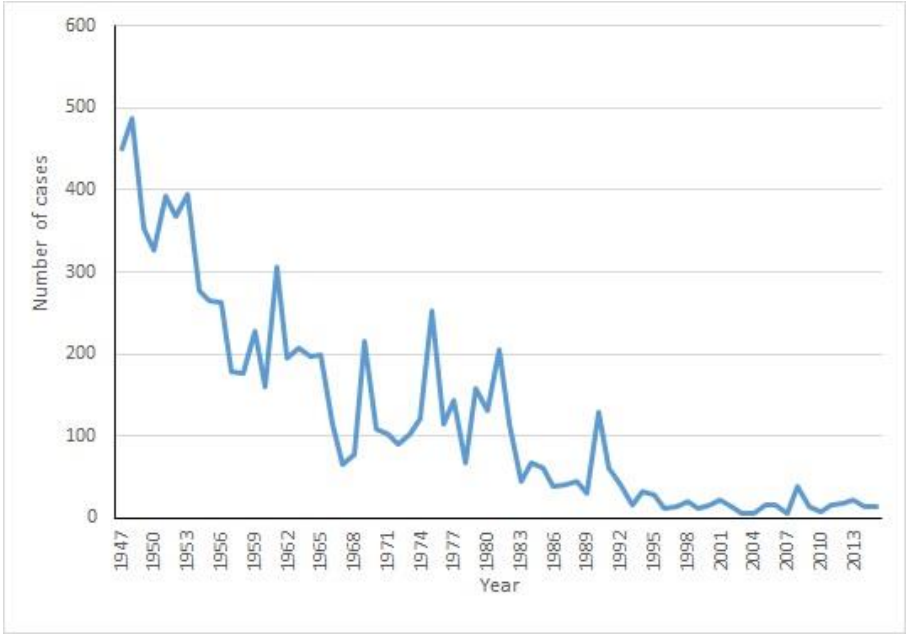
160 to 487 cases/yr
1 to 15 deaths/yr

1940-1960

Public health problem in the USA

1953-1954

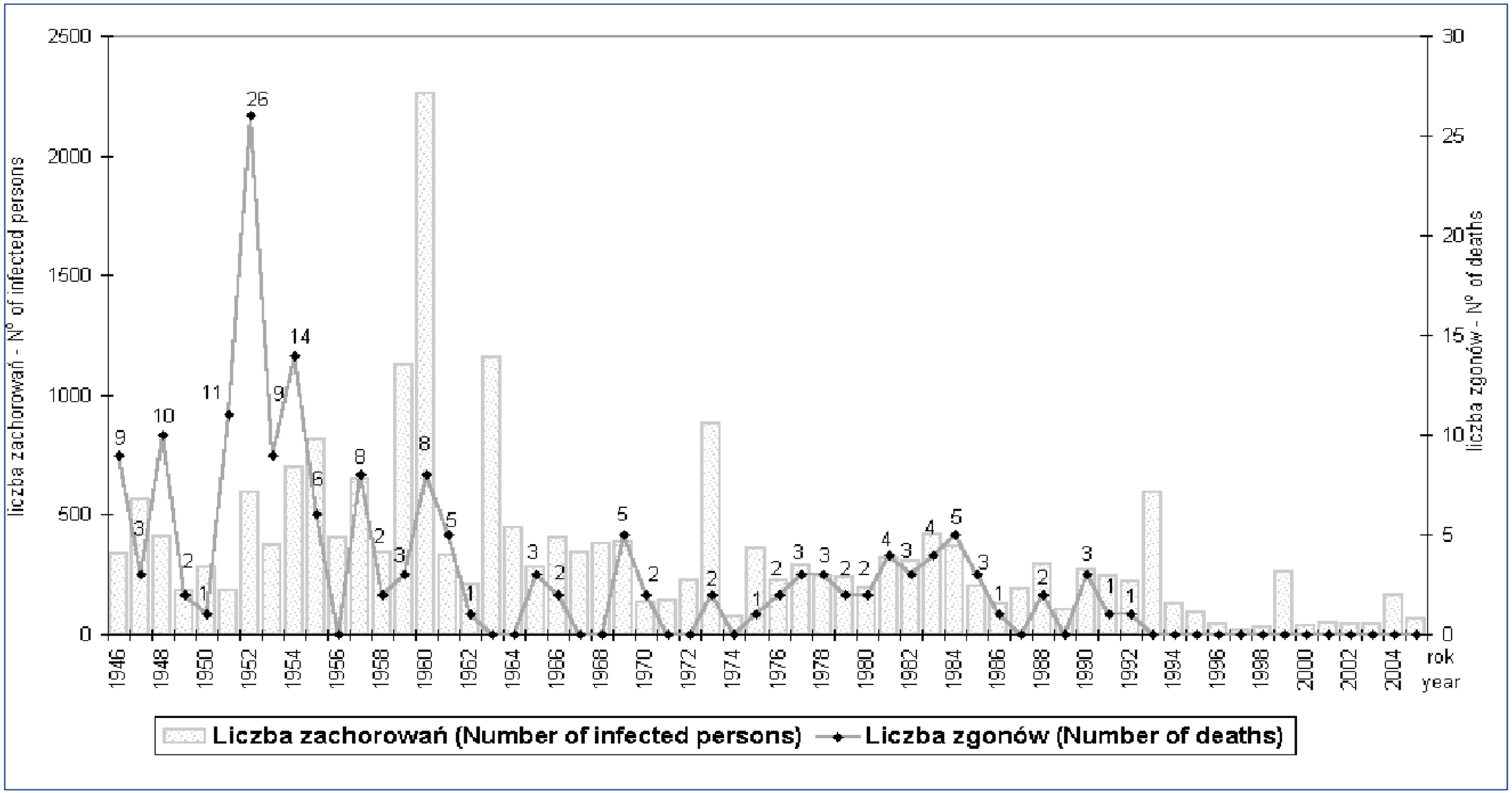
States passed laws against feeding raw garbage to swine



CDC

1940-1960 Public health problem in Poland

Hundred to thousands of cases/yr
26 deaths in 1952



Gołab E & Sadkowska-Todys M. Wiad Parazytol. 2006;52(3):181-7

1960 Creation **International Commission on Trichinellosis**

International Council : Honorary president: **Skryabin**, **USSR**, President: **Stefański**, **Poland**, Secretary: **Kozar**, **Poland**.
Executive Committee chaired by **Schwartz**, **USA**

in the midst of the Cold War !!

Figure 1. The presidential table at ICT 1. From left to right: B. Schwartz (USA), K.I. Skrjabin (USSR), Z. Kozar (Poland) and W. Stefański (Poland). Picture published in *Wiadomości Parazytologiczne* (1960).

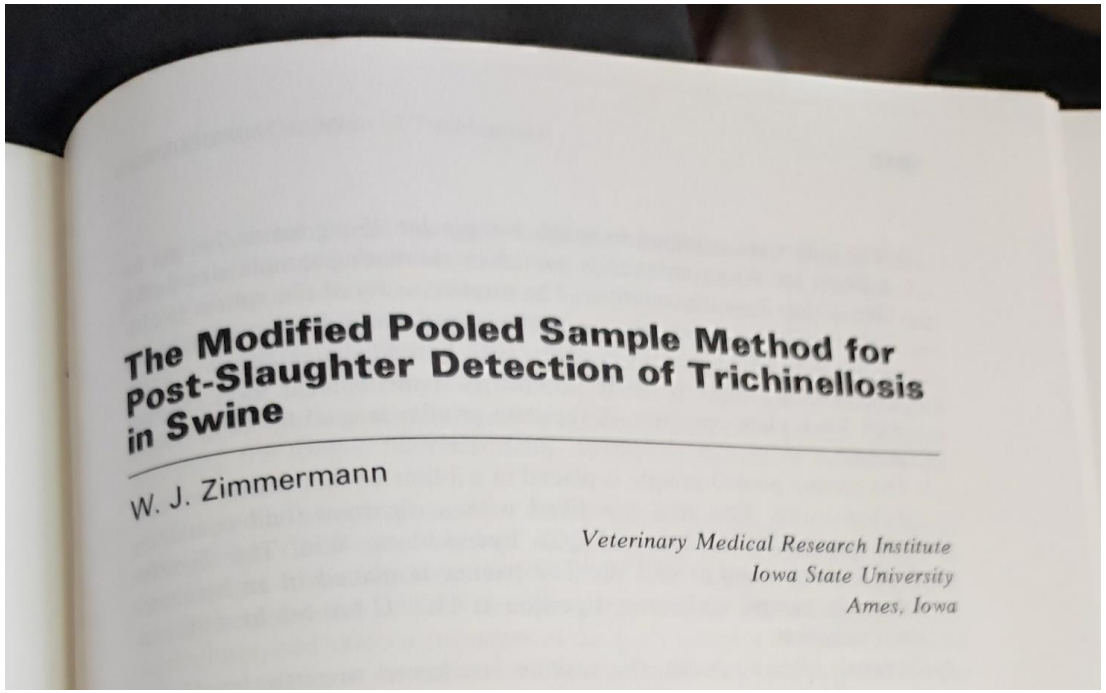
Aim: to organize a better control of the disease through scientific exchanges and meetings: *International Conferences on Trichinellosis*

see: Dupouy-Camet J, Kapel C, Gołąb E, Scandrett B, Zarlenga D. Early days of the International Commission on Trichinellosis (1958-1972). Ann Parasitol. 2020;66:259-263.

This Commission is still active !

https://www.ict-16.com/

1967 **Zimmermann** of Iowa State University developed the **digestion method** (and **pooled digestion**) to facilitate the examination for trichinae

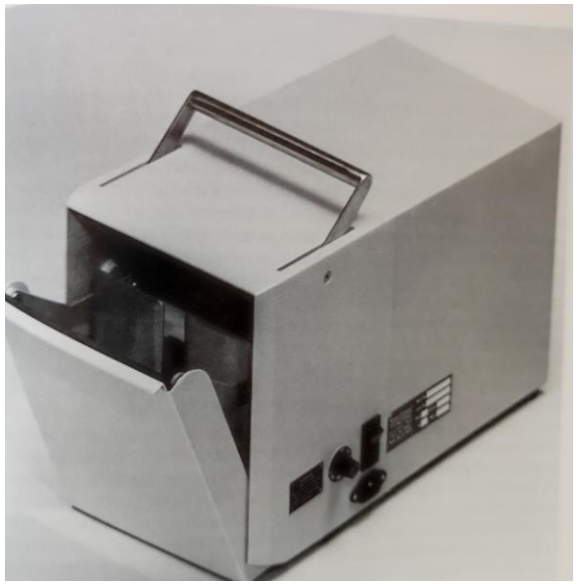


The Modified Pooled Sample Method for Post-Slaughter Detection of Trichinellosis in Swine

W. J. Zimmermann

Veterinary Medical Research Institute
Iowa State University
Ames, Iowa

ICT3 1974



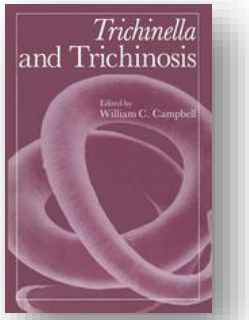
1974

Rijksinstituut voor Volksgezondheid en Milieu
Ministerie van Volksgezondheid, Welzijn en Sport

Surveillance in Swine by Immunodiagnostic Methods

E. JOOST RUITENBERG, FRANS VAN KNAPEN, and ANNEKE ELGERSMA

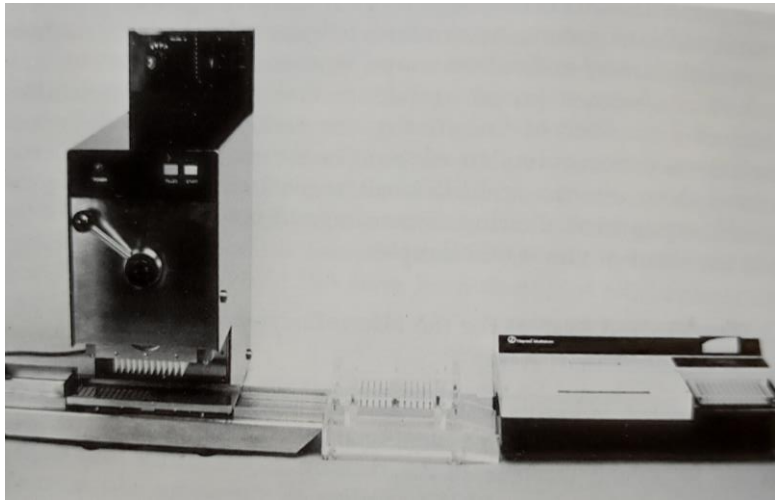
Ruitenberg RIVM developed an **ELISA** method detect the infection in pigs. Method later automatised



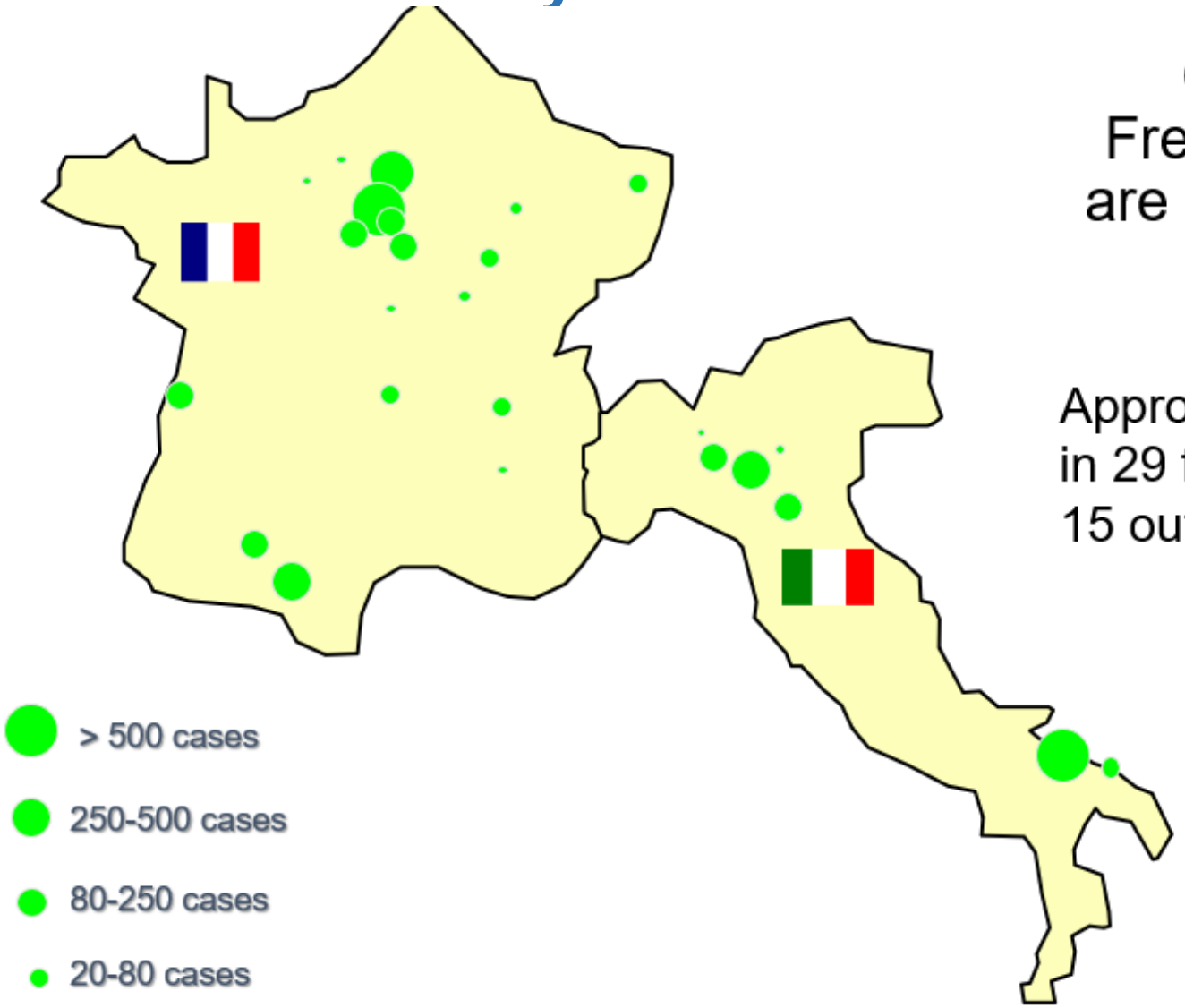
Bull. Org. mond. Santé
Bull. Wld Hlth Org. } 1974, 51, 108-109

Serodiagnosis of *Trichinella spiralis* infections in pigs by enzyme-linked immunosorbent assays*

E. J. RUITENBERG,[1] P. A. STEERENBERG,[2] B. J. M. BROSI,[2] & JANNY BUYS [2]



1975-2005 Emergence of a new vector, horsemeat, source of 15 outbreaks in France & Italy



Only Italian and French consumers are raw horse meat eaters

Approximately 3300 cases in 29 foci corresponding to 15 outbreaks (1975-2005)

A new interest for the disease !

Experimental infections of horses

Zur Trichinellose des Pferdes (1977)

Von H. Wohrl, F. Horchner und H. Grelck

PARASSITOLOGIA VOL. XX - N. 1, 2, 3 - Dicembre 1978

INFEZIONE SPERIMENTALE DEL CAVALLO CON LARVE DI TRICHINA (*)

S. PAMPIGLIONE, R. BALDELLI, C. CORSINI, S. MARI e A. MANTOVANI

Veterinary Parasitology, 31 (1989) 19–36
Elsevier Science Publishers B.V., Amsterdam — Printed in The Netherlands

Experimental Trichinellosis in Horses: Biological and Parasitological Evaluation

C. SOULE[1], J. DUPOUY-CAMET[2], P. GEORGES[3], T. ANCELLE[2], J.P. GILLET[1], J. VAISSAIRE[1], A. DELVIGNE[3] and E. PLATEAU[1]

1983 to present

Major input of scientists of five institutes

Rijksinstituut voor Volksgezondheid en Milieu
Ministerie van Volksgezondheid, Welzijn en Sport

RIVM Bilthoven

EJ Ruitemberg serology
F Van Knapen serology
J Van der Giessen epidemiology

Bundesinstitut für Risikobewertung

BFR Berlin

K Nöckler epidemiology
A Mayer-Scholl control

ISS Rome

A Mantovani public health
E Pozio, G La Rosa speciation
MA Gomez-Morales serology

United States Department of Agriculture

USDA Beltsville

R Lichtenfels speciation
D Murrell parasites
R Gamble serology, control
D Hill serology, control
D Zarlenga genomics
B Rosenthal genomics

agence nationale de sécurité sanitaire alimentation, environnement, travail

ANSES Alfort

C Soulé horse infection
P Boireau, I Vallée immunology
quality control
G Karadjian genomics
R Blaga public health

And many scientist in Canada, Denmark, Germany, Poland, China Argentina, Mexico, Romania, Serbia…

2005

USDA issued a certification program for ***Trichinella*-free farms** in collaboration with U.S. pork producers

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Veterinary Parasitology 132 (2005) 179–183

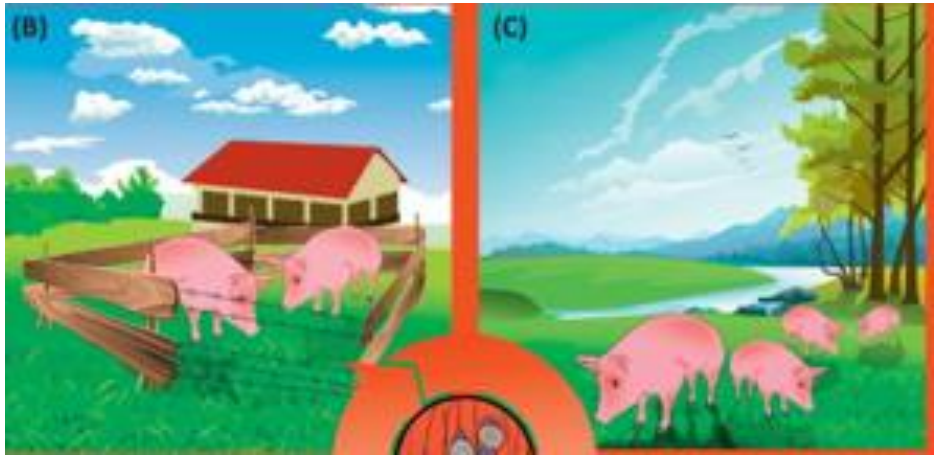
veterinary parasitology

www.elsevier.com/locate/vetpar

Trichinae certification in the United States pork industry

David G. Pyburn [a,*], H. Ray Gamble [b], Elizabeth A. Wagstrom [c], Lowell A. Anderson [a], Lawrence E. Miller [a]

[a] *USDA APHIS VS, 210 Walnut Street, Suite 891 Des Moines, IA 50309, USA*
[b] *National Academy of Sciences, 2001 Wisconsin Avenue, N.W., Washington DC 20007, USA*
[c] *National Pork Board, 1776 N.W. 114 Street, Clive, IA 50325, USA*



Pozio, 2014

2007 French and Canadian food agencies recommended quality control, technicians training, proficiency tests and accreditation

Journal of Food Protection, Vol. 70, No. 7, 2007, Pages 1685–1690

Use of Proficiency Samples To Assess Diagnostic Laboratories in France Performing a *Trichinella* Digestion Assay

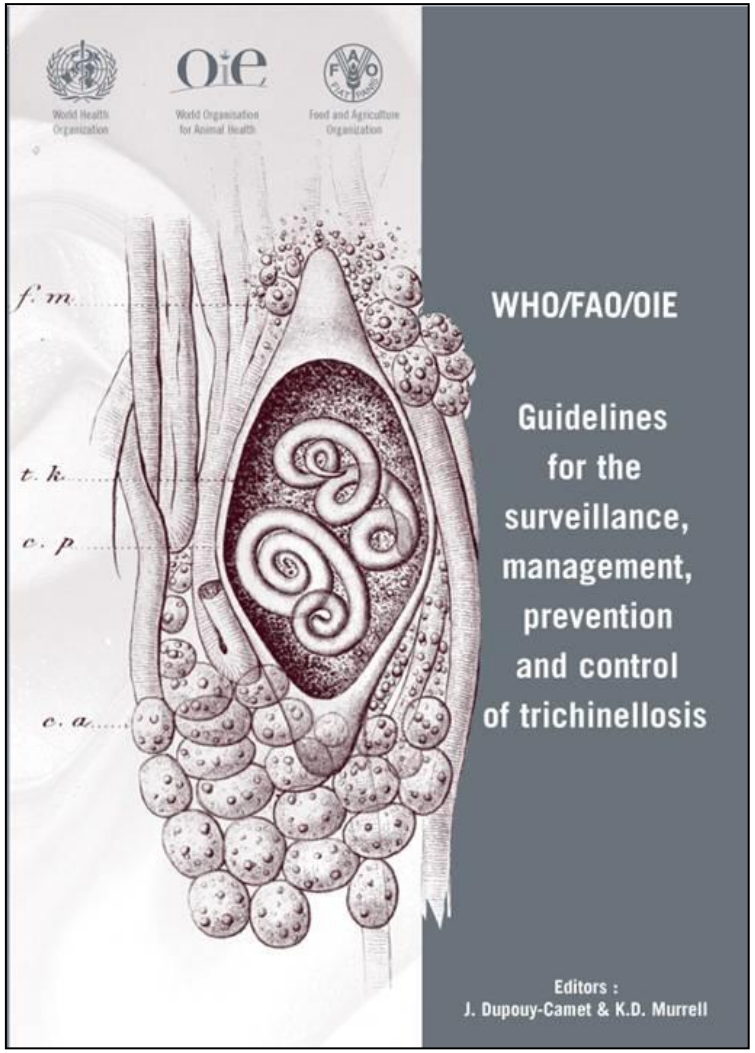
ISABELLE VALLÉE,[1]* PAULINE MACÉ,[1] LORRY FORBES,[2] BRAD SCANDRETT,[2] BENOIT DURAND,[3] ALVIN GAJADHAR,[2] AND PASCAL BOIREAU[1]

[1]*AFSSA, INRA, ENVA, UPVM, UMR956 BIPAR, 23 avenue du Général de Gaulle, F-94 706 Maisons-Alfort, France;* [2]*Centre for Food-borne and Animal Parasitology, Saskatoon Laboratory, Canadian Food Inspection Agency, 116 Veterinary Road, Saskatoon, Saskatchewan, Canada S7N 2R3; and* [3]*Epidemiology Unit, AFSSA-LERPAZ, 23 avenue du Général de Gaulle, 94 706 Maisons-Alfort, France*

MS 06-596: Received 20 November 2006/Accepted 18 February 2007

not a single case of horse-meat related trichinellosis in the past 25 years in France… many thanks to Isabelle and Pascal !

2007-2019 Guidelines and recommendations



2007

CODEX ALIMENTARIUS

NORMES ALIMENTAIRES INTERNATIONALES

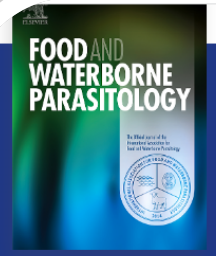
Organisation des Nations Unies pour l'alimentation et l'agriculture

Organisa mondiale

Guidelines for the control of *Trichinella* spp. parasites in pork *AGREED - 6 July 2015*

Food-producing animals may have parasites. *Trichinella* is a parasite that may be found in the meat of pigs and other animals. When humans eat meat produced by animals infecte that is raw or undercooked, some parasites may remain and cause acute and severe illness. Laws requiring intensive carcass testing to ensure meat is not infected with *Trichinella* h

2015



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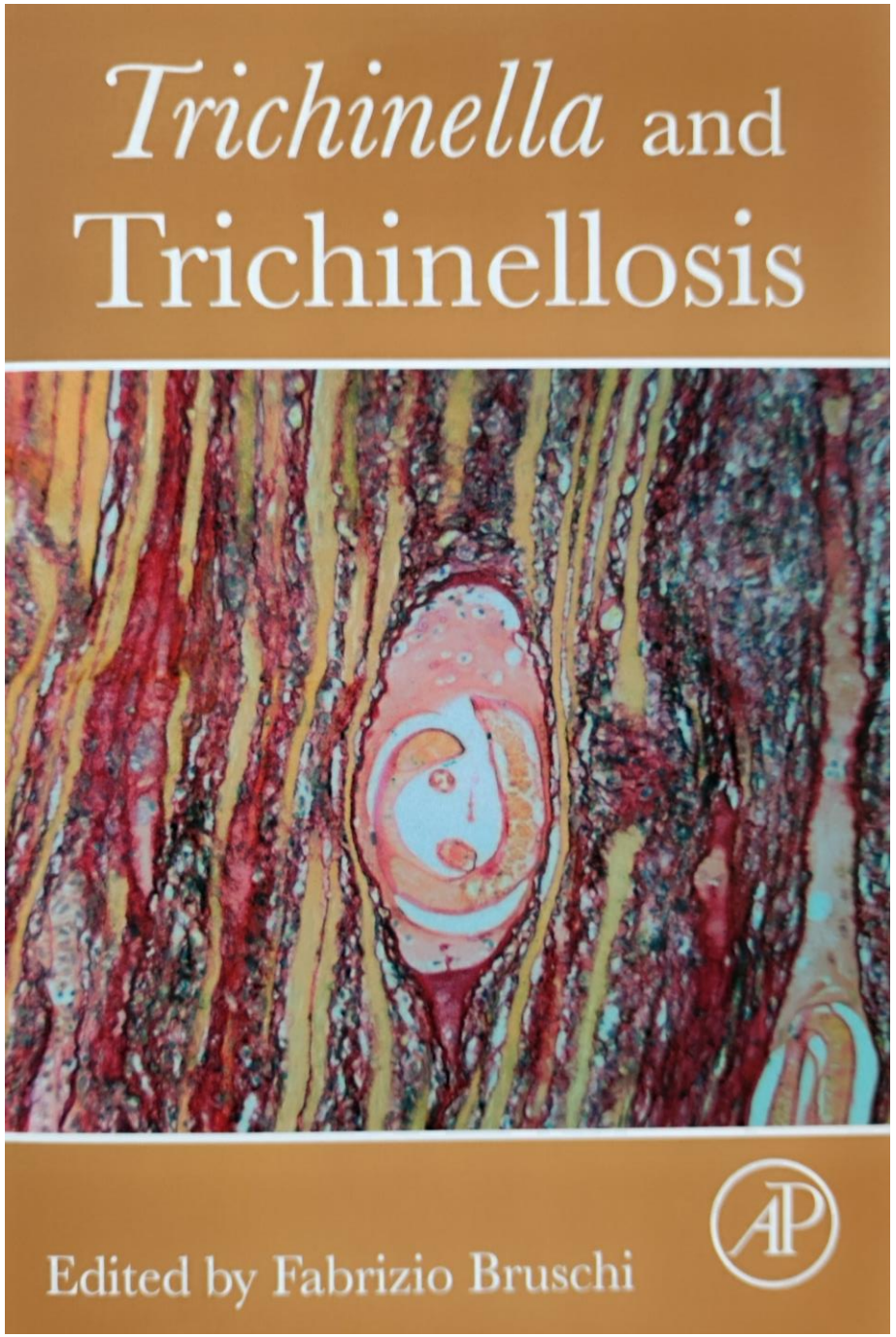
Special Issue: International Commission on Trichinellosis (ICT): Recommendations for the Diagnosis and Control of Trichinella

2019

More details in

2021



Conclusions

- A *One Health* approach of trichinellosis had allowed a good control of the disease in humans and of the infection in pigs

- This *One Health* approach exists since the 19th century !

- Human trichinellosis is a persisting problem in some remote parts of Argentina or China and amongst hunters or relatives consuming non controled wild meat (wild boar, bear…).

1895 Trichinosis became trichinellosis

Railliet, professor at Maisons-Alfort vet School (1876-1920) modified the genus *Trichina* to *Trichinella* as the name *Trichina* had been given before the 1835 discovery, to a genus of flies

Trichina sp