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Outbreak of Q fever in the French Alps, Chamonix Valley (Haute-Savoie)

Twenty-eight confirmed cases of Q fever have been identified in the Chamonix valley in Haute-Savoie since early July. Cases are all resident in the town of Chamonix or in the other communities situated in the valley between the town of Sallanche and the village of Vallorcine. Active case finding is taking place through all physicians and medical laboratories in the valley, and through the National Reference Laboratory (1).

An investigation to identify the mode of transmission and source of infection is on-going. The source of the outbreak has not yet been identified but airborne transmission from one of the herds (sheep, goats, or cattle) in the valley is suspected.

The Chamonix valley receives tens of thousands of tourists and other travelers each summer. It is therefore possible that cases have occurred among these travelers returning from a stay in the valley. Clinicians should therefore consider Q fever as a differential diagnosis in patients with an atypical pneumonia who have visited the Chamonix valley since June this year. Differential diagnosis may also include *Legionella*, an organism with which *Coxiella burnetii* cross-reacts serologically (2)

If clinicians are aware of any patient with Q fever having stayed in the Chamonix valley since June this year, they should inform their local regional epidemiologist, and contact Dr Robert Smith at CDSC (Wales) (tel: 029 2052 1997: email robert.smith@cdsc.wales.nhs.uk), or contact Henriette de Valk (h.devalk@invs.sante.fr) with copy to Alexandra Mailles (a.mailles@invs.sante.fr) and Isabelle Capek (i.capek@invs.sante.fr). Further information can be obtained from Henriette de Valk (telephone: 33 1 41 79 67 28) or Alexandra Maille (telephone: 33 1 41 79 68 01)

Human infection

Q fever is an acute (and sometimes chronic) febrile illness caused by the rickettsial organism Coxiella burnetii. The commonest animal reservoirs for *C. burnetii* are cattle, sheep, and goats. The organism is found in placental tissues and birth fluids as well as the milk, urine, and faeces of infected animals. Infection in these animals is usually asymptomatic although there may be inflammation of the placenta or abortion. It is, however, uncommon as a diagnosis of abortion in sheep and cattle. Cattle disease arising from Coxiella has not been included in veterinary investigation diagnosis analysis reports since 1983. There have been reports in the literature of serological evidence of natural infection in hens, ducks, geese, turkeys, pigeons, cats, and an association with raw milk consumption and contact with hay or straw.

Human infection usually occurs by inhalation of infected dust or from exposure to amniotic fluid or placenta where they are present in high numbers. Infection may also be acquired by inhalation of aerosols from the environment (soil, straw and wool), which become contaminated when these animals give birth. Exposure to C. burnetii is common in farmworkers (3). The organisms are resistant to heat and drying and the infectious dose is thought to be low.

In humans, infection is characterized by a self-limiting flu-like illness or pneumonia but in chronic cases endocarditis is the main syndrome (4). Osteomyelitis, infections of vascular grafts, hepatitis or aneurisms and infections during pregnancy have also been reported.

The incubation period ranges from four to 40 days and may vary with the infective dose of the organism, the route of exposure and the age of the patient. Infection may be asymptomatic, an acute febrile illness, a pneumonic illness or a chronic infection, particularly endocarditis or hepatitis. Almost all acute clinical cases have fever and fatigue, and most have chills, headaches, myalgia and sweats. Other features may include cough, a red or inflamed throat, weight loss, or neurological symptoms (usually presenting as a severe headache). Tiredness and malaise may persist for some months following infection. The diagnosis is confirmed by serologic testing. The treatment of choice for acute Q fever is doxycycline. Antibiotic treatment is most effective when initiated within the first three days of illness. A major manifestation in chronic cases is endocarditis, which is more difficult to treat and often requires combination therapy. In a review (2) of 839 clinically confirmed cases reported to the PHLS 92 (11%) were reported to have had endocarditis and ten (1%) liver involvement.

Pregnant women, immunosuppressed individuals and those with congenital or acquired valvular heart disease should avoid jobs which may expose them to the risk of acquiring Q fever. A Q fever vaccine (Q VAX) has been licensed for use in Australia for at-risk individuals in certain occupational groups. It is not, however, available in the UK.

Q fever worldwide

The geographic distribution of Q fever is wide and *C. burneti*i is found in virtually every country in the world, except New Zealand (5) although until recently, some parts of northern Europe were thought to be free of Q fever, and occasional cases were attributed to infection overseas. Recent evidence now suggests that C. burnetii infection is now endemic in Sweden and Poland (6).

In many countries, Q fever is not a reportable disease and it may be difficult to ascertain how many cases occur, furthermore, the source of infection often remains speculative. In Europe, surveillance of Q fever varies with the surveillance systems in place in each country (7). Large outbreaks of Q fever involving people without occupational exposure have rarely been reported. Indirect exposure to sheep flocks passing populated areas was shown to be a determinant of the outbreaks in Switzerland (8) and Northern Italy (9) and in Britain, urban outbreaks have been associated with the passage of farm vehicles containing contaminated straw and manure (10) or to wind-borne spread from farmland near an urban area (11).

Q fever in England and Wales

Around 70 cases are reported to CDSC annually from England and Wales but because much infection with *C. burnetii* is mild or asymptomatic and resolves spontaneously, the true incidence of infection is unknown. Males are 2.6 times more likely to be reported with Q fever than females, mainly due to occupational exposure and reported cases in children are rare, probably due to infection being more likely to be asymptomatic. Infections have been reported in all age groups with over 70% of cases occurring in the 25 to 44 year age group in both sexes. Throughout Europe, human infection increases in the spring and early summer (March to June). In the UK, most cases are reported from the south-west region of England or from Northern Ireland. Reported incidence in England and Wales has not increased during the past decade although there was a decline to 47 in the number of cases reported in 2001, probably due to the foot and mouth disease cull. Most UK cases are sporadic or associated with occupational exposure to animals although outbreaks do occur and are more likely to affect urban (naive) populations. There was a small outbreak among people working on the foot and mouth animal cull in 2001 (12).

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Further reading

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General outbreaks of foodborne illness, England and Wales: weeks 31-35/02*

Health authority	Organism	Place of outbreak	Month of outbreak	No. ill	Cases positive	Suspect vehicle	Evidence
Lincolnshire	*S.* Enteritidis PT1	Residential institution	August	6	6	None	–
Haringey and Enfield	*S.* Enteritidis PT4	Residential Institution	August	3	3	None	–
Bedfordshire	*S.* Enteritidis PT4 *S.* Braenderup	Restaurant	August	>5	>5	None	–
Sheffield	*S.* Enteritidis PT5C	Hospital	August	>1	>1	None	–
Buckingham and Milton Keynes	*S.* Enteritidis PT21	Restaurant	August	14	14	None	–
East Riding	*S.* Enteritidis	Restaurant	August	5	5	None	–

* Preliminary data. Final information will be published in the quarterly report.
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 investigators as indicating the suspect vehicle.

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Salmonella infections (faecal specimens), England and Wales: reports to the PHLS (salmonella data set*)

Details of serotypes of the 1863 salmonella infections recorded in July 2002 are given in the table below. In August 2002, 1842 salmonella infections were recorded and preliminary information was received about six outbreaks.

*figures quoted from the PHLS salmonella data set are for isolates confirmed and typed by PHLS Laboratory of Enteric Pathogens (LEP)

	July 2002
Salmonella (provisional total)	1863
***S.* Enteritidis** (PT4)	504
***S.* Enteritidis** (other PTs)	846
***S.* Typhimurium**	199
***S.* Virchow**	18
Other (typed)	296

Common gastrointestinal infections, England and Wales: laboratory reports, weeks 31- 35/02

	Number of reports received					Total reports	Cumulative total to	
Laboratory reports	**31/02**	**32/02**	**33/02**	**34/02**	**35/02**	**31-35/02**	**35/02**	**35/01**
Campylobacter	1128	1071	1029	979	612	**4819**	**29835**	**37123**
Escherichia coli* O157	23	10	20	42	25	**120**	**336**	**451**
Salmonella	355	425	481	510	305	**2076**	**7889**	**9445**
Shigella sonnei	3	16	13	17	4	**53**	**444**	**589**
Rotavirus	173	61	47	115	29	**425**	**13558**	**15101**
Norwalk-like virus	100	73	26	80	62	**341**	**2010**	**1240**
Cryptosporidium	52	40	40	42	29	**203**	**1580**	**1670**
Giardia	47	67	67	59	40	**280**	**1994**	**2067**

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General outbreaks of foodborne illness, England and Wales: quarterly report

Table 1 Final information on general outbreaks of foodborne illness: January to March 2002

Health authority	Organism	Place of outbreak	No. ill	Cases positive	Suspect vehicle	Evidence
Carmarthenshire	*S*. Enteritidis PT4	Retailer	6	6	Pancakes	D
Salisbury	*S*. Enteritidis PT4	Residential Institution	20	20	Eggs	M

Bury	*S.* Typhimurium DT12	Farm	5	5	Pasteurised milk	D
Bolton	*S.* Typhimurium DT104	Retailer	103	62	Cooked food	M,D
Lincoln	*S.* Typhimurium DT104	Hospital	3	3	None	-
Wellingborough	*S.* Typhimurium DT141	Private house	9	7	Egg fried rice dish	D
Eastleigh	*S.* Heidelberg	School	8	7	None	-
Leeds	Campylobacter	Restaurant	11	7	Chicken liver parfait	D

Table 2 Outbreaks of salmonella infection: April to June 2002

Outbreak type	*S.* Enteritidis		*S.* Typhimurium	Other serotypes	Total
	Phage type 4	Other phage types			
General	4	2	1	1	8
Household	16	20	9	10	55
Acquired abroad	–	6	–	3	9
Total	20	28	10	14	72

Salmonella serotypes recorded in the PHLS salmonella data set: April to June 2002

All serotypes recorded in the PHLS salmonella data set in the second quarter of 2002 are listed below. There were more than ten reports of 2336 serotypes, two to ten reports were 220 serotypes and one report of 44 serotypes.

	April to June 2002 (provisional)
S. Agona	31
S. Albany	12
S. Bareilly	11
S. Braenderup	16
S. Enteritidis	1573
S. Hadar	48
S. Heidelberg	19
S. Infantis	24
S. Java	44
S. Lanka	11
S. Montevideo	16
S. Newport	29
S. Panama	11
S. Stanley	22
S. Typhimurium	358
S. Unnamed	46
S. Virchow	65

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

S. Abony	2	*S.* Javiana	4
S. Adelaide	2	*S.* Kedougou	5
S. Agama	4	*S.* Kentucky	6
S. Ajiobo	2	*S.* Kiambu	3
S. Anatum	9	*S.* Kingabwa	4
S. Apapa	2	*S.* Kottbus	5
S. Arechavaleta	3	*S.* Liverpool	2
S. Arizonae	2	*S.* Livingstone	2
S. Binza	2	*S.* London	7
S. Blockley	7	*S.* Marina	3
S. Bonn	3	*S.* Mbandaka	8
S. Bovis-morbificans	3	*S.* Mississippi	3
S. Brandenburg	4	*S.* Muenchen	5
S. Bredeney	2	*S.* Ohio	4
S. Brunei	2	*S.* Okatie	2
S. Chester	2	*S.* Oranienburg	8
S. Coeln	3	*S.* Oritamerin	2
S. Dahomey	4	*S.* Oslo	6
S. Derby	8	*S.*. Poona	2
S. Durham	2	*S.* Potsdam	2
S. Emek	3	*S.* Reading	2
S. Give	3	*S.* Richmond	3
S. Gold-coast	2	*S.* Rissen	3
S. Haifa	2	*S.* Saint-paul	8
S. Havana	6	*S.* Schwarzengrund	5
S. Hull	3	*S.* Senftenberg	5
S. Hvittingfoss	2	*S.* Stanleyville	4
S. Ibadan	3	*S.* Thompson	9
S. Indiana	3	*S.* Urbana	3

One report of each of the following serotypes were received:

S.. Amager	*S.* Durban	*S.* Kokomlemle	*S.* Pomona
S. Baildon	*S.* Eastbourne	*S.* Lagos	*S.* Romanby
S. Berkeley	*S.* Fremantle	*S.* Manhatten	*S.* Rubislaw
S. Bonariensis	*S.* Fresno	*S.* Mikawasima	*S.* Ruiru
S. Canada	*S.* Gombe	*S.* Monschaui	*S.* San-diego
S. Cannstatt	*S.* Grumpensis	*S.* Moualine	*S.* Takoradi
S. Cerro	*S.* Hissar	*S.* Mount	*S.* Tamale
S. Chameleon	*S.* Idikan	*S.* Napoli	*S.* Wangata
S. Colindale	*S.* Kenya	*S.* New-brunswick	*S.* Weltevreden
S. Degania	*S.* Kimuenza	*S.* Overschie	*S.* Wien
S. Dublin	*S.* Kingston	*S.* Oxford	*S.* Zega

Surveillance of waterborne disease and water quality: January to June 2002, and summary of 2001

This is the second twice-yearly report on the surveillance of waterborne disease and water quality published in 2002.

Table 1 summarises details of waterborne outbreaks reported to the PHLS Communicable Disease Surveillance Centre (CDSC) in 2001. The strength of association between human illness and water exposure in outbreak investigations is assessed according to the microbiology results from cases, microbiological examination of water samples, and descriptive and analytical epidemiology (1). No new outbreaks or incidents from 2001 have been added to those reported previously (2, 3).

Table 1 Outbreaks and incidents of association between human disease and water in England and Wales: 2001

Outbreak reference number	Organism	NHS Region	Month	Total affected	Positive	Association (1)
01/136	*Cryptosporidium*	South East	February - March	5	4	Strong
Public swimming pool. Cryptosporidium *oocysts identified in main and learner pools and from clinical cases. Descriptive epidemiology suggested association with swimming pool. Inadequate treatment of pool water. Pool operating regime reviewed and enhanced.*						
01/347	*Cryptosporidium*	South East	June	152*	8	Possible
School outdoor swimming pool. Oocysts from cases and water. Pool closed. Pool operating regime reviewed and enhanced. No obvious faecal incident or contamination event occurred.						
01/440	*Cryptosporidium*	South West	August	14	5	Possible
Cases exposed to stream water flowing through a beach. High coliform count in water sample taken. Effluent from water treatment plant enters stream. Also problem with illegal tipping into sewer, possibly from campsite chemical toilets.						
01/104	VT-producing *Escherichia coli* O157 PT 21/28	Northern and Yorkshire	October	3	4**	Strong
Residential outdoor pursuits centre supplied by a private well water supply. Pathogen isolated from cases and from private water supply. Intermittent contamination of well water suspected. Appropriate control measures and engineering improvements made to water system.						
01/N01	*Pseudomonas aeruginosa*	London	October	>50	2	Strong
Pseudomonas folliculitis contracted at spa pool leisure facility. Pathogen detected in water and from cases. Evidence of pool operating system failure prior to onset of illness. Pool closed and treated.						
01/0528	*Cryptosporidium*	South West	October and November	3	3	Possible
Leisure Centre swimming pool. Pathogen detected in cases but not in water.						

* A proportion may have been due to NLV infection; ** One was asymptomatic.

Water related outbreaks of infection

Four waterborne outbreaks of infection were reported to CDSC between 1 January and 30 June 2002 (table 2).

Table 2 Outbreaks and incidents of association between human disease and water in England and Wales: 1 January to 30 June, 2002

Outbreak reference number	Organism	NHS Region	Month	Total affected	Positive	Association (3)
02/N01	*Pseudomonas aeruginosa*	Yorkshire and Humberside	February	35	6	Probable
Ps. aeruginosa isolated from the surface of a children's inflatable water slide4. Slide withdrawn from further use. Pool closed temporarily and hyperchlorinated.						
02/018	*Campylobacter and Cryptosporidium*	Yorkshire and Humberside	March	50	*campylobacter* 1 *cryptosporidium* 1	Possible
Outbreak associated with spring water supply.						
02/026	*Campylobacter*	Wales	June	30	4	Possible
Royal Marine recruits, on exercise, drank from moorland stream.						
02/034	*Campylobacter*	Wales	June	30	4	Possible
Two school parties staying on field adjacent to farm. Private untreated water supply to farm. Control measures included provision of bottled water and advice to boil water.						

Thirty-five cases of folliculitis, with dates of onset in February 2002, were associated with the use of an inflatable plastic slide in a public swimming pool in the Yorkshire and Humberside region (4). Six of the cases had skin swabs positive for *Pseudomonas aeruginosa*. Cases were mostly children aged between 7 and 14 (34/35), who had used the inflatable slide in the swimming pool. *Ps. aeruginosa* was later isolated from surface swabs of the inflatable, however the organism was not detected in pool water. Control measures included temporary closure of the pool, hyperchlorination of the pool water and removal of the inflatable slide.

Anecdotal evidence was provided for approximately 50 cases of gastroenteritis in children aged 11 to 15 years at a private boarding school in the Yorkshire and Humberside region during March 2002. Descriptive evidence suggested a link between illness and the private water supply to the school, however no pathogen was detected in the water. Evidence of causality was further weakened by the presence of *Campylobacter* in just one faecal specimen and *Cryptosporidium* (genotype 2) in another specimen, with five other samples testing negative. Previous outbreaks of campylobacter and cryptosporidium have, however, been noted to be associated with the same private water supply in 1992 and 1993 (5). The practice of spreading animal slurry within the water catchment zone may have contributed to the risk of contamination of the water supply. Control measures enforced by the local environmental health team, included guidance to install adequate water treatment facilities at the school, cessation of animal slurry spreading, and routine analysis of water samples for quality control.

Two cases of campylobacteriosis in Royal Marine recruits were linked by descriptive epidemiology to consumption of raw untreated water from a moorland stream whilst on exercise in the South West region in July 2002. No microbiological evidence was provided in terms of water samples from the stream.

Thirty cases of gastroenteritis were associated with a stay on a farm in North Wales during June 2002. The cases were aged between 11 and 14 years. Four were confirmed as campylobacter. Two school parties had camped on privately owned farm premises with a private water supply consisting of raw untreated water from a local fast-flowing stream, piped via a header tank to an unprotected tap in the farm yard. Farm animals (mainly sheep) had access to the open water inlet and outlet. Water from the farmyard tap was stored (without boiling) in small containers and used for drinking, food preparation, reconstituting powdered milk, cleaning teeth and washing eating utensils. Although campylobacter was not isolated, coliforms and *E. coli* were isolated from stream, tap, and container water samples. A cohort study identified the private water supply as the main risk factor. Other risk factors also identified during a site visit included: unfenced animals on the camping grounds with faeces littering the area, inadequate toilet and hand-washing facilities, activities in, and washing or drinking from, nearby streams also accessed by animals. Immediate control measures included advice to boil water, and to avoid the identified risk factors. Warning of the situation was issued to Norfolk schools; an advice leaflet on risk factors associated with camping will be distributed shortly. The Health and Safety Executive and local environmental health departments are currently following up control and remedial measures on the farm. A similar incident occurred three years ago when two cases of campylobacter were confirmed amongst a camping group from the same school staying at the same farm.

Surveillance of water quality

Private water supplies

A private water supply is any water supply that is not provided by a statutorily appointed water company. Private water supplies are used by more than a third of a million people throughout the United Kingdom (UK). Although these supplies provide water that is cheap and palatable, such supplies can become contaminated with faecal material of human or animal origin. Domestic users may be directly exposed to the risk of gastrointestinal illness through contaminated water and commercial use of private water supplies may expose larger populations to this risk.

The current legislation outlines criteria for the classification and sampling frequency of private water supplies. Category 1 supplies are used wholly for domestic purposes and category 2 supplies include supplies to premises such as; hospitals, residential homes, holiday sites and food preparation premises (6). These categories are further sub-divided into classes depending on the volume of water or number of people supplied. The specified sampling frequency varies between two samples per month to one sample every five years, depending on the class of supply.

The data on microbiological quality of private water supplies were collected from 12 laboratories; Birmingham, Bristol, Chelmsford, Chester, Coventry, Norwich, Nottingham, Preston, Reading, Shrewbury and Stoke Public Health Laboratories, and the Wessex Environmental Microbiological Services (WEMS). The Results of the microbiological analysis of samples from various classes of private water supply for January to June 2002 are presented (table 3). The presence of *E. coli* indicates that human or animal faecal contamination has occurred and that urgent action should be taken to eradicate the contamination. *E. coli* was isolated from 16% (308 from 1895) of supplies examined. The microbiological quality of private water supplies is better in the period January to June compared with the period July to December (table 4). The 1895 supplies examined yielded a total of 2955 samples, 316 (11%) of which were positive for *E. coli*.

Table 3 Routine, including regulatory, tests of private water supplies: January to June 2002

	Number of supplies (samples)						
	Total supplies	Category 1:domestic			Category 2: others*		Category unknown
		Class F [single dwelling]	Class D and E [<=100 people]	Class A to C [>100 people]	Class 3 to 5 [daily volume <=100m^3]	Class 1 and 2 [daily volume >100m^3]	
Number tested	1895 (2955)	407 (502)	114 (134)	6 (19)	153 (178)	4 (78)	1211 (2044)
Number positive for *E. coli*	308 (316)	99 (104)	30 (30)	1– (1)	40 (41)	1 (3)	137 (137)
Total coliforms (including *E. coli*)	731 (781)	210 (236)	65 (74)	3 (9)	81 (88)	1 (3)	371 (371)

*Supplies to premises such as hospitals, residential homes, holiday sites and food preparation premises.

Table 4 Percentage of private water supplies positive for *Escherichia coli*: January 1995 to June 2002

Year	Percentage of private water supplies positive for *E. coli*	
	Jan-June	July-Dec
1995	19	42
1996	18	40
1997	13	31
1998	23	37
1999	20	29
2000	17	28
2001	13	20
2002	16	–

The presence of coliforms, other than *E. coli* , in water does not specifically indicate faecal contamination, as they are natural inhabitants of many aquatic environments. Coliforms are, however, indicators of the efficiency of water treatment and current legislation states that they should not be present in drinking water. Coliforms (including *E. coli*) were isolated from 39% (731 from 1895) of supplies, from which 781 samples out of a total of 2955 (26%) were positive. The proportion of samples positive for *E. coli* from category 1 supplies (21%) was slightly higher than that of samples from category 2 supplies (17%).

The results of statutory testing of public water supplies in England and Wales have been compiled and published annually by the Drinking Water Inspectorate since 1992. These reports have shown that the microbiological quality of mains water supplied by twenty-six water companies has continued to improve over the last 10 years. In 2001 0.04% and 0.51% of the total samples from water supply zones were positive for *E. coli* and coliforms, respectively (7). In comparison private water supplies are generally of a poor microbiological quality, and despite an apparent improvement in the latter half of 2001 (3) this is not a continuing trend in 2002. Overall there has been no improvement in the microbiological quality of private water supplies since PHLS surveillance began (table 4). With new legislation on the way for private water supplies any real improvements in water quality will probably depend on the implementation of a robust evidence-based risk assessment, which will correlate environmental survey data and water quality information for private water supplies.

Pool waters
The data on the microbiological quality of bathing pools were provided by; Birmingham, Bristol, Chelmsford, Chester, Coventry, Norwich, Nottingham, Preston, Reading, Shrewsbury, and Stoke PHLs, and WEMS.

Guidelines for pool water quality state that *E.coli* should be absent from 100mL samples from all pools and that *Ps. aeruginosa* should be absent from 100mL samples from spa and hydrotherapy pools (8,9). Coliforms should also be absent from 100mL. A count of <10/100mL coliforms is, however, acceptable, provided that they are not in consecutive samples, aerobic colony count (ACC) after 24 hours incubation at 37°C is less than 10 colony forming units per mL (CFU/mL) and the residual disinfection and pH are within the recommended range. A raised ACC may result from heavy pool use and microbial proliferation in the pool water and indicates possible discrepancies in disinfection.

Results from the microbiological analysis of 5450 pool water samples from 1819 pools (158 hydrotherapy, 321 spa and 1340 swimming pools) are shown in table 5. The swimming pools were in municipal, leisure and sports centres, and hotels. Pools on a single site, such as learner, diving, and main pools, were counted separately. As for previous years, there was a low rate of isolation of *E.coli,* with less than 2 % (26 of 1819) of pools positive. The 26 positive pools yielded 31 positive samples. Coliforms (including *E. coli*) were isolated from 123 pools, which yielded 254 positive samples.

Table 5 Routine (including regulatory) tests of pool waters: January to June 2002

Organisms	Total pools (samples)	Hydrotherapy pools (samples)	Spa pools (samples)	Swimming pools (samples)	Swimming pools (samples)
Coliform organisms					
Number tested	1819 (5450)	158 (730)	321 (777)	1340 (3943)	–
Number positive for *E. coli*	26 (31)	12 (1)	12 (12)	13 (18)	–
Number positive for Total coliforms (including *E. coli*)	123 (254)	9 (10)	33 (38)	81 (206)	–
*Pseudomonas aeruginosa**					
Number tested	1503 (4321)	158 (727)	315 (765)	1030 (2829)	–
Number positive	204 (332)	14 (25)	77 (117)	113 (190)	–

* Not always tested for routinely

The presence of *Ps. aeruginosa* in hydrotherapy and spa pools is a potential health risk, as outbreaks of disease caused by Ps. aeruginosa have been associated with them. In conventional pools, *Ps. aeruginosa* is an optional quality parameter and is not always looked for *Ps. aeruginosa* was isolated from 11% (113 from 1030) of swimming pools in which it was looked for, 9% (14 from 158) hydrotherapy pools and 24% (77 from 315) spa pools (table 5). ACC of greater than 100 colony-forming units per mL were found in 4% (248 of 5450) and these 248 samples were obtained from 178 pools (table 6).

Table 6 Highest aerobic colony count (ACC) in all pool waters

ACC (CFU/mL)	Pool waters	Pools samples
0 to 10	1317	4613
11 to 100	324	589
>100	178	248
Total	**1819**	**5450**

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