

A straight flush of *Clostridium perfringens*: Multiple streams of evidence established in a food-borne outbreak investigation

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Introduction

- On 12 December 2006 the NSW Food Authority and South Eastern Sydney Illawarra Public Health Unit were notified of a possible food-borne illness outbreak among people who attended a private party at a local venue two days previously
- Catering for the main meal was provided by a local catering company
- Guests provided entrées and desserts
- A commercial baker provided the cake
- Hypothesis generating interviews suggested the reported illnesses were caused by ingestion of roast pork contaminated by *Clostridium perfringens* or *Bacillus cereus* at either the party or as left-overs during the following day
- During the following week there were two further complaints from different sources related to the same premises, with roast pork being the only common item

Methods

- We conducted an unmatched case-control study among people who ate at the party or the leftovers afterwards; controls were drawn from case households if possible
- Demographic and health data were collected by telephone interviews

Case definition

Onset of diarrhoea and/or abdominal pain within 24 hours of attending the private party on 9/12/2006 between 20:00-21:30 or eating leftovers from the party a day later

- Stool specimens were referred for bacterial, viral and toxin testing
- A food safety audit was conducted onsite at the caterer. Leftover food was obtained from the complainant and caterer for microbiological analysis
- Supporting evidence from OzFoodNet *C. perfringens* outbreak data was analysed

Results

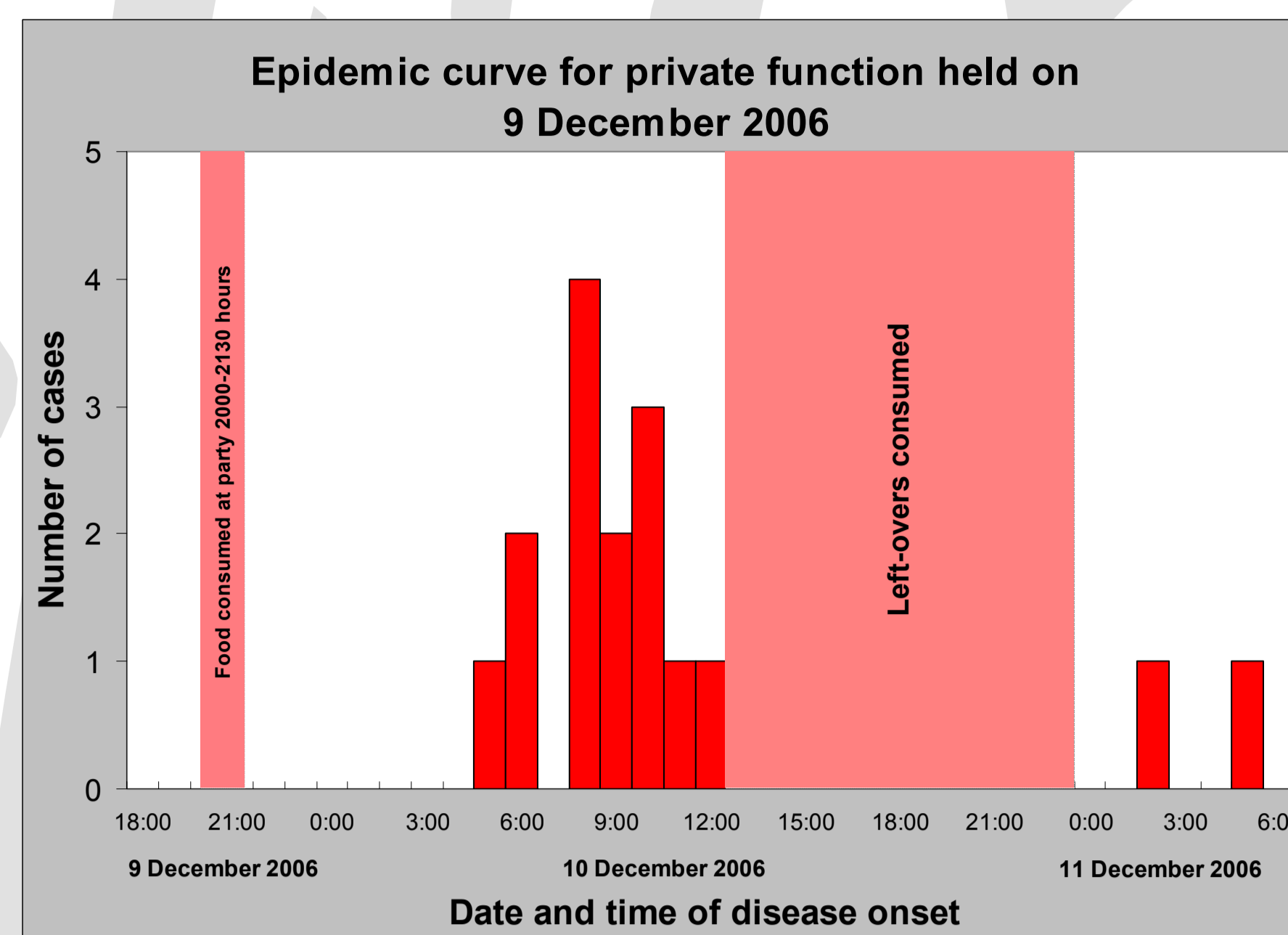
Outbreak summary

- There were an estimated 120 attendees; about 80 reported illness to the party's host (estimated attack rate 66.6%)

Epidemiological Investigation

- 29 people were interviewed

	Cases (N=17)	Controls (N=12)
Male (%)	10 (58.8)	2 (16.7)
Median age (range) in years	40.5 (0-77)	44 (4-72)



- Median incubation: 11.5 hrs (3-29.5)
- Median illness duration: 36 hrs (12-72)

Symptoms	Count (%)	N=17
Diarrhoea	16	(94.1)
Abdominal pain or cramps	11	(64.7)
Lethargy	6	(35.3)
Watery diarrhoea	4	(23.5)
Nausea	2	(11.8)
Bloody diarrhoea	2	(11.8)
Fever	2	(11.8)
Vomiting	2	(11.8)
Headache	1	(5.9)

- 19 people ate at the function only
- 1 person attended but ate nothing
- 2/3 were ill after eating only leftovers. Of these 2 cases, 1 ate leftover roast pork exclusively

Food items	Number Exposed (%)		Odds Ratio	95% CI
	Cases (N=17)	Controls (N=12)		
Apple sauce	5 (29.4)	0 (0.0)	-	-
Baklava	3 (17.6)	0 (0.0)	-	-
Calamari	6 (35.3)	5 (41.7)	0.8	0.2-3.5
Beef filled tortellini	4 (23.5)	2 (16.7)	1.5	0.2-10.2
Charcoal chicken	7 (41.2)	4 (33.3)	1.4	0.3-6.5
Chicken mushroom fettuccini	3 (17.6)	2 (16.7)	1.1	0.2-7.6
Chicken avocado salad	5 (29.4)	5 (41.7)	0.6	0.1-2.8
Chocolate biscuits	2 (11.8)	1 (8.3)	1.5	0.1-18.3
Crab sticks	6 (35.3)	3 (25.0)	1.6	0.3-8.5
Fish cocktails	4 (23.5)	3 (25.0)	0.9	0.2-5.2
Garden salad	8 (47.1)	5 (41.7)	1.2	0.3-5.5
Kataifi	2 (11.8)	1 (8.3)	1.5	0.1-18.3
Palumbi	4 (23.5)	1 (8.3)	3.4	0.3-34.9
Penne beef bolognese	4 (23.5)	3 (25.0)	0.9	0.2-5.2
Potato bake – cheese	6 (35.3)	3 (25.0)	1.6	0.3-8.5
Potato bake – garlic	2 (11.8)	2 (16.7)	0.7	0.1-5.5
Potato bake – mustard bacon	2 (11.8)	2 (16.7)	0.7	0.1-5.5
*Any potato bake	6 (35.3)	5 (41.7)	0.8	0.2-3.5
Rice	6 (35.3)	4 (33.3)	1.1	0.2-5.2
Roast pork	17 (100.0)	3 (25.0)	-	-
Seafood pasta salad	3 (17.6)	4 (33.3)	0.4	0.1-2.4
Spring rolls	3 (17.6)	5 (41.7)	0.3	0.1-1.6

Microbiological Investigation

- Stools were negative for routine enteric organism culture and viral testing
- Because *C. perfringens* toxin and spores were isolated from stool, *Bacillus cereus* toxin testing was not done
- Environmental sampling included:
 - Leftover food from the complainant
 - Leftover roast pork and chopping board swab from the caterer

	Collection date	Enterotoxin A	Spore count* (per g faeces)
Case 1	13/12/06	Positive	1.1 x 10 ⁷
Case 2	13/12/06	Not detectable	2.0 x 10 ⁵
Case 3	14/12/06	Positive	3.2 x 10 ⁷
Case 4	14/12/06	Positive	4.5 x 10 ⁷
Case 5	14/12/06	Positive	7.0 x 10 ⁵

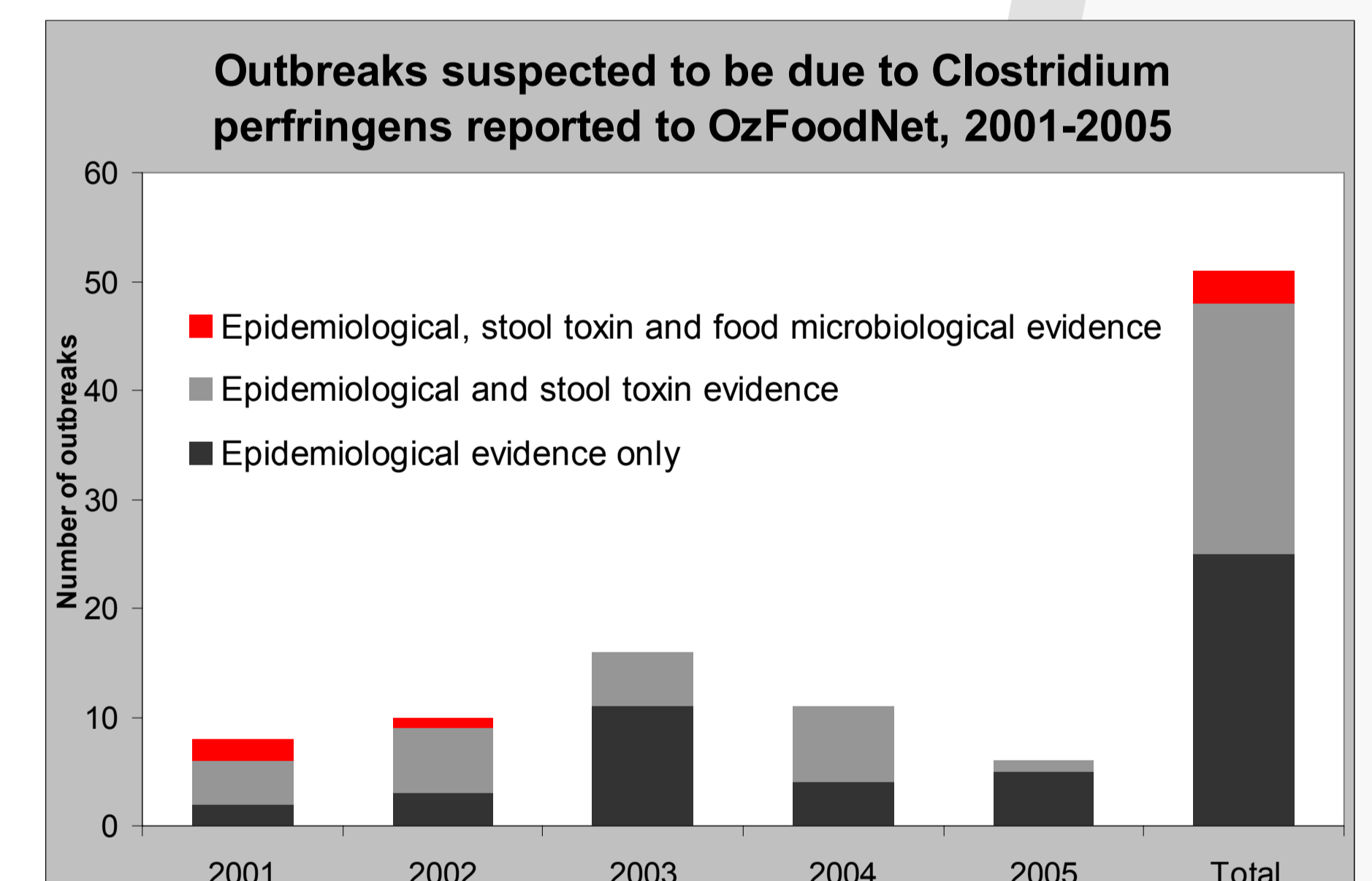
- C. perfringens* (Enterotoxin A) was isolated in the complainant's roast pork; 1.9x10⁷ colony forming units/g which is consistent with an infective dose
- A relatively low load was found in the chicken sample (3.5x10³ cfu/g) and was suggestive of cross-contamination of the leftovers.

Environmental investigation :

- No breaches in Food Safety Standards were evident at the time of inspection.
- Interview of the caterer suggested that preparation was adequate to prevent *C. perfringens* food poisoning

Outbreaks reported to Ozfoodnet

- Only 6% of outbreaks (3/51) suspected to be due to *C. perfringens* between 2001-2005 had epidemiological, stool and food microbiological supporting data (OzFoodNet unpublished data, 2007)



Conclusions

- It was fortunate to have all the following evidence to support the hypothesis:
 - Clinical picture
 - Descriptive epidemiology
 - Analytic epidemiology
 - Stool microbiological results & Food microbiological results
- Investigation timeliness, co-operation and collaboration between the PHU, NSW Food Authority, laboratories, the caterer and complainants contributed to this satisfying investigation.
- Because of the difficulty in obtaining independent evidence of adequate food preparation after the event, such complete data is indispensable when communicating food safety issues with businesses