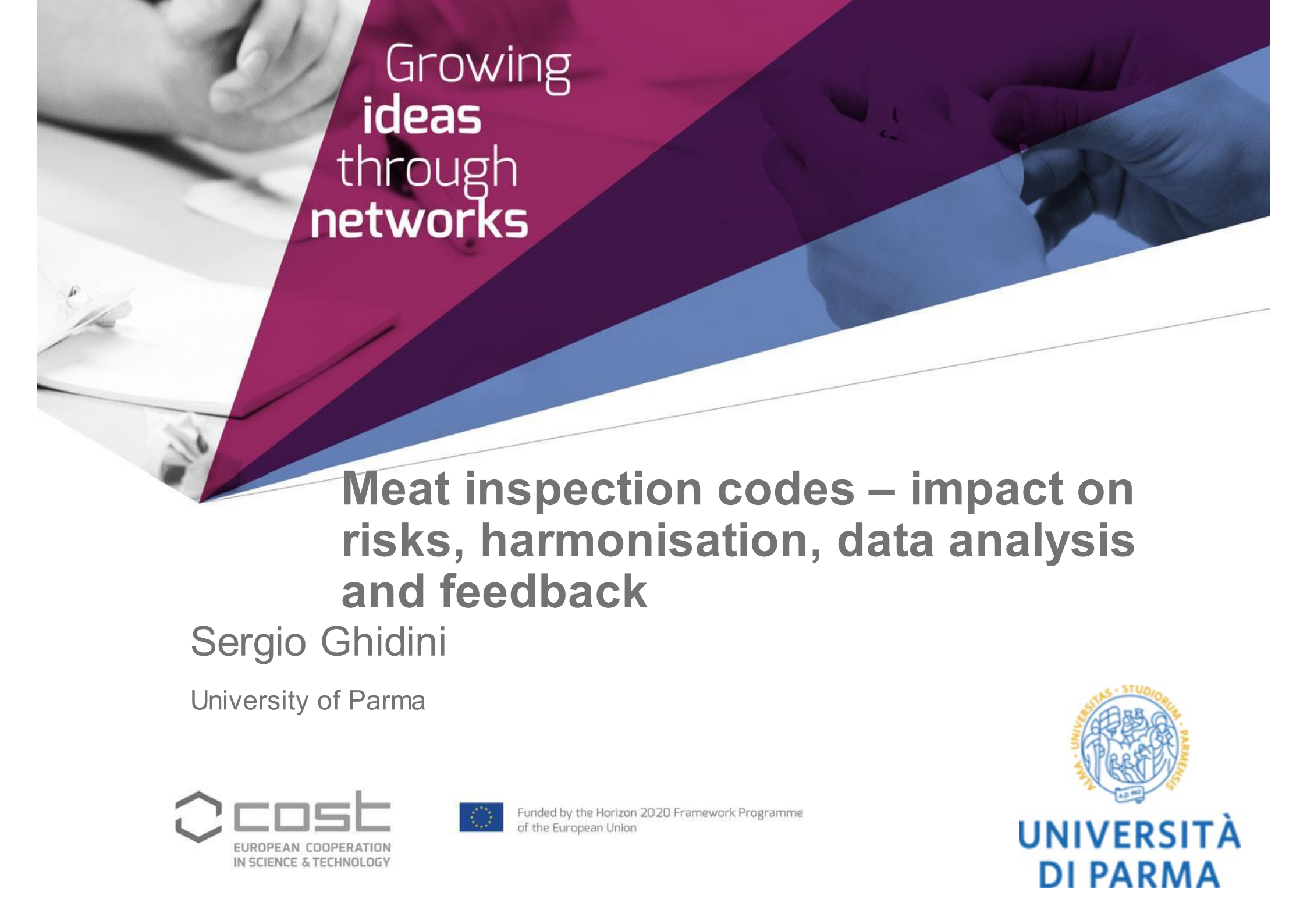




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Meat inspection codes – impact on risks, harmonisation, data analysis and feedback

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- WG4 impact of changes and alternatives to traditional meat inspection
- We have focused on the lesion code systems in place (questionnaire just sent out)
 - Used in relation to meat inspection of pigs
- Regulation (EU) 2019/627 applies in all Member States
 - But national coding systems are in place along with associated judgement
- Would it be possible to harmonize the coding systems?

DIFFERENCES IN TERMINOLOGY AND FREQUENCY OF MEAT INSPECTION LESIONS IN FINISHING PIGS IN SEVEN EUROPEAN COUNTRIES



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- Information about lesion code systems in place gathered from seven European countries
- Denmark, Finland, Germany, Italy, Norway, Portugal, and Spain
- Representing a broad variety of European pig production
- Pig meat inspection data from 2019 were collected
 - >1 M pigs examined in each country
 - Divided into total and partial condemnation
- Data used to compare systems, terminology and frequencies of lesion codes connected with partial or total condemnation



Description of coding systems

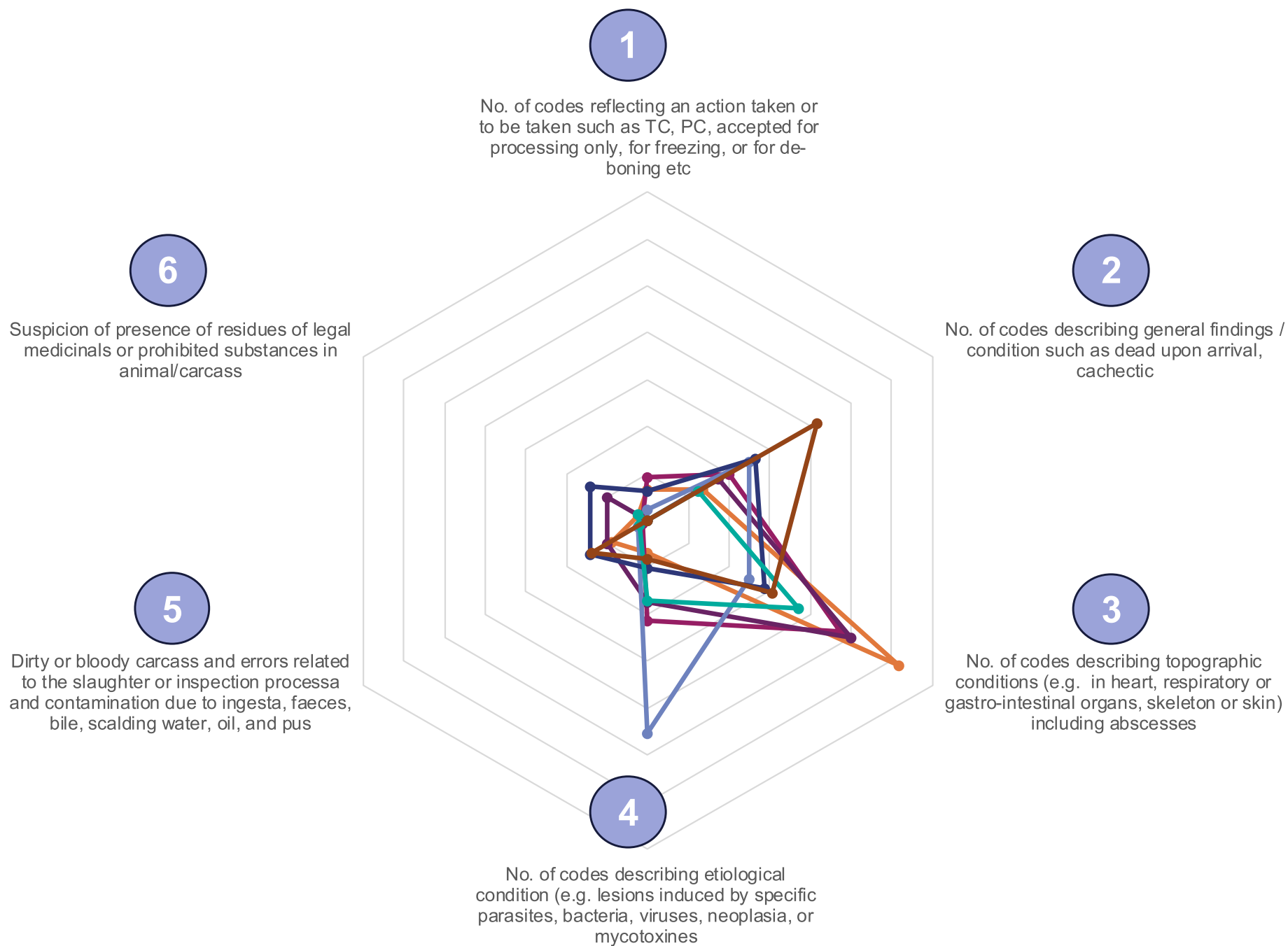
- Different number of codes in use in the 7 countries
- Some countries have separate lists for total and partial condemnation. Others use the same list (DK, Italy)
- Large variations on number of codes (from 44 for Italy to 207 for Portugal from which 138 for pigs)
- One code per condemned pig (Portugal) /more than two codes (Denmark up to 4) can be used per pig
- In some countries, one list for all animal ungulate species (Portugal) – in other countries, one list per species (DK)

Hence, different systems in place

- Different purposes, therefore varying levels of details
 - **Probably reflecting the national epidemiological situation, the local production, food safety culture, and the trade agreements in place**
- Will make it challenging to seek harmonization
- But we shall try...



Question	Denmark	Finland	Germany	Italy	Norway	Portugal	Spain
National lesion code system in place?	Yes	Yes	Yes	Yes, but not official	Yes	Yes	No, only at regional level
Total no. of codes in the system including ante-mortem (AM) and post-mortem (PM)	89	140 (+1 for accepted)	TC: 22 PC Carcass: 8 PC Organ: 12	44	49	TC: 138 PC: 56	36
No. of codes that can be used to describe one pig	4	Depends on the slaughterhouse	No limit	No limit	No limit	TC: 1 PC: several	No limit
No. of codes reflecting an action taken or to be taken such as TC, PC, accepted for processing only, for freezing, or for de-boning etc	6	12 (+1 for accepted)	0	1	3	0	0
No. of codes describing general findings / condition such as dead upon arrival, cachectic	6 AM codes and 6 PM codes	7 AM codes and 21 PM codes	7	11	13	24	2 AM codes and 13 PM codes
No. of codes describing topographic conditions (e.g. in heart, respiratory or gastro-intestinal organs, skeleton or skin) including abscesses	55	66	20	11	14	72	11
No. of codes describing etiological condition (e.g. lesions induced by specific parasites, bacteria, viruses, neoplasia, or mycotoxines	6	30	7	20	5	33	3
Dirty or bloody carcass and errors related to the slaughter or	8	2	4	1	7	4	5



meat inspection data sets from seven European countries

Question	Denmark	Finland	Germany	Italy	Norway	Portugal	Spain
Total No. of pigs slaughtered in country	16.6 M	1.8 M	53.6 M	11.5 M	1.6 M	4.2 M	53.0 M
No. of abattoirs in dataset	1 – the largest abattoir	All pig abattoirs	All pig abattoirs	3	1	All pig abattoirs in mainland Portugal	2
No. of pigs in dataset	3,968,106	1,788,400	53,561,424	952,224	196,773	4,219,242	3,460,187
Pig sub-population covered	Finisher pigs	Finisher pigs	Finisher pigs	Indoor-raised finisher pigs (heavy pigs >160 kg and >9 months old)	Finishing pigs, sows and boars	Fattening and breeding pigs, indoors raised or from free-range production	Indoor-raised finisher pigs only

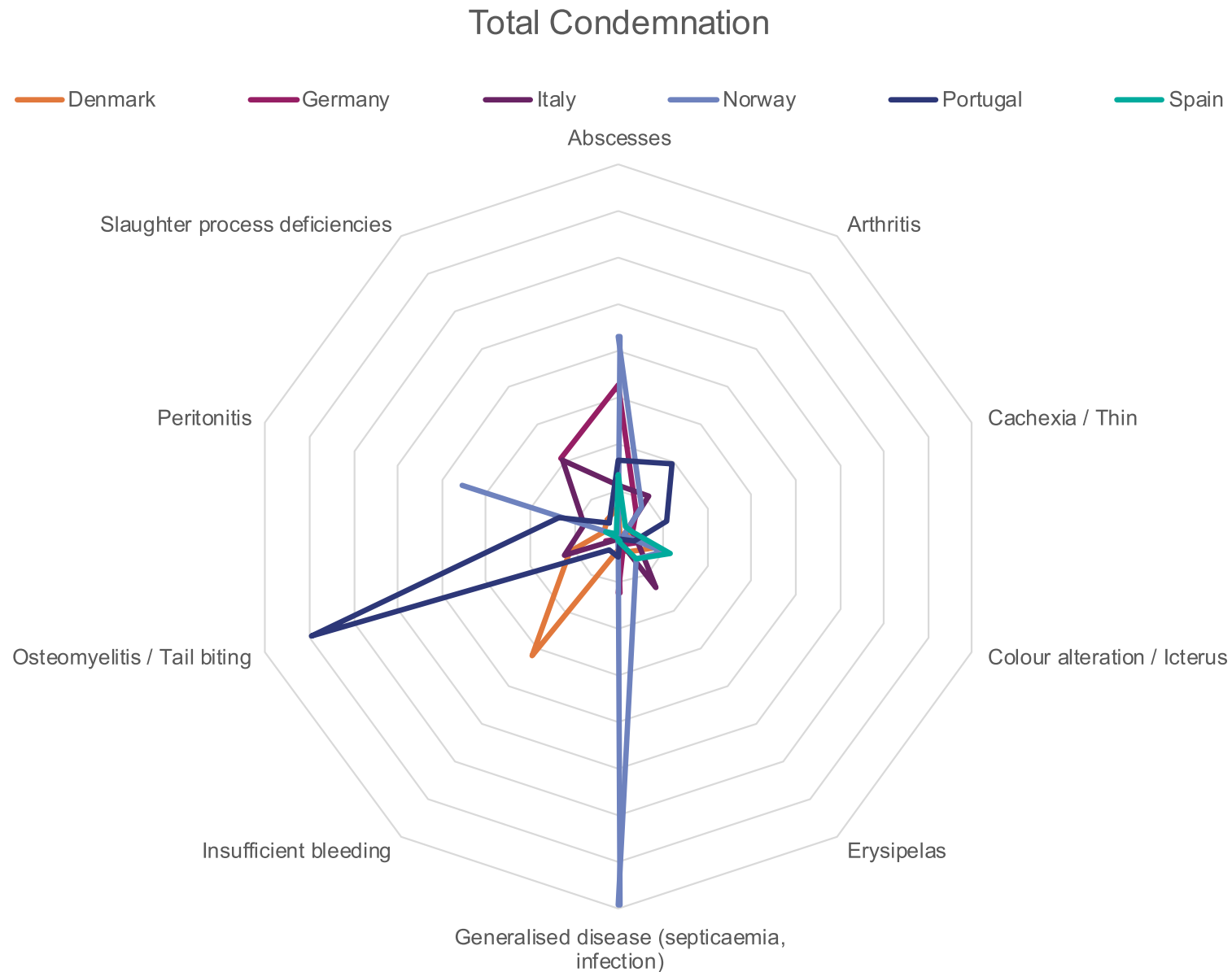
Absolute prevalence (%) for Total condemnations

Aggregated code	Denmark	Germany	Italy	Norway	Portugal	Spain
Abscesses	0.013	0.065	0.022	0.086	0.033	0.027
Arthritis	0.001	0.013	0.022	0.016	0.039	0.005
Cachexia / Thin	0.006	0.006	0.002	0.002	0.022	0.006
Colour alteration / Icterus	0.015	0.008	0.009	0.020	0.007	0.023
Erysipelas	0.008	0.004	0.027	0.012	<0.001	0.012
Generalised disease (septicaemia, infection)	0.006	0.024	0.001	0.159	0.009	0.002
Insufficient bleeding	0.063	0.001	<0.001	0.001	0.007	0.001
Osteomyelitis / Tail biting	0.022	0.006	0.025		0.139	0.001
Peritonitis	0.007		0.016	0.071	0.027	0.006
Slaughter process deficiencies	0.009	0.042	0.041	0.001	0.007	0.002

Total condemnation rate from 0.11% to 0.51%...

For Finland not the list for total condemnations, but the list of most common lesions

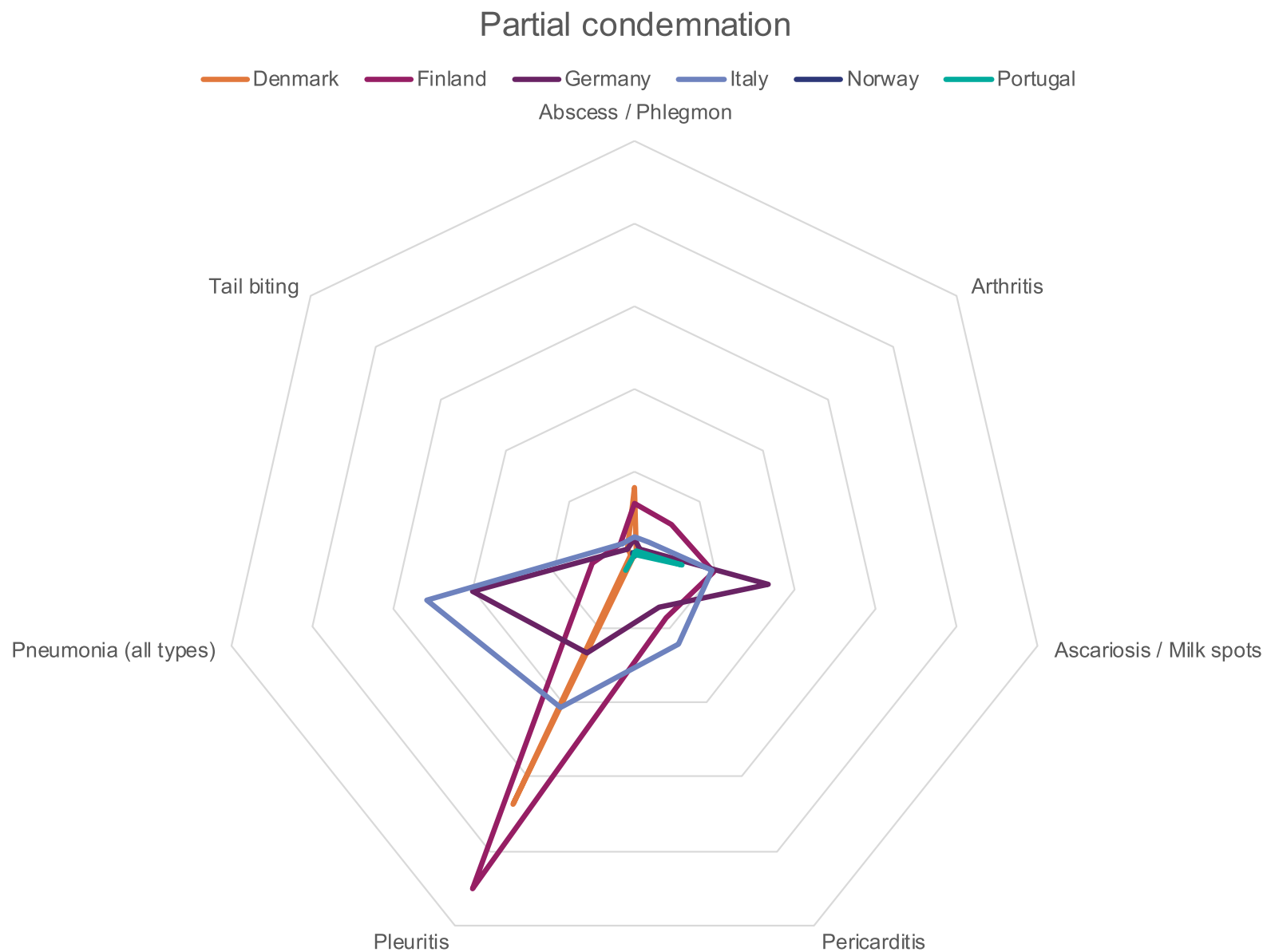
Absolute prevalence (%) for Total condemnations



Absolute prevalence (%) for partial condemnations

Lesion code	Denmark	Finland	Germany	Italy	Norway	Portugal
Abscess / Phlegmon	3,96	2,99	0,89	0,98	0,09	0,04
Arthritis	0,18	2,82	0,46	1,06	0,02	0,18
Ascariosis / Milk spots	0,07	4,97	8,33	4,78	0,06	2,99
Pericarditis	0,05	4,34	3,58	6,15	0,05	0,04
Pleuritis	16,8	22,5	6,64	10,4		1,18
Pneumonia (all types)	0,18	2,66	10,1	12,9	0,02	
Tail biting	0,47	1,02	0,47	0,94	0,06	0,00

Absolute prevalence (%) for partial condemnations



In brief

- different codes (number and meaning)
- different level of detail
- different systems (purposes, traditions, production)

Difficult to compare data →slaughterhouse as source of epiological indicators...

YES/NO

Further potential

- Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation)

Further potential and limitations (Reg. 1069/2009)

By products	criterion	destination	What inside	Potential
Class 1	SRM	destruction	Can contain prions	
Class 2	Organs with «lesions»	destruction	<u>Can</u> contain animal not human pathogens	Pet food? Protein recovery?
Class 3	commercial	Pet food	Can contain zoonotic pathogens	Heat treatment?

Further potential an limitations (Reg. 1069/2009)

- Can we improve the situation with a more appropriate coding?
- Can we save proteins we normally destroy? (class 2) → > sustainability
- Can we decide heat treatment for (class 3) by products in case HEI suggest it? → > safety

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Is all about codes?

Background

- 2014 Italy, need to test visual vs traditional meat inspection

METHODOLOGY ARTICLE

Open Access



Development and test of a visual-only meat inspection system for heavy pigs in Northern Italy

Sergio Ghidini^{1*} , Emanuela Zanardi¹, Pierluigi Aldo Di Ciccio¹, Silvio Borrello², Giancarlo Belluzi³, Sarah Guizzardi² and Adriana Ianieri¹

<https://bmcvetres.biomedcentral.com/articles/10.1186/s12917-017-1329-4>

Status

PROGRAMMA DI MACELLAZIONE

DEL

numero partita	allevamento	n° suini	TATGGI	prelievi vari	lesioni MAE% PP% BPC%		
68		131	0352053		50	20	10
69		133	0030004		10	10	5
70		20	0702032		20 20 20		
71		131	2024128		20	20	30
72		127	1140001		40	60	20
73		136	0500043		70	20	50
74		127	1265007		10	30	50
75		132	1223549				
76		130	07028 1360533				
77		140	0222017				
78		130	0252068	x	40	30	30
79		258	1200001	x	50	10	50
80		132	0720002				
81		135	0060039				
		135	0060039				

List of codes

APPARATO	TASTO LESIONE
Respiratorio	polmonite pleuro polmonite
Digerente	epatiti epatosi/epatodistrofie peritonite/periepatite enterite
Genito-Urinario	nefrite nefrosi criptorchide
Cardio Circolatorio	miocarditi pericarditi
Tegumentario	dermatite mal rosso
Locomotore	artrite alterazione colore muscoli (PSE/DFD) edema/emaciazione
Altro	ittero ascessi neoformazioni/tumori imbrattamento traumatismi linfadenopatia splenomegalia petecchie



tool



Veterinarians

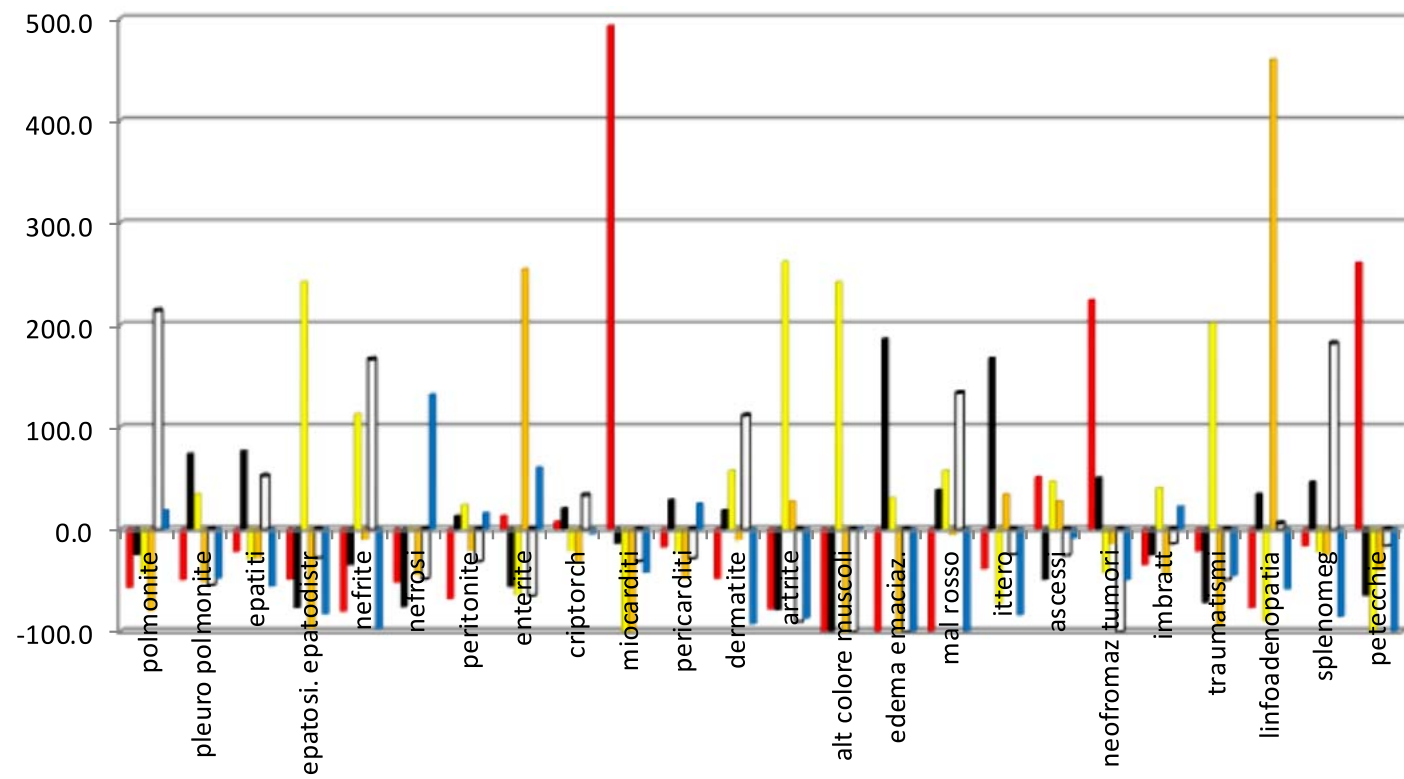
- 6 contracted veterinarians
- Training for tool use

Evaluation pre guidelines

- After around 5000 pigs/each
- Evaluates deviation from mean

Evaluation pre guidelines

- Valid for common codes
- Not for “exotic” codes



Evaluation pre guidelines

	Topolino	Minnie	Orazio	Paperina	Paperino	Clarabella
	% patologie	% patologie	% patologie	% patologie	% patologie	% patologie
polmonite	3,49	6,15	4,61	1,66	25,82	9,72
pleuro polmonite	6,49	22,47	17,37	6,21	5,91	6,69
epatiti	13,41	30,41	12,02	12,29	26,27	7,59
epatosi. epatodistr	1,03	0,46	6,93	0,06	1,47	0,34
nefrite	0,10	0,33	1,07	0,45	1,34	0,01
nefrosi	0,17	0,08	0,35	0,19	0,18	0,82
peritonite	0,06	0,22	0,25	0,16	0,14	0,23
enterite	0,15	0,06	0,05	0,46	0,05	0,21
criptorch	0,15	0,16	0,11	0,09	0,18	0,13
miocarditi	0,06	0,01	0,00	0,00	0,01	0,01
pericarditi	2,72	4,26	2,56	1,71	2,37	4,13
dermatite	0,47	1,08	1,43	0,81	1,92	0,06
artrite	0,01	0,01	0,24	0,08	0,01	0,01
alt colore muscoli	0,00	0,00	0,02	0,00	0,00	0,01
edema emaciaz.	0,00	0,01	0,01	0,00	0,00	0,00
mal rosso	0,00	0,03	0,03	0,02	0,05	0,00
ittero	0,02	0,09	0,01	0,05	0,03	0,01
ascessi	1,04	0,35	1,01	0,88	0,52	0,63
neofromaz tumori	0,03	0,02	0,01	0,01	0,00	0,01
imbratt	1,75	2,01	3,77	1,50	2,33	3,29
traumatismi	0,51	0,18	1,97	0,04	0,33	0,35
linfadenopatia	0,02	0,12	0,01	0,52	0,10	0,04
splenomeg	0,17	0,31	0,16	0,16	0,59	0,03
petecchie	0,06	0,01	0,00	0,01	0,01	0,00
% lesioni	31,91	68,83	53,97	27,35	69,62	34,29

Training

- Guidelines for lesion detection
- Guidelines for codes assignation

Evaluation post guidelines

	Minnie	Topolino	Clarabella	Orazio	TOT
polmonite	5,43	1,61	11,88	2,41	1911
pleuro polmonite	29,42	17,39	16,81	19,64	6756
epatite	32,17	16,46	10,69	14,33	5594
epatosi epatodistrofia	0,33	0,49	0,17	4,61	618
nefrite	0,07	0,37	0,08	0,32	71
nefrosi	0,30	0,49	0,63	0,22	137
peritonite	0,23	0,09	0,22	0,60	113
enterite	0,58	0,37	0,78	0,75	224
criptorchide	0,61	0,32	0,20	0,34	115
miocardite	0,00	0,04	0,01	0,01	4
pericardite	6,32	2,45	2,92	2,16	1059
dermatite	4,38	0,53	1,88	3,20	858
artrite	0,42	0,67	0,26	1,68	291
alt. colore muscoli	0,00	0,00	0,00	0,00	0
edema emaciazione	0,04	0,00	0,00	0,02	4
mal rosso	0,05	0,02	0,00	0,00	4
ittero	0,02	0,07	0,02	0,02	9
ascessi	1,17	1,23	1,10	1,43	422
neofromaz tumori	0,00	0,16	0,00	0,00	9
imbrattamento	4,29	3,77	3,96	2,46	1161
traumatismi	1,17	0,65	2,23	2,84	674
linfadenopatia	0,12	0,04	0,12	0,03	25
splenomegalia	0,81	0,61	0,15	0,67	176
petecchie	0,00	0,00	0,00	0,00	0
% lesioni	45,9	47,8	54,1	57,7	52,0

Official (ca) Vets

	Trad 1	Trad 2	Trad 3	Trad 4	Trad 5	Trad 6	Trad 7	Trad 8	Trad 9
polmonite	5,41	6,72	12,65	2,20	2,38	0,00	11,04	2,75	9,19
pleuro polmonite	10,60	8,01	14,81	13,52	7,13	7,86	10,60	9,64	14,09
epatiti	16,83	9,47	33,88	14,58	11,29	11,43	22,94	4,33	9,93
epatosi epatodistrofia	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
nefrite	0,07	0,06	0,78	0,00	0,00	0,00	0,05	0,00	0,00
nefrosi	0,08	0,22	0,02	0,00	0,00	0,00	0,05	0,00	0,00
peritonite	0,17	0,04	0,08	0,07	0,00	0,00	0,05	0,00	0,00
enterite	0,92	0,08	0,26	0,57	0,00	0,00	0,10	0,00	0,00
criptorch	0,27	0,00	0,02	0,00	0,00	0,00	0,14	0,10	0,00
miocarditi	0,00	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00
pericarditi	1,09	1,58	1,68	0,64	2,67	0,00	2,30	2,26	4,04
dermatite	1,22	0,23	5,09	0,39	0,15	0,00	0,14	0,00	0,00
artrite	0,24	0,35	0,77	0,25	0,89	0,00	0,34	0,69	0,00
alt. colore muscoli	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
edema emaciaz.	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
mal rosso	0,02	0,00	0,00	0,04	0,00	0,00	0,00	0,00	0,00
ittero	0,01	0,01	0,03	0,00	0,00	0,00	0,00	0,00	0,00
ascessi	0,97	1,28	1,25	1,84	0,59	0,36	1,44	0,88	0,12
neofromaz tumori	0,00	0,01	0,02	0,00	0,15	0,00	0,00	0,00	0,00
imbratt	1,89	1,40	1,49	2,06	1,78	1,07	2,69	3,15	2,08
traumatismi	0,66	0,08	0,06	0,07	0,00	0,00	0,05	0,00	0,00
linfadenopatia	0,04	0,00	0,00	0,04	0,00	0,00	0,00	0,00	0,00
splenomegalia	0,61	0,13	0,18	0,07	0,15	0,00	0,00	0,00	0,12
petecchie	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
% lesioni	41,1	29,7	73,1	36,3	27,2	20,7	51,9	23,8	39,6

Guidelines examples

Pneumonia

- Consider both acute or chronic
- Pneumonia when one whole lobe involved or parts of two contralateral lobes
- Consider abscesses in lungs as pneumonia



Guidelines examples

Pleurisy

- presence of adhesions on the carcass and / or pulmonary parenchyma leaks is found.
- evident presence of fibrin on the visceral layer of the pleural layer



Guidelines examples

Relevant for «quantitative» codes

- dirtytness
- skin lesions

Define a threshold



Conclusions



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- Codes must be supported by guidelines
- Only clear guidelines can generate reliable data
- Only solid and reliable data can be used for comparison and trend evaluation