

The background of the slide is a dense, light blue-tinted microscopic image of numerous roundworms. The worms are shown in various stages of movement, with some appearing as tight, circular coils and others as more elongated, winding paths. The overall texture is complex and organic, typical of a biological specimen under a microscope.

Helminthic food-borne infection in Japan

Raw meat consumption as a risk factor for zoonotic roundworm infections

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Details of seropositive cases diagnosed by ELISA in Faculty of Medicine, University of Miyazaki

Parasites	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Zoonotic roundworms	76	52	48	50	34	36	36	27	38	48
<i>Anisakis</i>	3	2	2	3	4	1	1	4	1	5
<i>Dirofilaria</i>	1	0	0	0	0	1	2	0	1	3
<i>Gnathostoma</i>	7	9	3	4	9	3	5	6	1	5
<i>Ancylostoma</i>	0	1	1	1	0	0	0	0	0	0
<i>Cysticercus</i>	4	5	2	4	8	3	7	4	2	4
<i>Paragonimus</i>	38	38	45	35	30	29	37	42	29	26
<i>Fasciola</i>	1	1	3	2	2	1	2	3	1	3
<i>Schistosoma</i>	4	4	3	6	6	2	3	3	5	8
<i>Clonorchis</i>	0	0	1	3	1	4	2	2	0	1
<i>Strongyloides</i>	2	0	2	0	2	2	2	1	3	2
<i>Spirometra</i>	1	0	4	2	0	1	1	1	4	4

What is Larva migrans syndrome (LMS)?

Larva migrans syndrome (LMS) is a clinical syndrome in humans caused by the migratory larvae of parasites

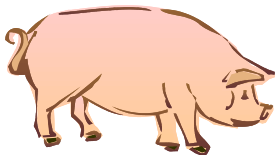
【Causative species】



Toxocara canis



Toxocara cati



Ascaris suum

Ascarid LMS

Ascarididae

What is ascarid LMS?

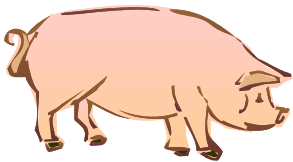
Definitive hosts



Toxocara canis



Toxocara cati



Ascaris suum

Paratenic/Accidental hosts

CNS

Eyes

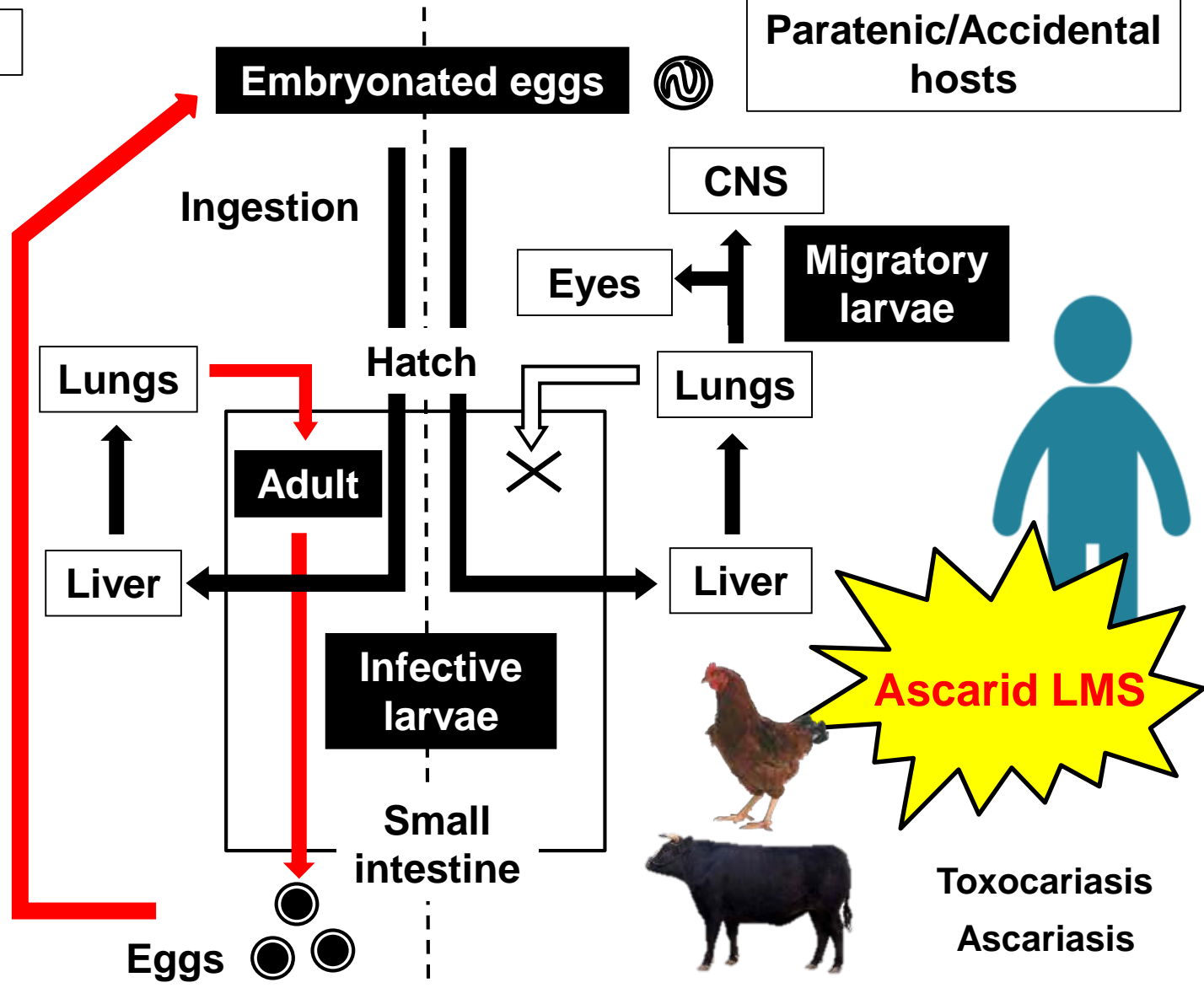
Migratory larvae

Lungs

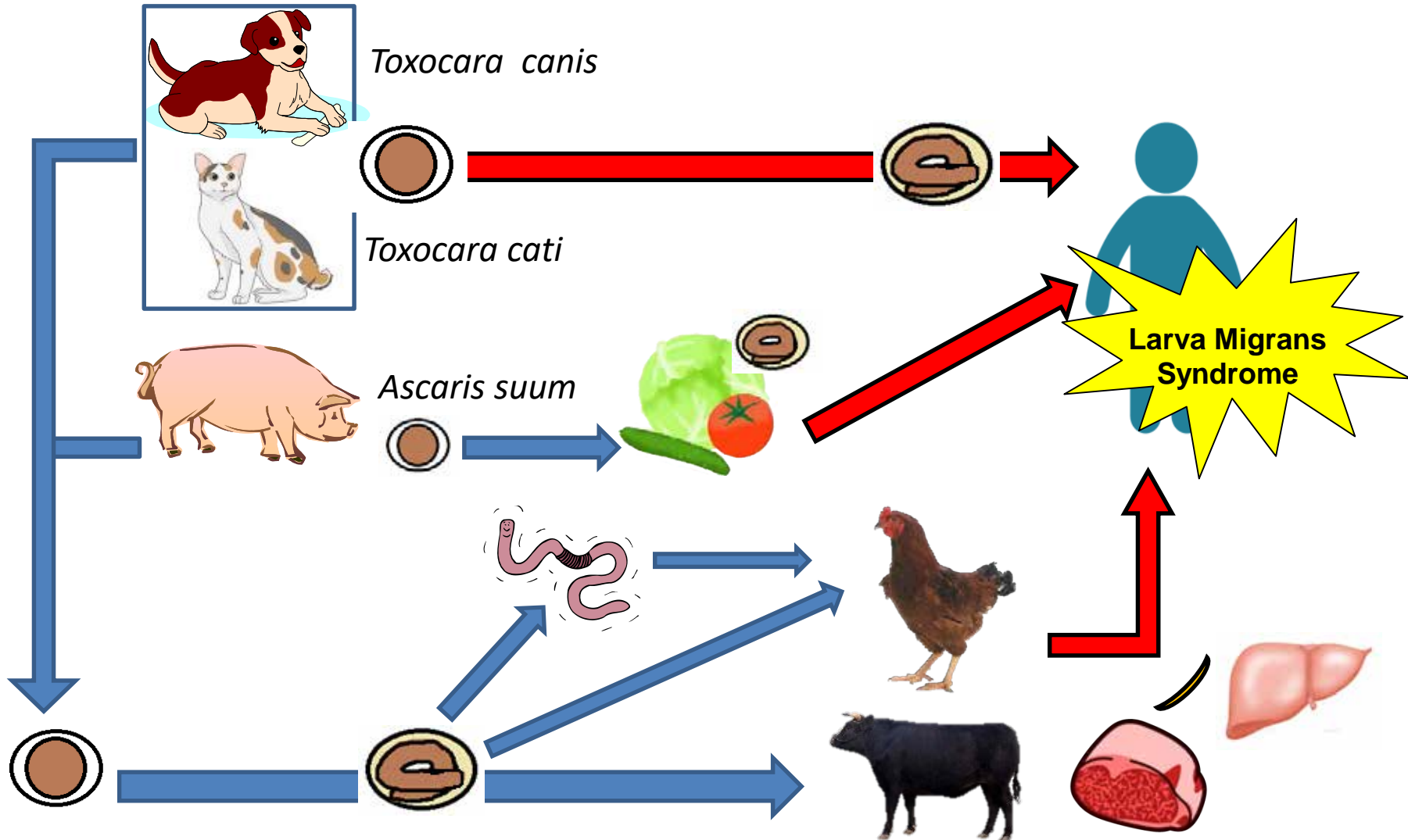
Liver

Ascarid LMS

Toxocariasis
Ascariasis



How does someone get ascarid LMS?



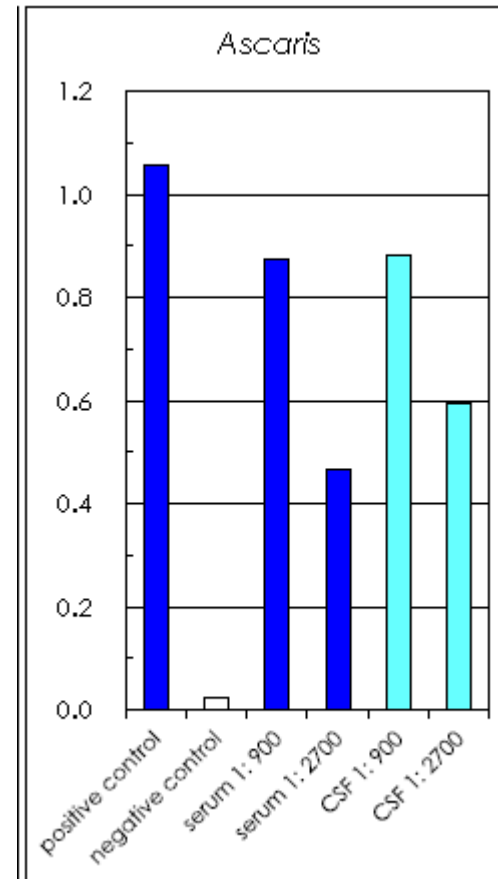
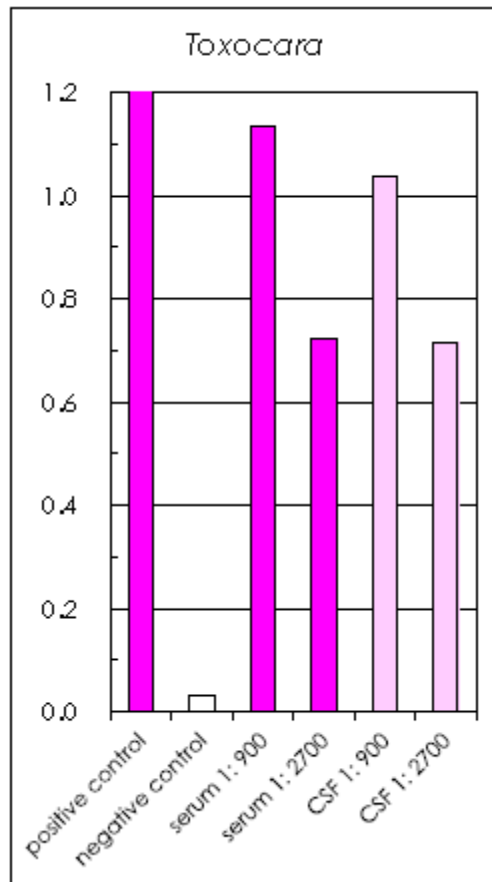
What are the symptoms of ascarid LMS?

- Many people do not have symptoms
- Some people may have:
 - Fever
 - Hypereosinophilia
 - Liver disfunction
 - Pneumonia
 - Uveitis
 - Allergic myelitis etc...

Depending on the affected organs!

How to diagnose ascarid LMS?

Detection of antibody against *Toxocara* and *Ascaris* antigens using ELISA or western blotting



Who is at risk for ascarid LMS?

Anyone!

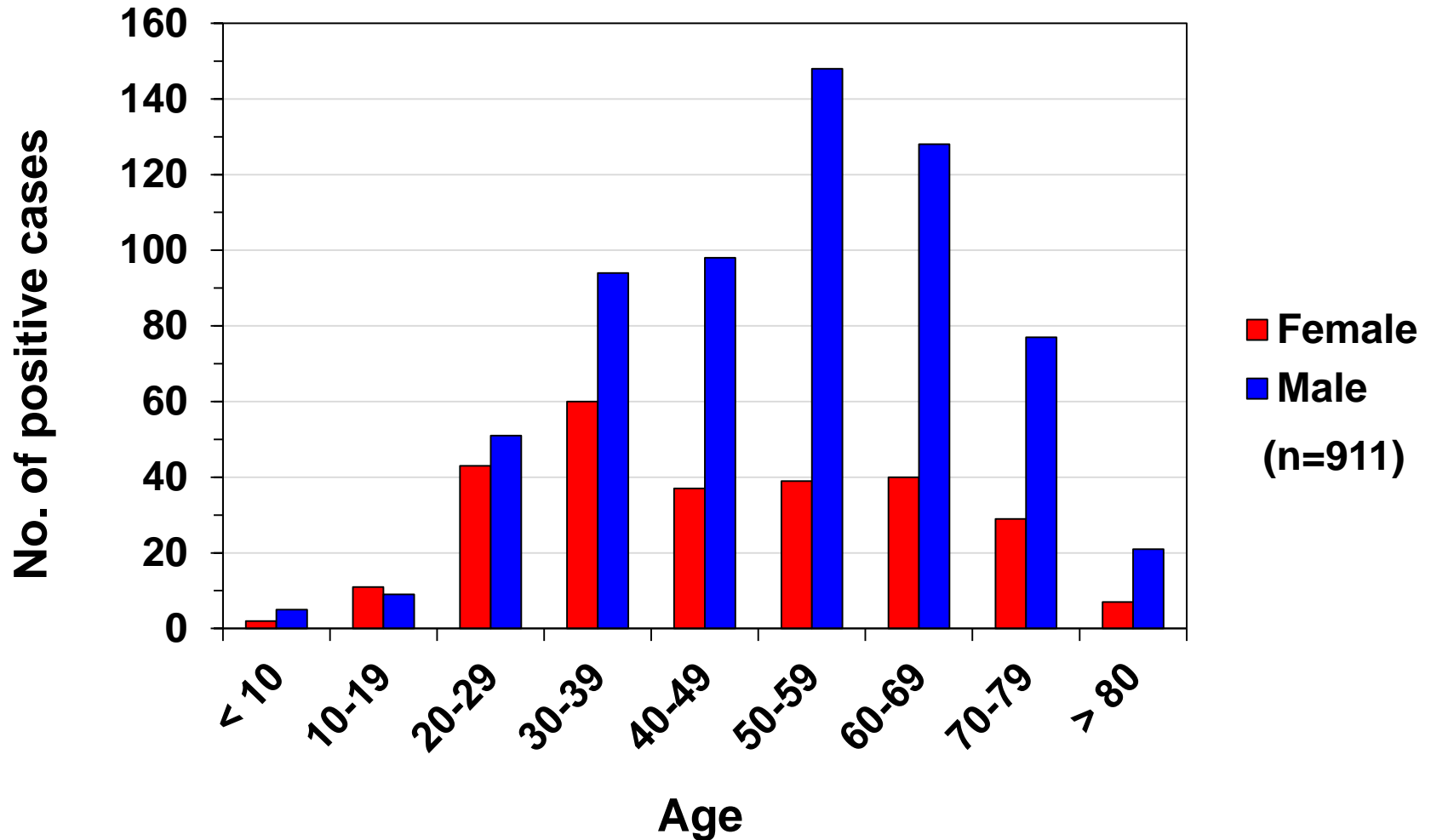
Risk factors:

Western countries:

- **Age (children)**
- **Dog, cat or pig owners**
- **Soil-related occupation**

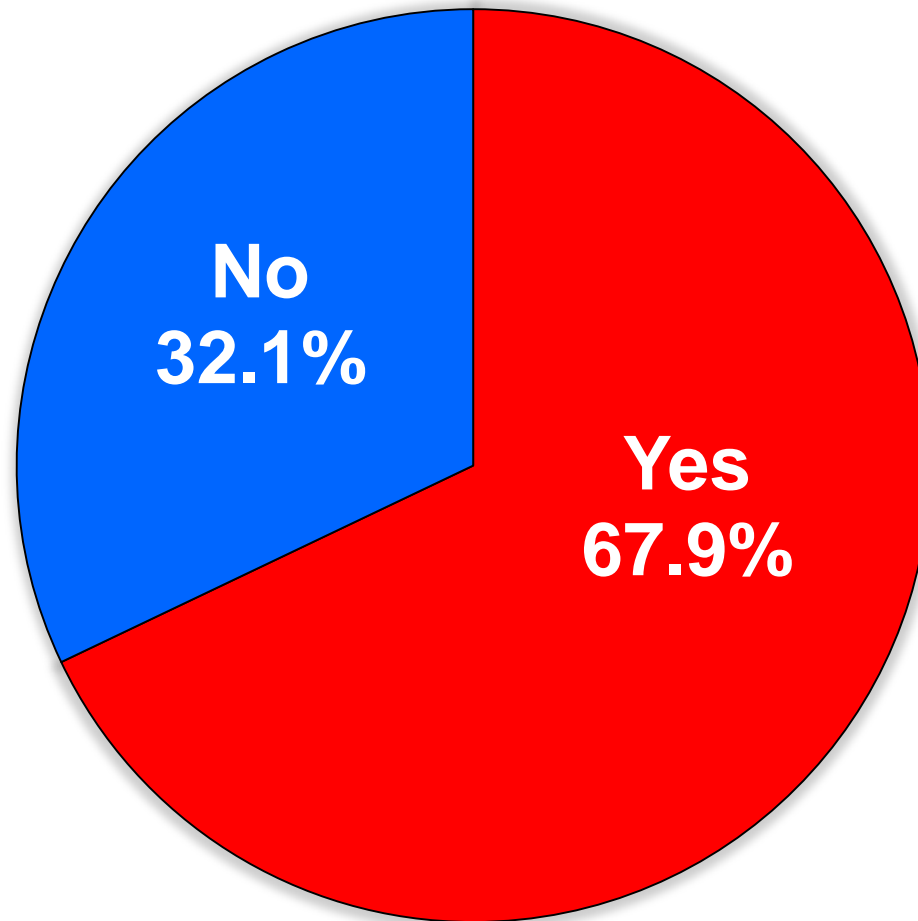
However...

Age and sex distribution of Japanese patients



(Yoshida *et al.*, 2016)

Dietary history of ingesting raw or undercooked meat and/or liver in ascarid LMS patients



(n=480, Yoshida *et al.*, 2016)

Who is at risk for ascarid LMS?

Anyone!

Risk factors:

Western countries:

- **Age (children)**
- **Dog, cat or pig owners**
- **Soil-related occupation**

Japan:

- **Age (adults)**
- **Sex (male)**
- **Consumption of raw or undercooked meat and/or liver**

58 year-old, male (in 2010)

Chief complaint:

Increased WBC on a regular check-up

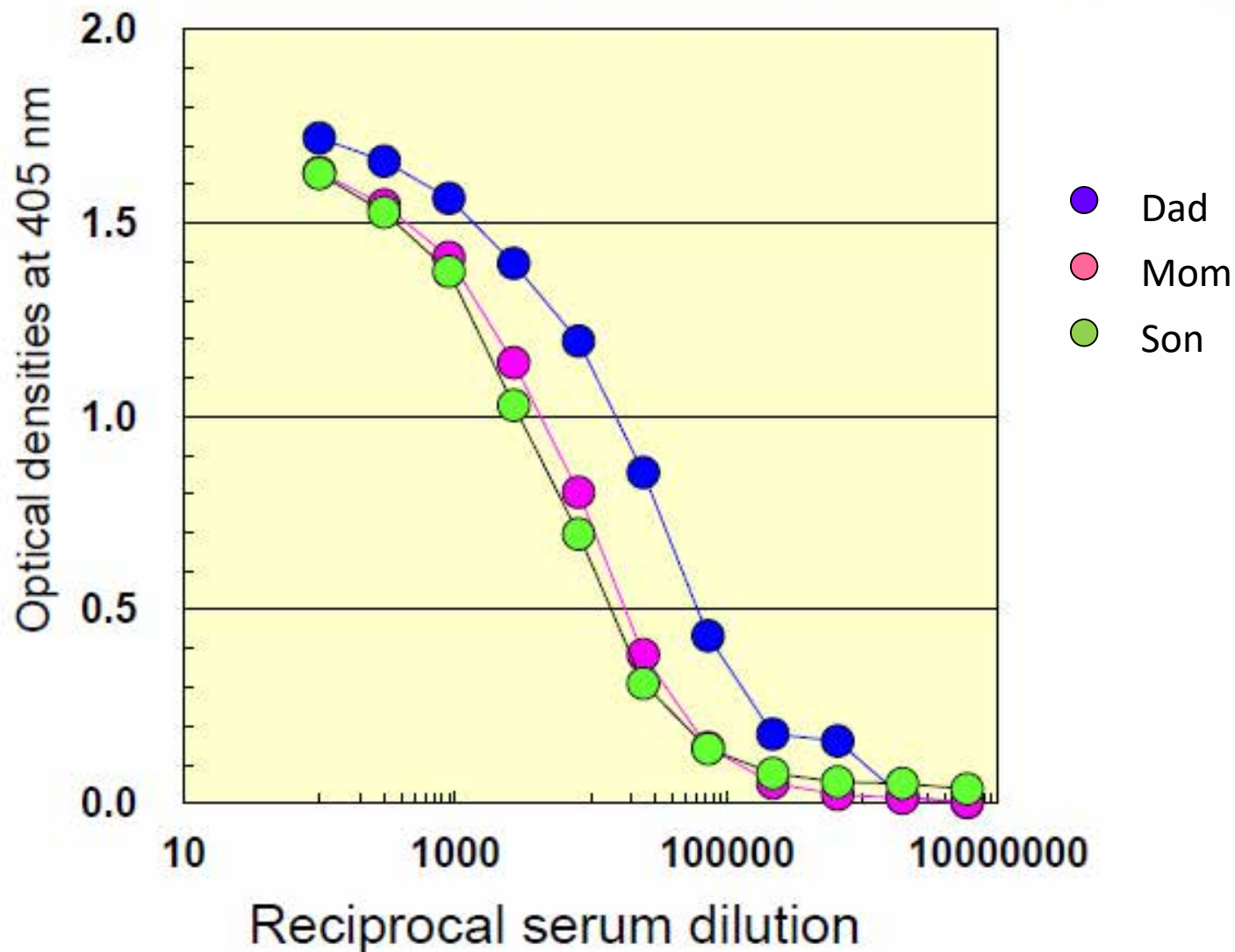
Presented at X University Hospital

Eo: 36%、 total IgE: 2,345 U/ml

He, his 57 year-old wife, and 27 year-old son, have been ingesting raw bovine liver every week in the last 1 year.

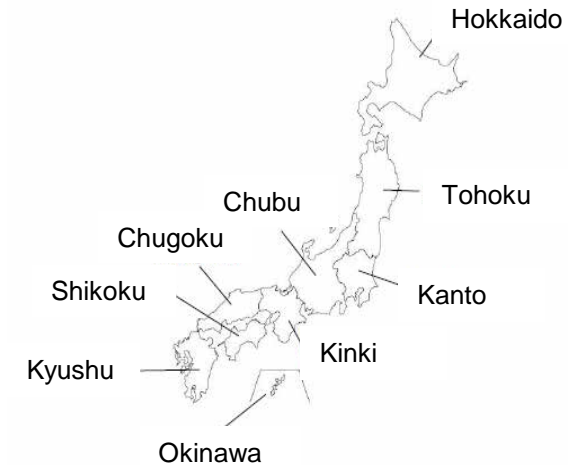
Because they believed it was good for health.

Binding of patient sera to *Toxocara canis* ES (excretory/secretory) Ag



Where is the most prevalent area of ascarid LMS?

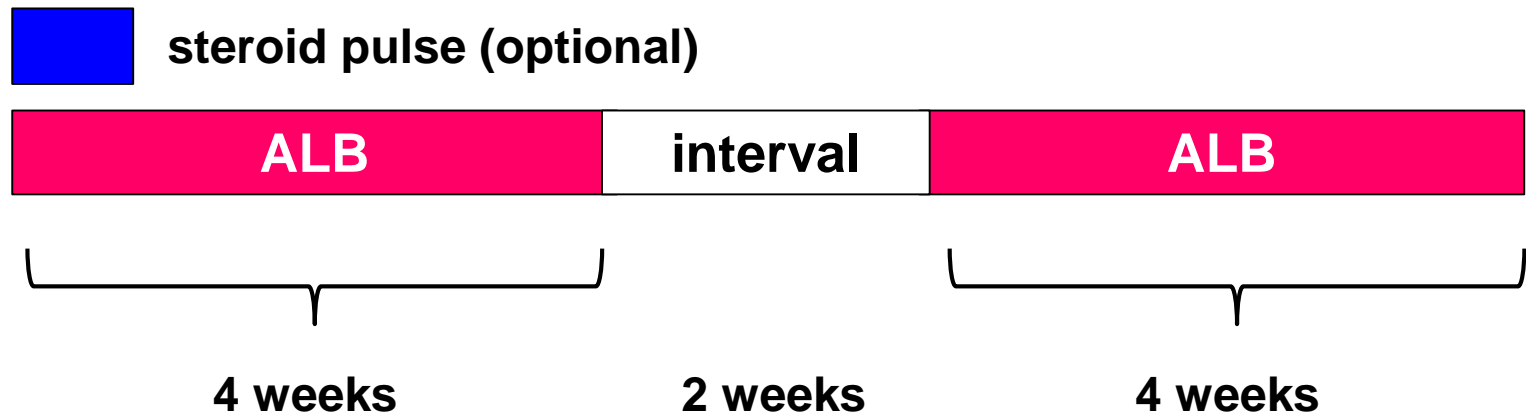
	Total examined cases	Positive cases	Negative cases	Positive rate (%)
Hokkaido/ Tohoku	173	17	156	9.8
Kanto	666	79	587	11.9
Chubu	378	47	331	12.4
Kinki	1,027	276	751	26.9
Chugoku/ Shikoku	405	68	337	16.8
Kyushu/ Okinawa	2,883	424	2,459	14.7



(Yoshida *et al.*, 2016)

What is effective treatment for ascarid LMS?

Albendazole 10-15 mg/kg for >4 weeks



(Hombu *et al.*, 2018)

How risky are raw beef and chicken?

◆ Serum samples



- **Japanese black cattle**

332 samples

Slaughterhouse

A: 153 samples

B: 179 samples



- **Free-range chicken**

178 samples

from 9 farms

- **Broiler chicken**

150 samples

Diagnose system for detection of ascarid infection

Screening test for anti-ascarid Abs

- *Ascaris suum*-SWAP* (As-SWAP) ELISA

*Soluble Worm Antigen Preparations



Positive

Discrimination of infecting species

- Pre-adsorbed larval-Excretory/Secretory (ES) Ag ELISA
 - Adsorption Ag: *Toxocara vitulorum*-SWAP · *Ascaridia galli*-SWAP
 - Detection Ag: *Toxocara canis* larval-ES antigen (Tc-ES)
Ascaris suum larval-ES antigen (As-ES)

Tc-ES > As-ES

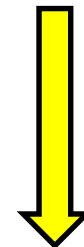


- Tc-ES Western Blot test



***Toxocara* spp.**

As-ES > Tc-ES



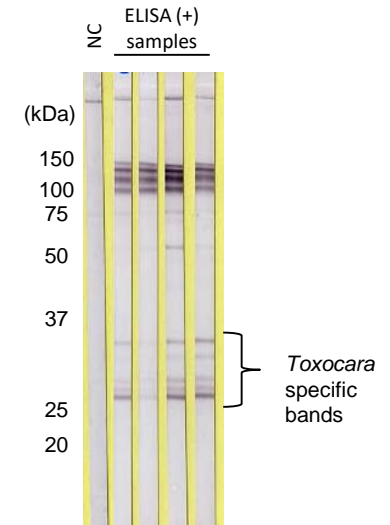
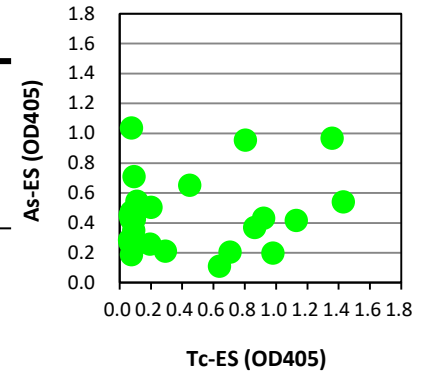
Ascaris suum



Detection of anti-*Toxocara*/*Ascaris* antibodies in beef cattle

	<i>Toxocara</i> spp.	<i>Ascaris</i> <i>suum</i>	Negative	Total
A	14	8	131	153
B	21	13	145	179
Total	35	21	276	332
(%)	(10.5%)	(6.3%)	(83.1%)	

anti-ascarid Ab (+): 16.8%





Detection of anti-*Toxocara*/*Ascaris* antibodies in chickens

		<i>Toxocara</i> spp.	<i>Ascaris</i> <i>suum</i>	Negative	Total
Broiler		0	0	150	150
Free-range chickens	A	0	0	21	21
	B	5	0	15	20
	C	3	0	17	20
	D	2	1	16	19
	E	0	0	25	25
	F	5	0	16	21
	G	0	0	12	12
	H	0	0	20	20
	I	6	0	14	20
Total		21 (12%)	1 (0.6%)	156 (87.6%)	178

anti-ascarid Ab (+): 12.6%

How to prevent ascarid infections in domestic animals?

Give the information about the infection to farmers!

- **Keep dogs and cats out of the barn**
- **Keep animals separately**
- **Deworm dogs, cats and pigs**
- **Do not feed the feedstuff potentially contaminated with ascarid eggs or larvae**

How to prevent ascarid LMS in humans?

- Deworm dogs, cats and pigs
- Reduce contact with contaminated soil
- Wash hands after taking care of animals and working with soil
- Wash vegetables before eating

Avoid consumption of raw meat and liver!

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