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식품, 식육의 안전성과 양돈 현장의 대책



김현일 대표
(주)젠티팜

주요내용

Ⅰ. 최근 축산물 안전 관련 이슈 Ⅱ. 점점 더 중요시되는 식육 위생
Ⅲ. 우리나라의 현실은? Ⅳ. 항생제 내성 문제

1. 최근 축산물 안전 관련 이슈 〈2017.08.15〉

경과

- 2016년 11월 : 네덜란드 Food Safety Agency가 처음으로 Fipronil 오염 감지(finds no danger to public health)
- 2017년 1월 : 벨기에 회사 Poultry Vision이 닭이 구제를 위해 fipronil이 들어 있는 세제 사용
- 2017년 6월 : 벨기에 Food safety authority 네덜란드산 계란에서 "light contamination" 확인
- 2017년 7월 : 네덜란드에 통보했으나 회신이 없자 EU에 도움 요청 / Dega16이 7개 국가 (나중에 17개 국가)에 사용중인 것 확인
- 2017년 8월 : 네덜란드 경찰 Chickfriend 관계자 구속

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EU 8개국 오염 계란 유통



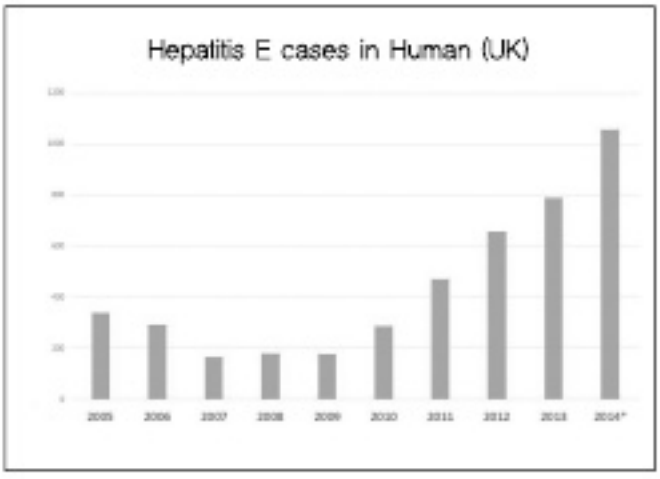
중요한 포인트

- 왜 fipronil은 산란계 사용이 금지되어 있을까?
- 왜 fipronil을 산란계에서 쓰게 됐을까?
- Fipronil의 대안은?

〈2017.08.25〉



영국에 있는 TESCO 매장 사진. 미국의 월마트, 프랑스의 까르푸와 더불어서 영국의 대표 할인 매장으로 잘 알려져 있다. 최근 감염된 영국 내 환자들의 쇼핑 데이터를 분석해본 결과 공통적으로 TESCO에서 쇼핑을 한 사실이 확인되었고 더 정밀하게 분석해 보니 TESCO 자체 브랜드의 소시지를 소비했다고 발표했다.





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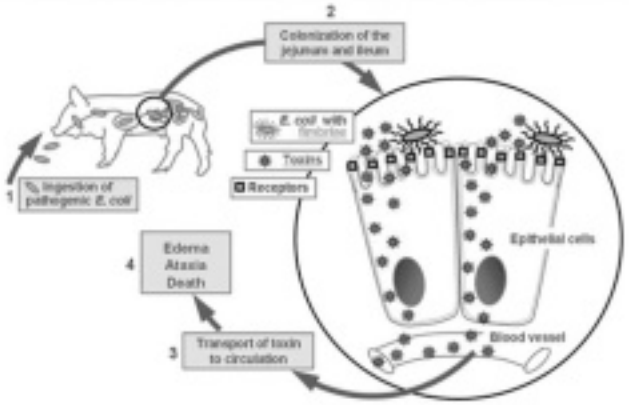
〈2017.09.07〉

맥도널드 조주연 대표 공식사과

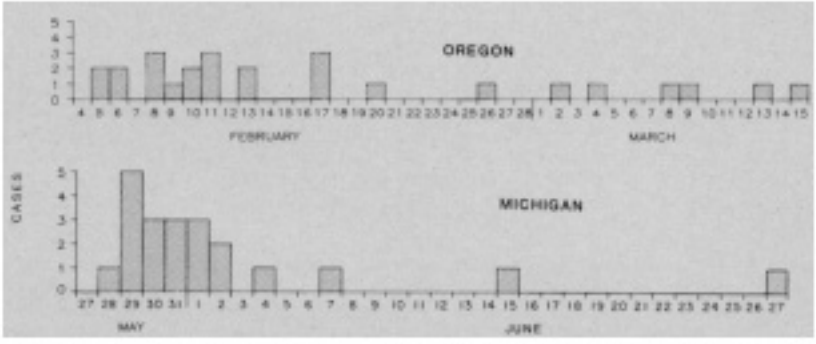


햄버거를 먹고 설사 및 복통 (2016년 9월 25일)





햄버거 패티에 들어있던 세균이 증상을 나타내기 위해서는 일단 사람의 장관 내에 자리를 잡은 다음 독소를 생성해야 한다. 그래서 햄버거를 먹은지 2시간만에 증상이 나타나기 어렵다는 의견이 많은 것이고, 햄버거를 먹은지 2시간만에 증상이 나오려면 해당 패티가 아주 많은 세균에 오염이 되어 있어야 하는데, 이 경우 한 명에서만 발생하기 어렵다는 점도 지적되고 있다.



1982년 미국에서 발병한 장출혈성대장균증. 오레건주의 경우 1982년 2월부터, 미시건주의 경우 1982년 5월부터 발생하였다. 전체 43개 케이스에 대해서 역학조사를 해보니 상당수가 맥도널드 햄버거 섭취와 관련이 있었다(Riley, Remis et al, 1983).

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2. 점점 더 중요시되는 식육 위생

인수공통전염병 케이스(영국)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Campylobacteriosis	52212	52679	58140	55787	65211	70371	72321	72629	66575	70353
Salmonellosis (non-typhoidal)	13708	14084	13279	11517	10486	9692	9395	8792	8461	9121
Cryptosporidiosis	5413	4728	3668	4937	5647	4604	3573	6655	4111	4597
VTEC O157	958	1286	1120	1247	1315	1052	1484	1260	1015	1185
Hepatitis E	339	292	166	180	178	287	472	657	788	1054
Lyme disease	693	940	1027	1098	1093	1213	1189	1249	1060	955
Pasteurellosis	425	490	457	497	559	586	668	666	717	776
Toxoplasmosis	114	123	146	457	494	414	364	328	325	370
Non-O157 VTEC	11	20	25	36	45	44	37	59	100	305
Listeriosis	223	208	254	207	234	179	165	185	178	188
Leptospirosis	60	50	81	76	56	42	52	78	50	78
Taeniasis	76	89	101	100	72	114	94	70	79	70
Yersiniosis	76	62	78	62	62	54	55	55	60	65
Q fever	61	200	71	68	31	55	114	126	47	61
Mycobacterium bovis	26	29	24	23	29	36	39	39	30	39
Psittacosis	61	30	39	63	60	58	41	37	30	32
Hydatid disease	11	14	10	18	9	7	15	6	13	16
Brucellosis	12	16	15	15	18	12	25	14	14	11
Hantavirus	0	0	0	0	0	0	1	1	4	5
Toxocariasis	5	2	1	2	4	12	4	7	3	5
Streptococcus suis	3	4	2	7	2	4	1	3	3	3
Anthrax	0	1	0	1	13	39	0	5	2	2
Trichinellosis	0	0	0	0	0	1	0	0	0	1
Avian influenza	0	1	4	0	0	0	0	0	0	0
Rabies 'classical'	1	0	0	1	0	0	0 1#		0	0
Rabies EBLV	0	0	0	0	0	0	0	0	0	0
vCJD15‡	5	5	5	2	3	3	5	0	1	0

WHO 인수공통전염병(200가지 이상)



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OIE 홈페이지

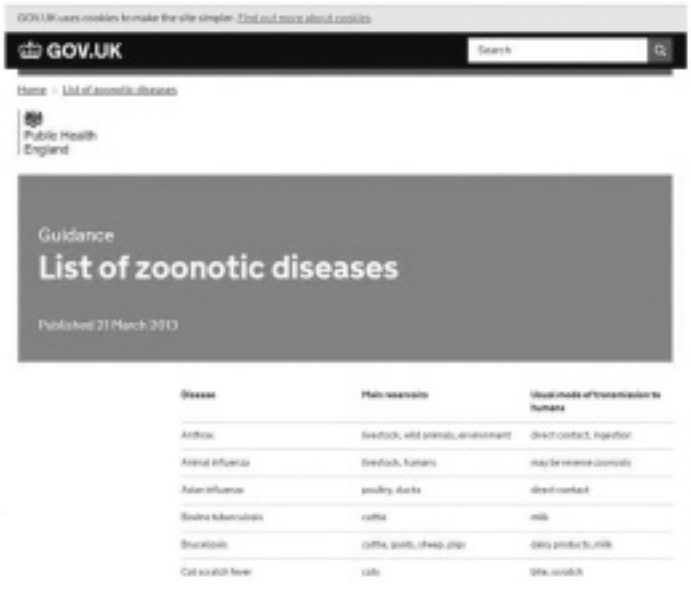


미국 CFSPH 홈페이지(67)



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영국 정부가 관리하는 인수공통전염병(43)



DISCONTOOLS 홈페이지(21)



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DISCONTOOLS 홈페이지(21)



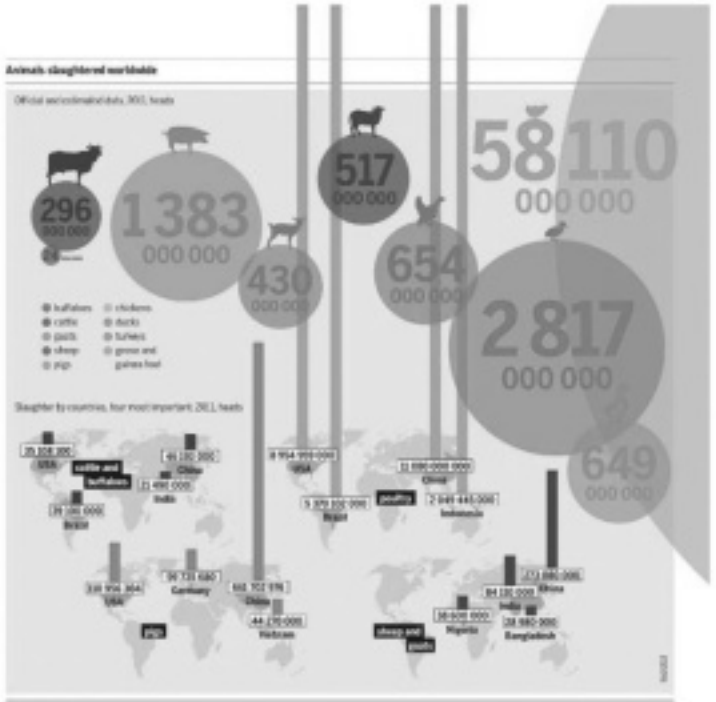
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인수공통전염병 비교 (80)

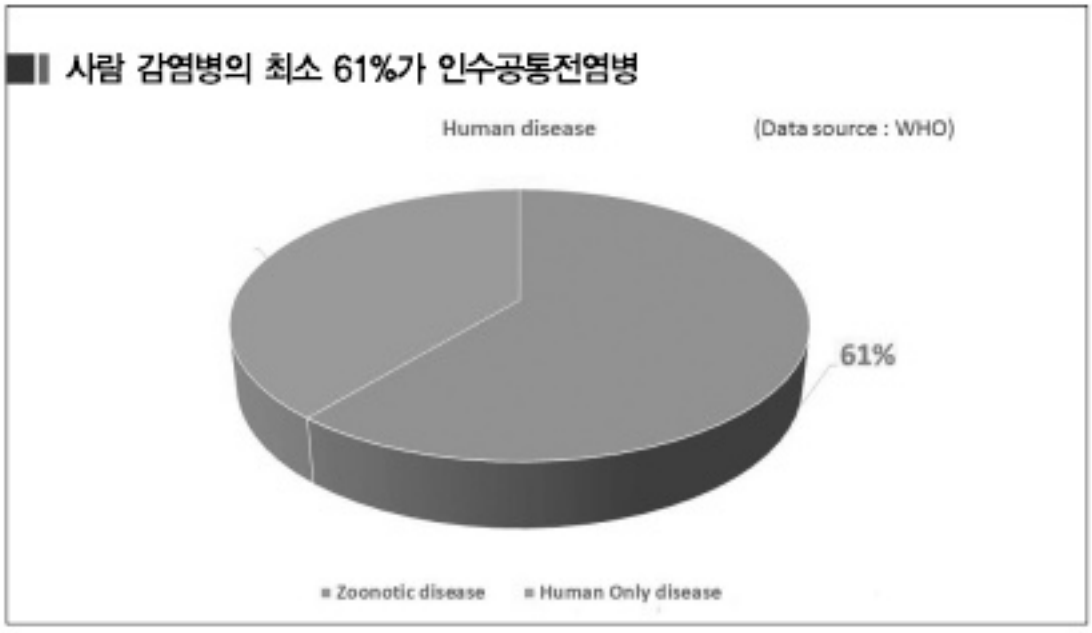
Diseases	CFSPH	UK Gov.	Discontools
Acariasis	○		
Anthrax	○	○	○
Animal influenza	○	○	
Avian influenza	○	○	
Baylisascariasis	○		
Bovine tuberculosis	○	○	○
Bovine Spongiform Encephalopathy			○
Brucellosis	B. abortus/Canis/melitensis/suis/Marine Mammals	○	○
Campylobacteriosis	○	○	○
Cat scratch fever	○	○	
Chagas (Trypanosomiasis-American)	○		
Chagas (Trypanosomiasis-African)			○
Chlamydiosis (Avian/Mammalian)	○		○
Contagious Ecthyma	○		
Crimean-Congo Hemorrhagic Fever	○		○
Cryptococcosis	○		
Cysticercosis		○	○
Cryptosporidiosis	○	○	○
Dermatophytosis	○		
Eastern Equine Encephalomyelitis	○		
Equine Encephalomyelitis	○		
Echinococcosis	○		○
Escherichia coli	O-157/H7		○
Enzootic abortion		○	
Erysipeloid		○	
Ebola, Crimean-Congo HF, Lassa and Marburg viruses		○	
Fish tank granuloma		○	
Giardiasis	○		
Glanders	○		
Haemorrhagic colitis		○	
Hantavirus syndromes	○	○	
Hendra	○		
Hepatitis E		○	○
Hookworms	○		
Hydatid disease		○	
Influenza	Animal (Avian / Swine	○	
Larva Migrans	○		
Leishmaniasis	○		○

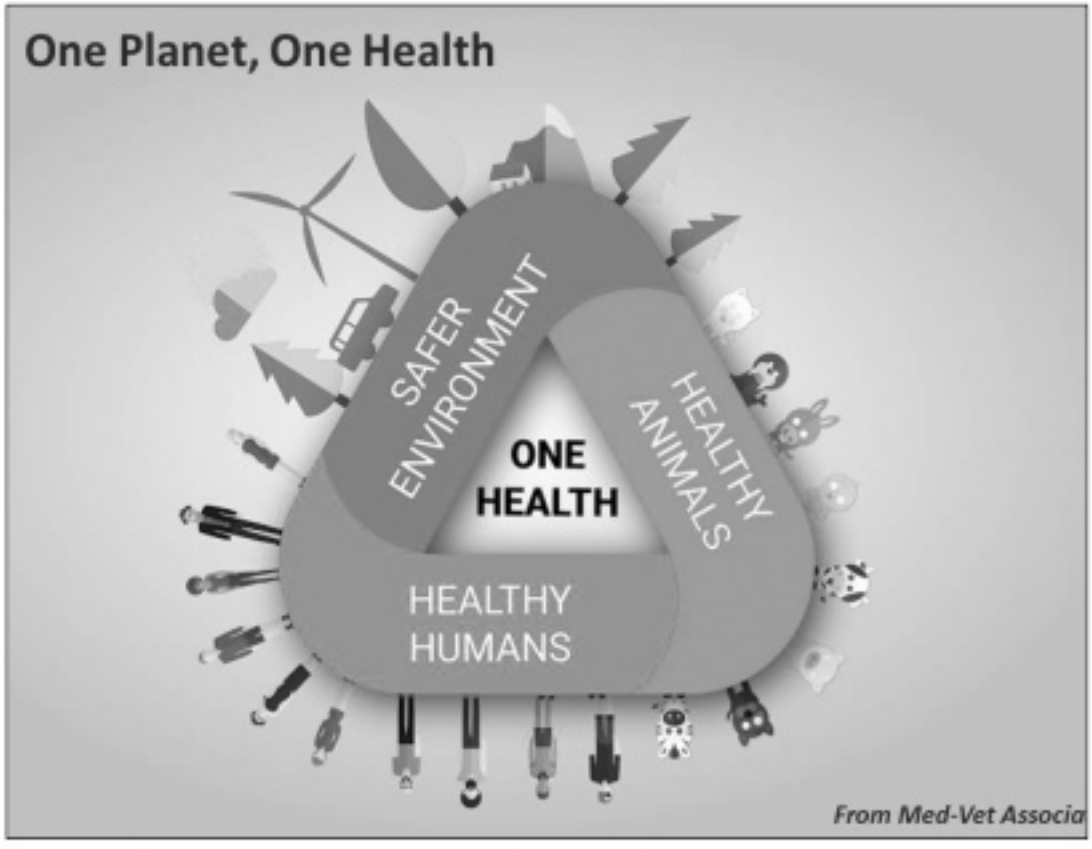
Diseases	CFSPH	UK Gov.	Discontools
Leptospirosis	○	○	○
Listeriosis		○	
Lassping Ill	○	○	
Lyme disease	○	○	
Lymphocytic choriomeningitis	○	○	
Marburg Virus Disease	○		
Melioidosis	○		
Monkeypox	○		
Mycobacteriosis	○		
Newcastle Disease	○		
Nipha	○		○
Orf (Parapox)		○	○
Pasteurellosis		○	
Plague	○	○	
Psittacosis	○	○	
Q fever	○	○	○
Rabies	○	○	○
Rat bite fever (Haverhillfever)	○	○	
Rift Valley fever	○	○	
Ringworm	○	○	
Rocky Mountain Spotted Fever	○		
Salmonellosis	(Serotypeshold /Reptile Associated		○
Sarcocystosis	○		
Sporotrichosis	○		
Streptococcal sepsis	○	○	
Taenia	○		
Tickborne encephalitis	○	○	
Toxocariasis	○	○	
Toxoplasmosis	○	○	
Trichinellosis	○	○	
Trichuriasis	○		
Tularemia	○	○	
Typhus Fever	○		
Venezuelan EquineEncephalomyelitis	○		
Vesicular somatitis	○		
Viral Hemorrhagic Fever (Arenavirus)	○		
Viral Hemorrhagic Fever (Filavirus)	○		
West Nile fever	○	○	
Western EquineEncephalomyelitis	○		
Zoonotic diphtheria		○	
	67	43	23

Different Animal population and density



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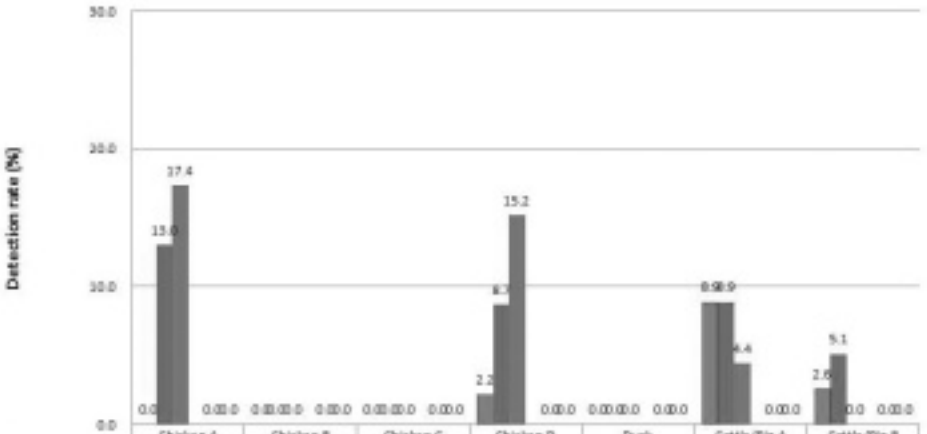




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3. 우리나라의 현실은?

실제 도축장에서의 검출되는 세균들



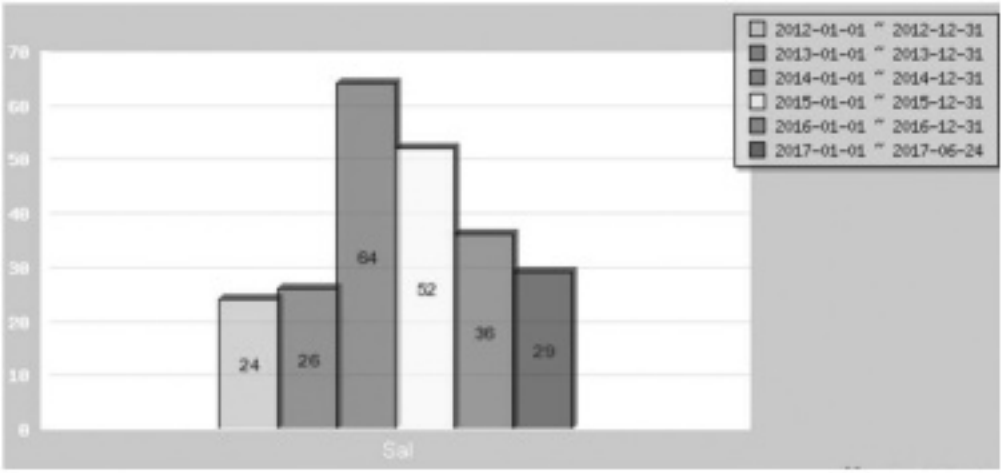
	Chicken A	Chicken B	Chicken C	Chicken D	Duck	Cattle/Pig A	Cattle/Pig B
Salmonella spp.	0.0	0.0	0.0	2.2	0.0	8.9	2.6
L.monocytogenes	15.0	0.0	0.0	8.7	0.0	8.9	5.1
S.aureus	17.4	0.0	0.0	15.2	0.0	4.4	0.0
C.coli	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C.jejuni	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EHEC	0.0	0.0	0.0	0.0	0.0	0.0	0.0

인수공통전염병 케이스(영국)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*
Campylobacteriosis	52212	52679	58140	55787	65211	70371	72321	72629	66575	70353
Salmonellosis (non-typhoidal)	13708	14084	13279	11517	10486	9692	9395	8792	8461	9121
Cryptosporidiosis	5413	4728	3668	4987	5647	4604	3573	6655	4111	4597
VTEC O157	958	1286	1120	1247	1315	1052	1484	1260	1015	1185
Hepatitis E	339	292	166	180	178	287	472	657	788	1054
Lyme disease	693	940	1027	1098	1093	1213	1189	1249	1060	955
Pasteurellosis	425	490	457	497	559	586	668	666	717	776
Toxoplasmosis	114	123	146	457	494	414	364	328	325	370
Non-O157 VTEC	11	20	25	86	45	44	37	59	100	305
Listeriosis	223	208	254	207	234	179	165	185	178	188
Leptospirosis	60	50	81	76	56	42	52	78	50	78
Taeniasis	76	89	101	100	72	114	94	70	79	70
Yersiniosis	76	62	78	62	62	54	55	55	60	65
Q fever	61	200	71	68	31	55	114	126	47	61
Mycobacterium bovis	26	29	24	23	29	36	39	39	30	39
Psittacosis	61	80	89	63	60	58	41	37	30	32
Hydatid disease	11	14	10	18	9	7	15	6	13	16
Brucellosis	12	16	15	15	18	12	25	14	14	11
Hantavirus	0	0	0	0	0	0	1	1	4	5
Toxocariasis	5	2	1	2	4	12	4	7	8	5
Streptococcus suis	3	4	2	7	2	4	1	3	3	3
Anthrax	0	1	0	1	13	89	0	5	2	2
Trichinellosis	0	0	0	0	0	1	0	0	0	1
Avian influenza	0	1	4	0	0	0	0	0	0	0
Rabies 'classical'	1	0	0	1	0	0	0‡		0	0
Rabies EBLV	0	0	0	0	0	0	0	0	0	0
vCJD‡	5	5	5	2	3	3	5	0	1	0

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살모넬라 (MD : 3.60 / DVM : 3.25)



-, Zoonotic *Salmonella* infections cause approximately 130,000 illnesses annually in the United States (Anderson, Marsden-Haug et al, 2017),
-, Human Salmonellosis by Salmonella typhimurium : England (206 cases, 1989)
-, Pork-related serotypes such as **Salmonella Typhimurium and Salmonella Derby** may become a serious human health hazard in the near future (Boyen, Haesebrouck et al, 2008)

살모넬라(*Salmonella*)

– 대표적인 동물 유래 식중독균

■ **살모넬라 식중독 감염 비율**

- In EU
  - 77% caused by Salmonella
- In USA
  - 40% caused by Salmonella
- In Korea
  - 3rd frequent pathogen

국내 식중독 원인균별 순위

순위	원인균	%
1	노로바이러스	11.48
2	병원성대장균	10.74
3	**살모넬라**	**9.63**
4	황색포도상구균	7.41
5	장염비브리오균	7.04
6	바실러스세레우스	5.56
7	캠필로박터제주니	5.19
8	자연독	2.22
9	클로스트리디움퍼프리젠스	1.85
10	기타바이러스	0.74

질병관리본부, 2010

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인체 살모넬라 감염증 중 상당수가 돈육 유래

Table 1
Salmonella isolated from pork in various countries*

Country	Year	Sampling	Sample	All serotypes		*Salmonella* Typhimurium %Pos
				N	%Pos	
USA	1999	Post-harvest	Raw meat	209	3.3	ND
Great Britain	1999	Harvest	Carcasses	2509	5.3	2.1
Vietnam	2000	Post-harvest	Raw meat	136	69.9	ND
Mexico	2001	Post-harvest	Raw meat	339	58.1	5.1
Belgium	2004	Harvest	Raw meat	374	12.3	4.0
Denmark	2004	Harvest	Carcasses	34038	0.8	0.3
Finland	2004	Harvest	Carcasses	6576	0	–
Germany	2004	Harvest	Raw meat	4744	0.5	0.3
Hungary	2004	Harvest	Raw meat	8257	1.3	0.4
Italy	2004	Harvest	Raw meat	256	4.3	1.2
Italy	2004	Harvest	Carcasses	1096	3.6	0.9
Latvia	2004	Harvest	Raw meat	185	1.1	–
Malta	2004	Harvest	Raw meat	400	32.8	–
Poland	2004	Harvest	Raw meat	895	0.2	–
Portugal	2004	Harvest	Raw meat	256	15.2	–
Spain	2004	Harvest	Raw meat	147	10.2	–

* Data are from references Zhao et al. (2001), EFSA (2005), Davies et al. (2004), Phan et al. (2005), and Zaidi et al. (2006).

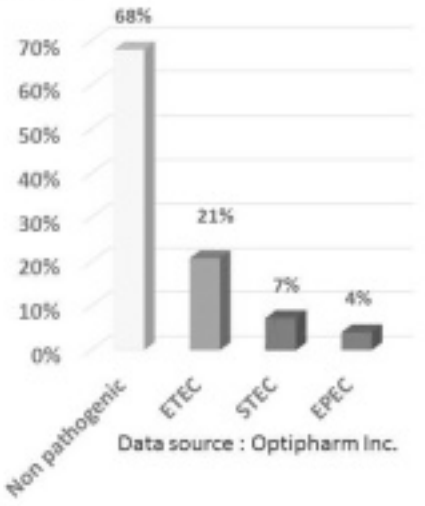
It has been estimated in various European countries that 15–23% of all cases of salmonellosis in humans, are related to the consumption of pork (Borch et al., 1996; Berends et al., 1998; Steinbach and Hartung, 1999; Van Pelt et al., 2000)

살모넬라의 항생제 내성

Antimicrobial	No. of positive	
Aminoglycosides		
Gentamycin	7	11.9%
Kanamycin	15	25.4%
Sterptomycin	59	100%
Penicillins		
Ampicillin	18	30.5%
Cephems		
Cephalothin	7	11.9%
Folate pathway inhibitors		
Trimethoprim/sulfamethoxazole	21	35.6%
Phenicols		
Chloramphenicol	24	40.7%
Quinolones		
Nalidixic acid	4	6.8%
Tetracyclines		
Tetracycline	59	100%
β-lactam/β-lactamase inhibitor combinations		
Amoxicillin/clavulic acid	6	10.2%

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대장균 감염증



(Melton-Celsa 2014)

Toxin type(s)	Prototype strain used for determination of stx subtype[a]	Linked with serious human disease; difference(s) from prototype toxin[b]	Reference(s)
Stx	3038T	Yes	(133)
Stx1a	EDL933 (makes Stx1a and Stx2a)	Yes	(113)
Stx1c	DG131/3	No, immunologically distinct	(134, 135)
Stx1d	MRHE3	No, immunologically distinct, less potent	(136)
Stx2a	EDL933 (makes Stx1a and Stx2a)	Yes	(113)
Stx2b (originally named VT-2d or Stx2d1)	EH250	No, the B subunit gene was not detected by methods used to detect other stx, B subunit genes	(24)
Stx2c	031	Yes, less toxic to Vero cells and mice	(137)
Stx2d (Stx2dact)	C165-02	Yes, more toxic after incubation with elastase, less toxic to Vero cells	(138)
Stx2e	E32511	No, binds to Gb4, associated with disease in pigs	(139)
[illegible]	[illegible]	isolated in STEC from pigeons, immunologically distinct	[illegible]
Stx2g	7v	No, the stx_{2g} gene is not amplified by primers specific for stx_{2}	(141)

리스테리아


Listeria monocytogenes

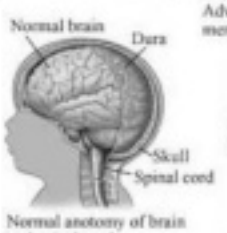
Scanning electron micrograph of *Listeria monocytogenes*

Scientific classification	
Domain:	Bacteria
Kingdom:	Eubacteria
Phylum:	Firmicutes
Class:	Bacilli
Order:	Bacillales
Family:	Listeriaceae
Genus:	*Listeria*
Species:	***L. monocytogenes***
Binomial name	
Listeria monocytogenes	

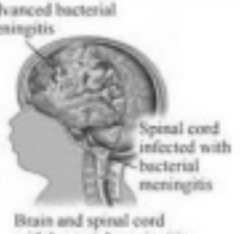
(E. Murray et al. 1926) Pirie 1940







Normal anotomy of brain and spinal cord



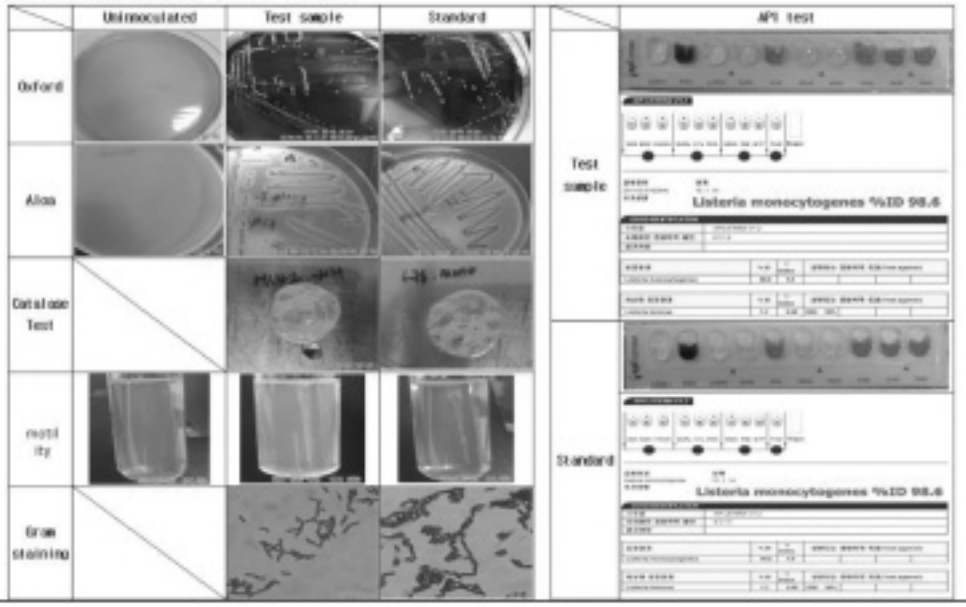
Brain and spinal cord with bacterial meningitis

Case Fatality : 15% (210 / 2,161 cases (Europe))

Diseases	CFSPH	UK Gov.	Discontools
Listeriosis		○	

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도축장에서 검출되는 *Listeria monocytogenes*



영국의 리스테리아(2006 to 2015)

(*Listeria* data 2006 to 2015)

Table 1: Annual cases of *Listeria monocytogenes* in England and Wales

Year	Number of cases	Cases per 100,000 population
2006	185	0.34
2007	226	0.42
2008	181	0.33
2009	213	0.39
2010	160	0.29
2011	148	0.26
2012	167	0.30
2013	160	0.28
2014	169	0.29
2015	169	0.29

Figure 1: Annual cases of *Listeria monocytogenes* in England and Wales

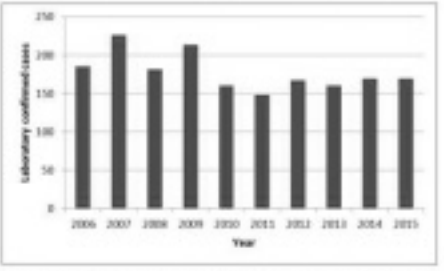


Figure 2: Age-sex breakdown of *Listeria monocytogenes* laboratory reports

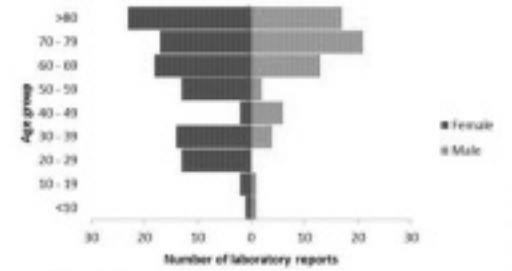
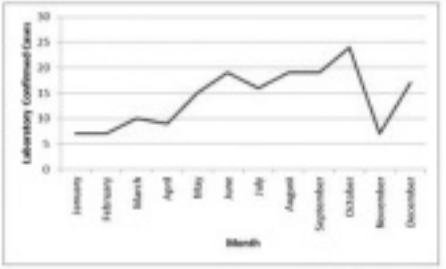


Figure 3: Seasonal trend of laboratory reports of *Listeria monocytogenes* in England and Wales



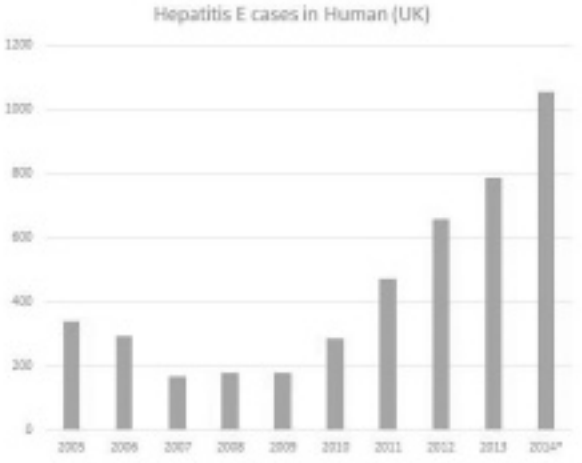
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E형 간염

Table 1. IgG anti-HEV prevalence in swine from commercial herds in the United States

Herd	Age	No. of swine tested	No. of swine with anti-HEV (%)
A	6 wk	8	0 (0)
	12 wk	8	0 (0)
	20 wk	8	8 (100)
	26 wk	8	5 (63)
	Adult	25	14 (56)
B	3–4 wk	8	0 (0)
	5–6 wk	8	0 (0)
	7–8 wk	8	0 (0)
	13 wk	12	10 (83)
	6 mo	8	8 (100)
	Adult	17	16 (94)
C	2 mo	8	1 (13)
	3 mo	8	8 (100)
	4 mo	8	4 (50)
	5 mo	8	8 (100)
	Adult	8	8 (100)
D	2 mo	10	2 (20)
E	6 mo	10	10 (100)
F	6 mo	10	10 (100)
G	6 mo	10	10 (100)
H	5 mo	10	10 (100)
I	>1 yr	10	10 (100)
J	1–2 yr	10	10 (100)
K	1–3 yr	10	10 (100)
L	2 yr	10	10 (100)
M	2–3 yr	10	10 (100)
N	Adult	19	15 (79)
O	Adult	6	5 (83)
P*	Adult	10	0 (0)

*Specific-pathogen-free (SPF) swine herd.



Data source : Laboratory-confirmed cases of zoonotic disease in humans, 2005-2014 / United Kingdom

표 1. 4℃ 냉장저장 시 돼지고기 초기오염 정도에 따른 저장기간별 미생물수 변화(단위 : c.f.u./㎠)

초기 오염정도	1일	7일	14일	21일	
				총세균수	대장균수
10^2	4.15×10^2	4.10×10^3	1.16×10^4	2.58×105	-
10^3	4.90×10^3	1.99×10^4	3.24×105	3.35×106	4
10^4	1.46×10^4	5.95×10^4	8.60×105	1.65×107	315

(농촌진흥청 축산과학원)

10일이면 12,000km 이동 가능!

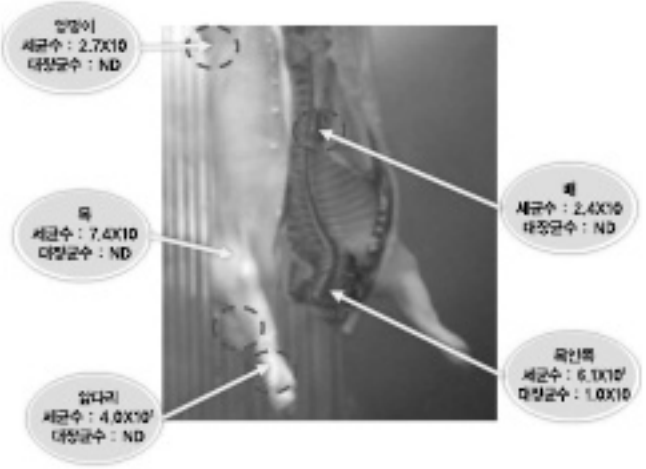


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Plant Quality Audit

※제품검사이분 도체

번호	품명	세균수 (CFU/100㎠)	대장균수
1	#610 앞살이	2.7×10	ND
2	#610 배	2.4×10	ND
3	#610 목	7.4×10	ND
4	#610앞다리	4.0×10⁷	ND
5	#610목안목	6.1×10⁷	1.0×10



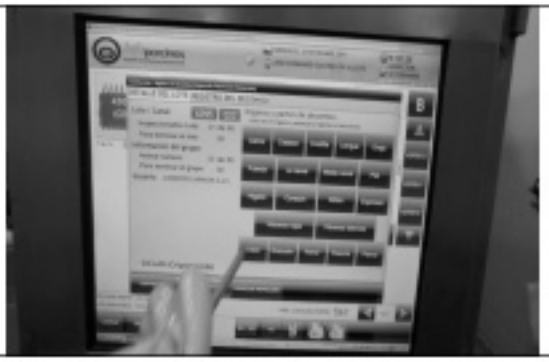








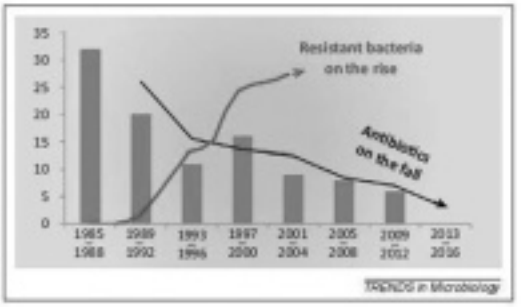
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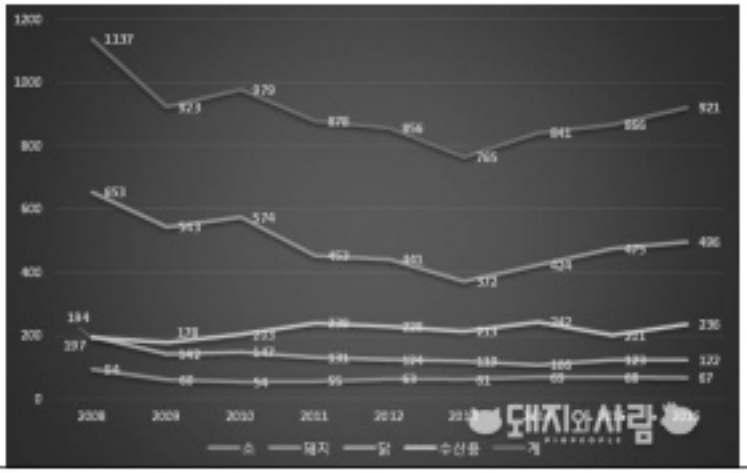
4. 항생제 내성 문제

항생제 내성 세균 문제

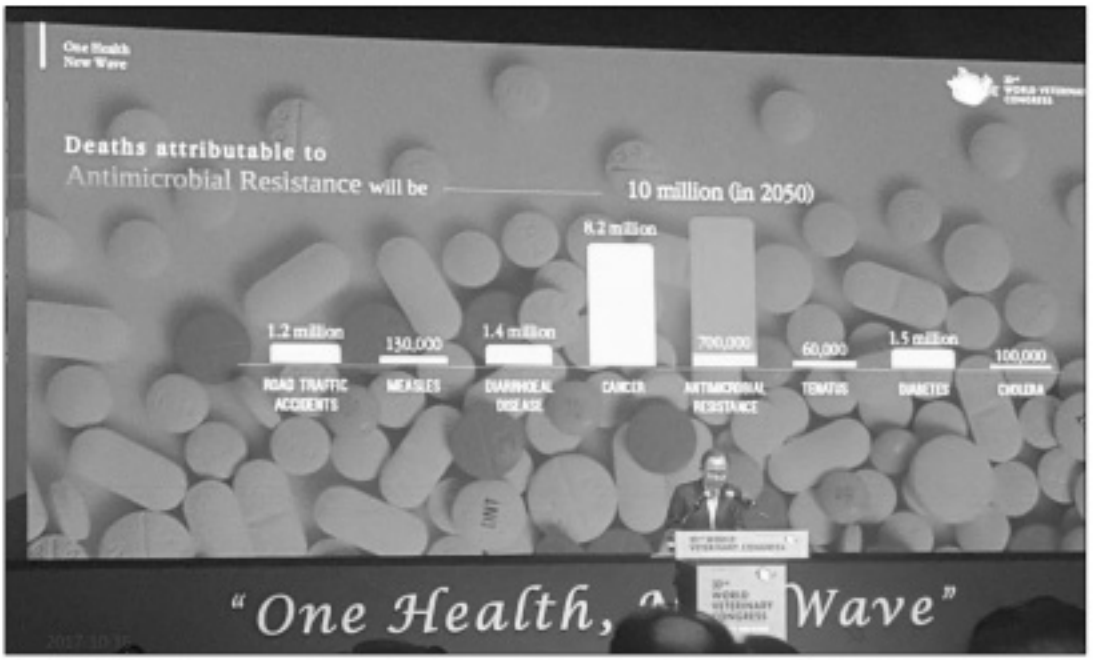




판매량이 증가하고 있는 항생제



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SNS를 통한 정보 공유



네이버 : 땡칠이닥터

FACEBOOK : Hyunil Kim