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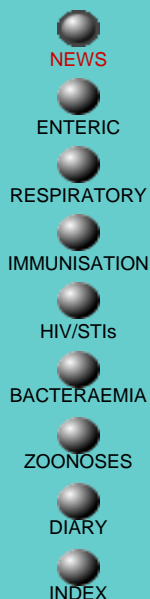
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Outbreak of Ebola Fever, Uganda, East Africa – August 2000 to January 2001

The largest outbreak of Ebola haemorrhagic fever (EHF) yet reported, which occurred in Uganda, was declared officially over on 27 February 2001. The last patient known to be infected with the virus recovered more than six weeks previously, more than twice the maximum incubation period for EHF (1).

The outbreak was first reported in early October 2000 when cases of unusual febrile illness with occasional hemorrhage but significant mortality was reported from hospital and public health services in Gulu District in northern Uganda, bordering Sudan and close to the Democratic Republic of the Congo (DRC). The establishment of active surveillance and laboratory testing in late October revealed that the outbreak had actually started in late August. The cause of the outbreak was confirmed as Ebola virus in mid-October by the National Institute of Virology (NIV) in South Africa (2). The source has not been established, but may be related to the movement of people across borders in the complex geo-political environment of central Africa, including the DRC and Sudan, where previous Ebola outbreaks have been reported (3). Later work undertaken by NIV and the Centers for Disease Control and Prevention (CDC) in Atlanta identified that the virus was of the type referred to as Ebola-Sudan (this is where the strain was first isolated and does not imply that this outbreak originated in Sudan). Most of the cases were reported from Gulu District, but infection also spread some hundreds of miles to Masindi and Mbarara Districts in central and south west Uganda through the movement of infected people who had yet to develop symptoms. As in previous Ebola outbreaks, transmission was recognised as taking place in healthcare settings, although contact with victims during traditional funerals is thought to have added to the spread of the epidemic during its early phase.

Over 25 international organisations from the Global Outbreak and Alert and Response Network combined to combat the outbreak, with over 100 international staff in the field. The Ugandan authorities and the World Health Organization led intense activities, with support from many institutions including from Europe, including the UK Public Health Laboratory Service (database management and training), the Institute for Tropical Medicine (Belgium), Epicentre Paris, the Tropical Medicine Institute, Hamburg, Germany, Medecins sans Frontiers (Holland and Belgium), the emergency department of Italian Cooperation, the Italian Institute of Health, Rome, and the International Committee of the Red Cross.

Control activities were organised in very difficult circumstances – Gulu District has been subject to low level guerrilla activity for over a decade. Many of the rebels live among the people in Gulu, while camps for abducted children operate over the border in Sudan. Activities included surveillance and epidemiology, clinical case management, social education and mobilisation, providing hospital and laboratory facilities and logistical support. Active surveillance and risk assessment was undertaken by local teams, with strong community involvement to find cases early and to identify disease activity. Targeted prevention activities were organised, including follow-up of contacts of identified cases for 21 days, establishment of trained burial teams for all potential and confirmed EHF deaths, cessation of traditional healing and burial practices, stopping large public gatherings, and strict enforcement of infection control measures including laboratories and hospital wards.

Laboratory testing was performed at a field laboratory established and maintained by CDC in Gulu. Cases were classified according to three categories: alert, suspect, and probable. The precise case definition has been published (2). All cases classified as suspect (essentially those with fever and contact with a potential case; those with unexplained bleeding; those with fever and other specific symptoms) were assessed by a doctor and hospitalised and tested for Ebola virus if the clinical evaluation was consistent with EHF. Probable cases were suspect cases whose condition was confirmed by a physician. Laboratory tests were undertaken where possible, including virus antigen detection, antibody ELISA tests, and PCR. Laboratory confirmed cases were defined as individuals who met the surveillance case definitions and were either positive for Ebola virus antigen or IgG antibody. By 23 January, 425 presumptive case patients had been reported including 224 deaths (53%), a lower mortality rate than has been seen in some earlier outbreaks. Ninety-three per cent (393) of the cases were from Gulu District itself and six per cent (27) were from Masindi District and one per cent (5) from Mbarara. The ages of the patients ranged from 3 days to 72 years with a median of 28 years. The mean time from symptom onset to death was 8 days. Two hundred and eighteen of the 425 presumptive cases were laboratory confirmed. Particularly important risk factors for transmission were attending funerals of presumptive cases where ritual contact with the dead person occurred. Intrafamilial and healthcare-associated transmission were also important. Fourteen of 22 healthcare workers in Gulu were infected after establishing the isolation wards. A number of healthcare workers died, including Dr Matthew Lukwiya, the physician who first identified the outbreak, and who had been active in organising and providing hospital care until he acquired his infection (1).

Ebola hemorrhagic fever is caused by infection with Ebola virus and was first recognised in 1976 – the natural reservoir of the virus remains unknown. Outbreaks are associated with the introduction of the virus into the community by one infected person followed by dissemination by person-to-person transmission, often within medical facilities. This is the largest reported outbreak worldwide. In this four-month outbreak approximately 5,600 contacts were under surveillance for up to 21 days by approximately 150 trained volunteers. Contacts did travel to other parts of the world, including to Europe, although there are no reported cases of people developing illness in Europe in association with this particular outbreak. Active follow-up was instituted for one contact who traveled to the United Kingdom. The risk of transmission to the UK will always be present in the future, and has occurred recently with other viral hemorrhagic fevers, notably Lassa fever (4). Ongoing spread in Europe is possible, but it is less likely given the widespread use of universal precautions that should minimize the spread of pathogens transmitted by direct contact.

1. WHO. Uganda ebola outbreak officially over. *WHO Communicable Disease Surveillance and Response* [online] Geneva: World Health Organization, 2001. [cited 7 March 2001]. Available at <www.who.int/disease-outbreak-news/n2001/february/28february2001.html>.

2. WHO. Outbreak of ebola haemorrhagic fever, Uganda, August 2000 - January 2001. *Wkly Epidemiol Rec* 2001; **76**: 41-8.

3. CDC. Outbreak of Ebola Hemorrhagic Fever Uganda, August 2000-January 2001. *Mortal Morb Wkly Rep MMWR* 2001; **50**: 73-7.

4. CDSC. Lassa fever imported into England. *Commun Dis Rep CDR Wkly* 2000; **10** (11): 99.

Two to ten reports of each of the following serotypes were received:

(2)	<i>S. adelaide</i>	(9)	<i>S. livingstone</i>
(8)	<i>S. agama</i>	(5)	<i>S. london</i>
(2)	<i>S. ajiobo</i>	(8)	<i>S. manhattan</i>
(5)	<i>S. albany</i>	(4)	<i>S. mikawasima</i>
(2)	<i>S. amsterdam</i>	(5)	<i>S. mississippi</i>
(8)	<i>S. anatum</i>	(10)	<i>S. muenchen</i>
(4)	<i>S. arizonae</i>	(5)	<i>S. muenster</i>
(9)	<i>S. bovis-morbificans</i>	(2)	<i>S. napoli</i>
(2)	<i>S. canada</i>	(3)	<i>S. nima</i>
(2)	<i>S. carrau</i>	(8)	<i>S. ohio</i>
(4)	<i>S. cerro</i>	(3)	<i>S. oslo</i>
(7)	<i>S. chester</i>	(8)	<i>S. panama</i>
(2)	<i>S. coeln</i>	(3)	<i>S. pomona</i>
(4)	<i>S. corvallis</i>	(4)	<i>S. poona</i>
(2)	<i>S. cubana</i>	(6)	<i>S. richmond</i>
(2)	<i>S. duisburg</i>	(2)	<i>S. rissen</i>
(3)	<i>S. durban</i>	(6)	<i>S. saint-paul</i>
(2)	<i>S. eimsbuettel</i>	(3)	<i>S. san-diego</i>
(5)	<i>S. emek</i>	(4)	<i>S. schwarzengrund</i>
(3)	<i>S. galiema</i>	(10)	<i>S. senftenberg</i>
(3)	<i>S. gold-coast</i>	(5)	<i>S. stanleyville</i>
(7)	<i>S. grumpensis</i>	(2)	<i>S. tel-el-kebir</i>
(5)	<i>S. haifa</i>	(4)	<i>S. uganda</i>
(2)	<i>S. halle</i>	(2)	<i>S. umbilo</i>
(9)	<i>S. havana</i>	(6)	<i>S. weltevreden</i>
(5)	<i>S. javiana</i>	(2)	<i>S. wien</i>
(4)	<i>S. kedougou</i>	(2)	<i>S. zanzibar</i>
(2)	<i>S. larochele</i>		

One report of each of the following serotypes was received:

<i>S. abony</i>	<i>S. colindale</i>	<i>S. irumu</i>	<i>S. litchfield</i>	<i>S. reading</i>
<i>S. anecho</i>	<i>S. dublin</i>	<i>S. ituri</i>	<i>S. mango</i>	<i>S. saarbruecken</i>
<i>S. banana</i>	<i>S. durham</i>	<i>S. jukestown</i>	<i>S. marina</i>	<i>S. suelldorf</i>
<i>S. berkeley</i>	<i>S. eastbourne</i>	<i>S. kiambu</i>	<i>S. molade</i>	<i>S. wagenia</i>
<i>S. binza</i>	<i>S. gatuni</i>	<i>S. kinshasa</i>	<i>S. niimi</i>	<i>S. wandsworth</i>
<i>S. bron</i>	<i>S. hartford</i>	<i>S. korlebu</i>	<i>S. oritamerin</i>	<i>S. wangara</i>
<i>S. brunei</i>	<i>S. hvittingfoss</i>	<i>S. krefeld</i>	<i>S. overschie</i>	<i>S. widemarsh</i>
<i>S. coleypark</i>	<i>S. ibadan</i>			

General outbreaks¹ of foodborne illness, England and Wales: laboratory reports, July to September 2000

Health authority	Organism	Place of outbreak	Number ill ²	Cases positive	Suspect vehicle ³	Evidence ⁴
Manchester	<i>Salmonella bredeney</i>	Retailer	10	11	Chicken breast	D
St Helens	<i>S. bredeney</i>	Retailer	19	12	Cooked chicken	M
East Riding	<i>S. enteritidis</i> PT4	Reception	84	62	Pasta salad, coleslaw	M, S
Ipswich	<i>S. enteritidis</i> PT4	Caterer	8	8	None	–
Kensington, Chelsea, and Westminster	<i>S. enteritidis</i> PT4	Restaurant	57	20	Egg fried rice	M
Chepstow	<i>S. enteritidis</i> PT4	Retailer	19	19	Iced sliced cakes	D

West Sussex	<i>S. enteritidis</i> PT4	Not stated	–	–	–	–
Sefton	<i>S. enteritidis</i> PT4	Restaurant	–	–	–	–
Warwickshire	<i>S. enteritidis</i> PT4	Hotel	–	–	–	–
East Sussex	<i>S. enteritidis</i> PT4	Restaurant	–	–	–	–
Birkenhead	<i>S. enteritidis</i> PT4	Restaurant	5	5	Chicken fried rice	D
Runcorn	<i>S. enteritidis</i> PT4	Restaurant	14	14	Chinese meal	D
Harrow	<i>S. enteritidis</i> PT4	Private house	15	4	Roast meats	S
Bristol	<i>S. enteritidis</i> PT6	Restaurant	5	4	Salmon fish cake	D
East Hertfordshire	<i>S. enteritidis</i> PT6	Private house	20	6	Italian meat balls	M
Gloucester	<i>S. enteritidis</i> PT6A	Private house	–	–	–	–
Camden	<i>S. enteritidis</i> PT14B	Restaurant	20	20	Salmon and egg benedict	D
Cambridge	<i>S. enteritidis</i> PT21	Reception	–	–	–	–
Welwyn and Hatfield	<i>S. enteritidis</i> PT21	Restaurant	–	–	–	–
Winchester	<i>S. enteritidis</i> untypable	Restaurant	11	11	Roast beef	S
Calderdale	<i>S. typhimurium</i> PT7	Restaurant	3	3	Chicken	D
National	<i>S. typhimurium</i> DT104	Community	361	361	Lettuce	S
Waveney	<i>S. typhimurium</i> DT104	Retailer	11	11	Mayonnaise	D
Lancaster	Campylobacter	Restaurant	18	18	Lettuce	D
Wycombe	Campylobacter	Office	19	19	Buffet lunch	D
Darlington	Campylobacter	Restaurant	5	1	None	–
Leeds	<i>Clostridium perfringens</i>	Residential institution	24	5	Rolled roast brisket	D
Blackpool	<i>Escherichia coli</i> O157 PT21/28	Hotel	30	8	None	–
South Derbyshire	<i>E. coli</i> O157 PT21/28	Retailer	8	4	Meat products	D
North Dorset	<i>E. coli</i> O157 PT8	Prison	56	32	Pork chops, lamb steaks, spaghetti	S
Bradford	Scombrototoxin	Hotel	5	*	Tuna steaks	M
Aylesbury Vale	Scombrototoxin	Restaurant	2	*	Tuna	M
Trafford	<i>Shigella sonnei</i> PT6	Retailer	26	11	Buffete	D
Wolverhampton	SRSV	Restaurant	124	4	Prawn and salmon starter	S
Trafford	SRSV	Office	45	1	Rice salads	S
Kings Lynn and West Norfolk	Unknown	Residential institution	7	–	Chicken supreme	D
Lincoln	Unknown	Public house	21	–	None	–
Nottingham	Unknown	Restaurant	3	–	Whipping cream	D
Lambeth	Unknown	Restaurant	3	–	Tuna salad sandwich	D
Kingston	Unknown	Restaurant	12	–	Ham	D
Darlington	Unknown	Function	20	–	Rice	D

1. General outbreaks involve members of more than one household; 2. The number known to be ill; 3. Local investigations may not provide conclusive evidence of vehicles of infection. Vehicles are therefore designated 'suspect'; 4. M (microbiological): identification of an organism of the same type from cases and in the suspect vehicle, or vehicle ingredient(s), or detection of toxin in faeces or food. S (statistical): a significant statistical association between consumption of the suspect vehicle(s) and being a case. D (descriptive): other evidence, usually descriptive, reported by local investigations as indicating the suspect vehicle; * not applicable.

Outbreaks¹ of salmonella infection in: October to December 2000

Outbreak type	<i>S. enteritidis</i>		<i>S. typhimurium</i>	Other serotypes	Total
	Phage type 4	Other phage types			
General ²	4	3	1	3	11
Household ³	21	17	12	19	69
Acquired abroad ⁴	4	8	2	5	19
Total	29	28	15	27	99

1. An 'outbreak' represents two or more related laboratory confirmed infections in humans of whom at least one was ill, or two or more related cases of illness in humans of whom at least one had confirmed infection with salmonella; 2. 'General outbreak' involves members of more than one household; 3. 'Family outbreaks' involve members of one household only; 4. Family and general outbreaks in which infection was acquired outside England and Wales.

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