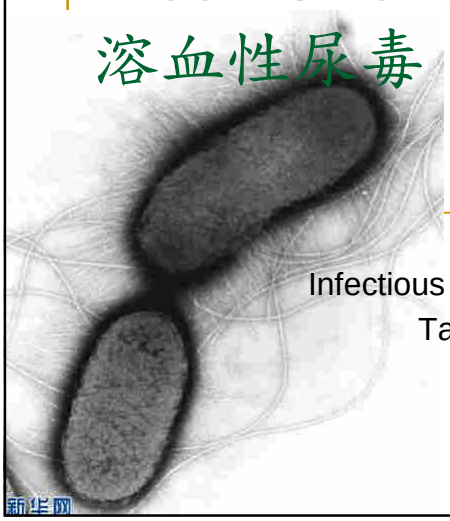
E coli O104談食品安全與溶血性尿毒



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人類飲食習慣的改變

圖片摘自http://www.wretch.cc/blog/xyxyx/2612149

我國法定傳染病分類

類 別	傳染病名稱
第一類	天花、鼠疫、狂犬病、炭疽病、H5N1流感、SARS
第二類	白喉、麻疹、 、德國麻疹、流行性腦脊髓膜炎、多重抗藥性結核病、登革熱、瘧疾、屈公病、西尼羅熱、霍亂、傷寒、副傷寒、小兒麻痺症、桿菌性痢疾、腸道出血性大腸桿菌感染症、阿米巴性痢疾、急性病毒性A型肝炎、漢他病毒症候群、流行性斑疹傷寒
第三類	百日咳、破傷風、日本腦炎、結核病（除多重抗藥性結核病外）、癩病、先天性德國麻疹症候群、急性病毒性肝炎(除A型外)、腮腺炎、退伍軍人病、侵襲性b型嗜血桿菌感染症、梅毒、淋病、新生兒破傷風、腸病毒感染併發重症
第四類	疱疹B病毒感染症、鉤端螺旋體病、類鼻疽、 Q熱、地方性斑疹傷寒、萊姆病、兔熱病、恙蟲病、貓抓病、弓形蟲感染症、庫賈氏病、肉毒桿菌中毒、水痘、侵襲性肺炎鏈菌感染症、流感併發重症、NDM-1腸道菌感染症
第五類	裂谷熱、馬堡病毒出血熱、拉薩熱、伊波拉病毒出血熱、黃熱病

依傳播途徑區分

經動物與昆蟲感染	狂犬病、弓形蟲感染症、日本腦炎、西尼羅熱、裂谷熱、鼠疫、拉薩熱、鉤端螺旋體病、萊姆病、恙蟲病、炭疽病、伊波拉病毒出血熱、馬堡出血熱、漢他病毒症候群、疱疹B病毒感染症、兔熱病、Q熱、地方性斑疹傷寒、流行性斑疹傷寒、貓抓病、鼠咬熱
經空氣或飛沫傳染	禽流感、Q熱、漢他病毒症候群、炭疽病、鉤端螺旋體病、類鼻疽、鸚鵡熱、布氏桿菌症
經飲食傳染	阿米巴痢疾、腸道出血性大腸感菌感染症、新型庫賈氏病、肉毒桿菌中毒、布氏桿菌症、沙門氏菌、蛔蟲、肝吸蟲、廣東住血線蟲、胞蟲症、旋毛蟲
經血液或皮膚傳染	伊波拉病毒出血熱、馬堡出血熱、鉤端螺旋體病、類鼻疽
其他	庫賈氏病

藍色字體標示處: 非法定傳染病，但疾管局提供相關檢驗及部分罕見用藥

1981~2010 年食品中毒案件病因物質案件數統計

單位：案

病因物質	70 年至 79 年	80 年	81 年	82 年	83 年	84 年	85 年	86 年	87 年	88 年	89 年	90 年	91 年	92 年	93 年	94 年	95 年	96 年	97 年	98 年	99 年	總計
病因物質判明合計	337	47	55	57	68	79	128	180	117	96	126	86	124	113	96	96	97	89	102	131	207	2,431
細菌小計*	299	42	49	54	62	75	122	177	114	91	116	78	111	105	81	88	92	85	98	125	170	2,234
腸炎弧菌	144	12	20	25	35	46	105	160	102	75	84	52	86	82	64	62	58	38	52	61	60	1,423
沙門氏桿菌	23	3	3	0	5	8	9	4	5	7	9	9	6	11	8	7	8	11	14	22	27	199
病原性大腸桿菌	40	0	4	0	2	7	1	0	0	0	1	0	0	0	0	0	2	1	1	10	11	80
金黃色葡萄球菌	96	23	18	24	13	12	7	14	3	6	22	9	18	7	9	12	18	23	14	30	41	419
仙人掌桿菌	44	13	15	12	12	11	7	15	12	12	5	8	4	11	7	9	10	7	12	11	46	283
肉毒桿菌	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	6	1	8	31
其他	7	1	0	2	0	4	1	0	0	0	0	3	1	0	0	1	1	0	4	6	5	36
化學物質	12	3	2	2	1	2	0	0	0	1	2	1	2	3	4	2	2	1	1	3	2	46
天然毒	26	2	4	1	5	2	6	3	3	4	8	7	11	5	11	6	3	3	3	3	11	127
病因物質不明合計	342	46	33	20	34	44	50	54	63	54	82	92	138	138	178	151	168	159	170	220	296	2,532
總計	679	93	88	77	102	123	178	234	180	150	208	178	262	251	274	247	265	248	272	351	503	4,963

*細菌性中毒案件數之小計，為扣除重複計數之值。

Taiwan FDA

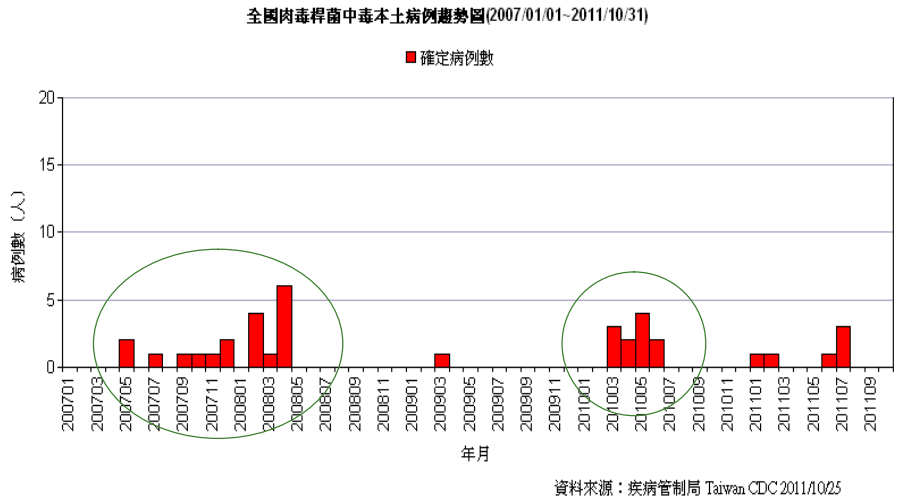
2010年網購三明治沙門氏菌污染事件

網購三明治沙門氏菌污染事件之規模

分局別	追蹤件數	食用人數	生病人數	侵襲率
第一分局	31	586	306	52%
第二分局	6	30	22	73%
第三分局	0	0	0	0%
第四分局	6	266	224	84%
第五分局	5	29	2	7%
第六分局	0	0	0	0%
總計	48	911	554	61%

食用真空包裝豆乾導致肉毒桿菌中毒事件

2007年至2011年11月肉毒桿菌中毒本土病例趨勢圖



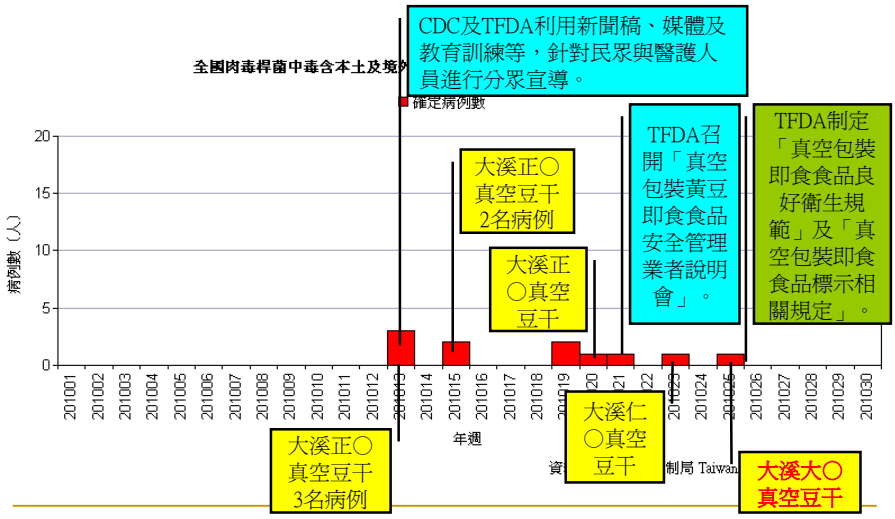
資料來源：疾病管制局 Taiwan CDC 2011/10/25

99年 1月至6月肉毒桿菌中毒確定病例各類嫌疑食品暴露分析表　　99年確定病例累計11例

編號	性別	年齡	發病月份	縣市別	型別	真空包裝豆乾	真空包裝素三層肉	素便當（含真空素食火腿）	素肉乾/素肉鬆	豆腐/雞蛋豆腐	豆干丁/豆干絲/豆皮	豆漿	花生/花生粉/花生麵筋	潤餅	醬瓜/玉筍	玉米罐頭	絞肉醃瓜/瓜仔肉	黑胡椒醬/番茄醬	滷味/滷豬肉/滷雞肉/滷蛋/滷白菜	其他雞豬魚等熟食肉類
1	女	61	3	桃園縣	A	v			v	v			v	v	v					
2	女	41	3	桃園縣	A	v			v	v			v	v					v	v
3	男	47	3	桃園縣	A	v			v	v			v	v	v				v	v
4	女	71	4	苗栗縣	A	v												v	v	
5	女	44	4	苗栗縣	A	v												v	v	
6	男	15	5	桃園縣	A												v			
7	男	19	5	台中縣	A					v	v		v		v		v			v
8	女	53	5	台北縣	B	v	v					v				v		v	v	
9	男	29	5	台中縣	A			v											v	
10	男	36	6	雲林縣	E	v					v	v								
11	女	68	6	高雄市	A	v					v		v							
食用該嫌疑食品人數						8	1	1	3	4	3	2	5	3	3	1	2	3	6	3
食用黃豆類製品人數						10														
食用真空包裝黃豆類製品人數						9														

11名病例中有10例曾食用黃豆類製品；9例曾食用真空包裝黃豆類製品。

2010年肉毒桿菌中毒事件



引起集體食物中毒的大腸桿菌O111

2011 / 08月號 牛頓

2011年4月下旬發生在日本烤肉連鎖店的集體食物中毒的主要禍首就是大腸桿菌O111。至5月13日止，仍未能確認被O111汙染的食物是否就是生牛肉。O111會產生一種稱為「verotoxin」的毒性蛋白質，引起出血性腹瀉。再者，當verotoxin隨著血液流到全身，也可能會引發重症造成死亡。雖然也曾經發生過數起O111引起食物中毒的事件，但卻以這次造成重症比率最高。

2011年4月下旬，在日本富山縣、福井縣和神奈川縣的同一烤肉連鎖店相繼發生用餐者食物中毒的情形。根據日本厚生勞働省（相當於衛生署）於5月11日下午4時所公布的資料表示，具有食物中毒症狀的人有118位，其中重症者達24人，死亡人數4人（數字為三縣之合計）。

※日本NIID流行病學分析，與生牛肉料理具有高度關聯性。

Escherichia coli

- Known as commensal of the large intestine since first described in 1885
- ***Enterobacteriaceae***, the **enteric bacteria**, are facultatively anaerobic Gram-negative rods
  - genera within the family are human intestinal pathogens (e.g. *Salmonella*, *Shigella*, *Yersinia*).
  - several others are normal colonists (e.g. *Escherichia*, *Enterobacter*, *Klebsiella*)
- The entire DNA base sequence genome has been known since 1997

Escherichia coli

- *E. coli* inhabitant of the human intestinal tract
- Only a very small proportion of the total bacterial content.
  - The anaerobic *Bacteroides* species in the bowel outnumber *E. coli* by at least 20:1
- Can grow in the presence or absence of O_2
  - Adapt to its intestinal (anaerobic) and its extra-intestinal (aerobic or anaerobic) habitats
- Indicator of fecal pollution and water contamination

Pathogenesis

Over 700 serotypes based on **O, H, and K antigens**

- the serotype O157:H7 causing hemolytic uremic syndrome (HUS)
  - an outbreak in the United States of America. EHEC in 1982
  - second to Salmonella as a cause of bacterial diarrhea in NW Pacific
- Diarrheagenic strains pathogenic *E. coli* are classified based on their unique virulence factors

Enterovirulent *E coli*, EEC

- 5 virotypes cause diarrheal diseases:
  - enterotoxigenic *E. coli* (ETEC)
  - enteroinvasive *E. coli* (EIEC)
  - enteropathogenic *E. coli* (EPEC)
  - enterohemorrhagic *E. coli* (EHEC)
  - enteroaggregative *E. coli* (EAEC)
- Each class falls within a serological subgroup and manifests distinct features in pathogenesis.

Virulence determinants and characteristics

Kenneth Todar, PhD Online Textbook of Bacteriology

ETEC

- fimbrial adhesins e.g. CFA I, CFAII, K88, K99
- non invasive
- produce LT and/or ST toxin
- watery diarrhea in infants and travelers
  - no inflammation, no fever

Virulence determinants and characteristics

Kenneth Todar, PhD Online Textbook of Bacteriology

EIEC

- nonfimbrial adhesins, possibly outer membrane protein
- invasive (penetrate and multiply within epithelial cells)
- does not produce shiga toxin
- dysentery-like diarrhea (mucous, blood),
  - severe inflammation, fever

Virulence determinants and characteristics

Kenneth Todar, PhD Online Textbook of Bacteriology

EPEC

- non fimbrial adhesin
- EPEC adherence factor (EAF) enables localized adherence of bacteria to intestinal cells
- moderately invasive (not as invasive as *Shigella* or EIEC)
- does not produce LT or ST; some reports of shiga-like toxin
- usually infantile diarrhea; watery diarrhea with blood
  - some inflammation, no fever
- symptoms probably result mainly from invasion rather than toxigenesis

Virulence determinants and characteristics

Kenneth Todar, PhD Online Textbook of Bacteriology

EAEC

- adhesins not characterized
- non invasive
- produce ST-like toxin (EAST) and a hemolysin
- persistent diarrhea in young children
  - without inflammation or fever

Virulence determinants and characteristics

Kenneth Todar, PhD Online Textbook of Bacteriology

EHEC

- adhesins not characterized, probably fimbriae
- moderately invasive
- does not produce LT or ST but does produce shiga toxin
- pediatric diarrhea, copious bloody discharge (hemorrhagic colitis)
  - intense inflammatory response
- may be complicated by hemolytic uremia

Reservoir of EEC

- Mainly cattle, occasionally pork and chicken meat
  - mutton samples have been examined to have E. coli O157:H7
- Human being may also be reservoir and caused the transmission among people.

Mode of Transmission

- Intake of contaminated food, most frequently, the improperly prepared beef (specially mince) and raw milk
- Through contaminated water supply
- Food processing by patient contaminated with EEC

Clinical Symptom

- 2~8 days, normally 3~4 days
- Afebrile, mild diarrhea, acute to dull abd. pain,
- Initial watery diarrhea, then significant bloody (hemorrhagic) colitis
- 6-7%, some report as high as 15%, will complicate hemolytic uremic syndrome or brain disease in about 2 weeks
  - renal failure and hemolytic anemia
  - fever and neurologic symptoms, constitutes TTP can have a mortality rate in the elderly as high as 50%

Microbiologic Diagnosis

- Isolation of E. coli of serotype O157:H7 or other verotoxin-producing E. coli from diarrheal stools
  - Can't grow at 44~45 C
- sorbitol-MacConkey (SMAC) agar
- tested for the presence of verotoxin
- DNA probes to detect genes encoding for the production of verotoxins (VT1 and VT2)

Treatment

- Supportive
- No evidence that antibiotics improve outcome
- Some antibiotics may precipitate kidney complications
- Antidiarrheal agents, such as loperamide should also be avoided
- Hemolytic uremic syndrome is life-threatening required blood transfusions and kidney dialysis

Preventive measure

- Identify and isolation
  - Meat can become contaminated during slaughter, and organisms can be thoroughly mixed into beef when it is ground
- Unpasteurized milk and sewage-contaminated water
- Young children typically shed the organism in their feces for a week or two after their illness resolves
  - Sometimes carry the organism without symptoms

2011 Germany E. coli O104:H4 outbreak

2011 Germany outbreak

- Serious outbreak of food borne illness focused in northern Germany in May through June 2011
- Characteristic bloody diarrhea, abd. cramp, nausea and with a high frequency of hemolytic-uremic syndrome (HUS)
- Low febrile
- Adults with HUS
- Acute onset, 7-10 days, some prolong to 12 days
- All affected people had been in Germany or France

2011 Germany outbreak

- The agriculture authority incorrectly linked EHEC to cucumbers imported from Spain
- An organic farm in Bienenbüttel, Lower Saxony, which produces a variety of sprouted foods, as the likely source of the E. coli outbreak

A deadly E. coli contamination were found on sprouts at a farm in Lower Saxony, German

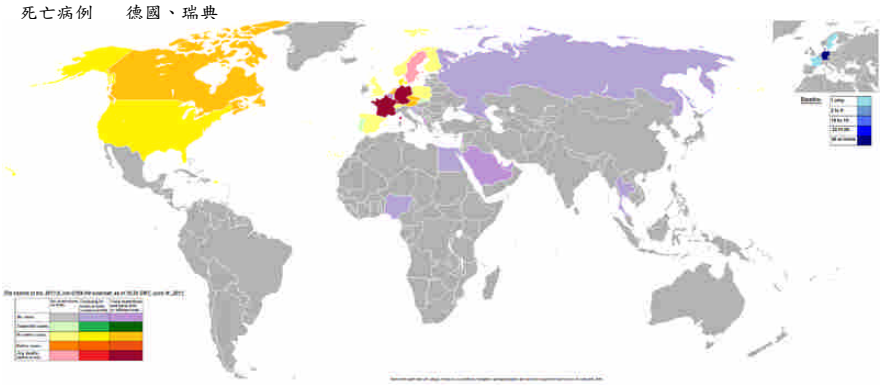
It's the sprouts", the president of the Robert Koch Institute (RKI), Reinhard Burger, said

2011 Germany outbreak

- Originally thought to have been caused by an enterohemorrhagic (EHEC) strain of E. coli
- later shown to have been caused by an enteroaggregative E. coli (EAEC) strain
- Acquired the genes produce Shiga toxins

2011 Germany outbreak

說明	標示顏色
沒有病例	俄羅斯
疑似病例	葡萄牙、芬蘭、美國、加拿大
確定病例	丹麥、法國
死亡病例	德國、瑞典



EHEC Outbreak

Number of cases reported as for 21 July 2011

1 Deaths
2 HUS case
3 Non HUS case

Austria	0	1	4
Canada	0	0	1
Czech Republic	0	0	1
Denmark	0	10	15
France	0	7	10
Germany	48	857	3078
Greece	0	0	1
Luxembourg	0	1	1
Netherlands	0	4	7
Norway	0	0	1
Poland	0	2	1
Spain	0	1	1
Sweden	1	18	35
Switzerland	0	5	0
United Kingdom	0	3	4
United States	1	4	2
Total	**50[1]**	**908[2]**	**3,167[3]**

2011 Germany outbreak

Origins of the E. coli Strain Causing an Outbreak of Hemolytic Uremic Syndrome in Germany

An unusual serotype of Shiga-toxin producing *E coli* (O104:H4) began in Germany in May 2011. As of July 22, a large number of cases of diarrhea caused by Shiga-toxin producing *E. coli* have been reported.

The outbreak strain belonged to an enteroaggregative E. coli lineage that had acquired genes for Shiga toxin 2 and for antibiotic resistance.

David A Rasko, et al. N Engl J Med 2011; 365:709-717August 25, 2011
Holger Rohde, et al. N Engl J Med 2011; 365:718-724August 25, 2011

2011 Germany outbreak

- 3167 without the hemolytic uremic syndrome (16 deaths) and 908 with the hemolytic uremic syndrome (34 deaths), indicating that this strain is notably more virulent than most of the Shiga-toxin producing *E. coli* strains. Preliminary genetic characterization of the outbreak strain suggested strains should be classified within the enteroaggregative pathotype of *E. coli*.
- The enteroaggregative *E. coli* O104:H4 strains are closely related and form a distinct clade among *E. coli* and enteroaggregative *E. coli* strains.
- The genome of the German outbreak strain can be distinguished from those of other O104:H4 strains because it contains a prophage encoding Shiga toxin 2 and a distinct set of antibiotic-resistance factors.

Enteroaggregative *E. coli* O104:H4

- Shiga-like toxin-producing E. coli
- Heat stable at 7°C to 50°C , deactivated over 70°C
- Destroy gut endothelium cause hemorrhage and bloody stool
- Circulating toxin combined with endothelial cell membrane of glomerulus, inhibit ADAMTS13 enzyme that induced intra-vascular coagulopathy and HUS

Enteroaggregative *E. coli* O104:H4

- Most diarrheagenic pathogenic *E. coli* are EHEC
- EAEC with Shiga-like toxin, SLT
  - O157:H7 cause outbreaks in beef
  - O104:H21 in Montana, USA in 1994
  - 2004 a Korean female with HUS had isolated O104:H4
  - Taiwan first report EHEC hemorrhagic diarrhea from a 6 year old American-born boy in 2001

Diagnosis and Detection of EHEC/EAEC

- A EU/International standard for the detection of E. coli O157
  - Food, diary
  - Water
  - Specimen
- Molecular typing
  - At least 2 methods-German, France
  - Phenotyping, serotyping, antibiotic resistant pattern
  - OMP patterns, LPS patterns, multilocus enzyme electrophresis
  - Genotyping: plasmid analysis, RFLP, ribotyping, PFGE, PCR, RAPD

Treatment of EHEC diarrhea and complication

- Mainly supportive
- Controversial of antibiotics usage
- Isolations
- Source identify
- Food/diary processing

Eat health and
Thanks for your attention