J. Hyg., Camb. (1984), **92**, 293–299
Printed in Great Britain

An outbreak of calicivirus associated gastroenteritis in an elderly persons home. A possible zoonosis?

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(*Received* 26 *March* 1984; *accepted* 9 *May* 1984)

SUMMARY

An outbreak of gastroenteritis caused by calicivirus began amongst residents and staff of an old persons home 24 hours after the proprietor's dog had been sick. Serological evidence suggests that the calicivirus isolated from one of the cases may be capable of infecting dogs as well as man. The virus strain responsible for this outbreak differs antigenically from those associated with two other outbreaks in the U.K. and one in Japan. The characteristic morphology of calicivirus is lost if stool is stored at −70 °C.

INTRODUCTION

Caliciviruses are known to be a cause of infantile gastroenteritis in many parts of the world (references cited in Cubitt & McSwiggan, 1981). However, only one outbreak involving elderly patients has been recorded (Cubitt, Pead & Saeed, 1981). In this report we describe an outbreak of gastroenteritis in an old people's home involving a dog, the residents, the staff and their children. Evidence is presented which indicates that the strain of calicivirus responsible for this episode may infect both man and dogs.

THE OUTBREAK

On 22 June 1983 the 3-year-old son of the proprietor of an elderly people's home in Exeter developed diarrhoea and vomiting. About 36 h later his father became ill but felt well enough to travel abroad with his wife, who herself developed symptoms during the flight. The same day a care assistant and all nine elderly residents (aged 65–95) became ill. On 26 June the locum manager and his wife who had moved in 2 days earlier developed gastroenteritis, and finally, on the 27th, a further care assistant and her 9-year-old daughter became ill.

Fourteen of the 17 persons involved had diarrhoea and vomiting; the other three complained of upper abdominal pain with some vomiting but no diarrhoea. All the patients recovered within 18–24 h, except for a rather frail lady of 95 who remained unwell for 3 days.

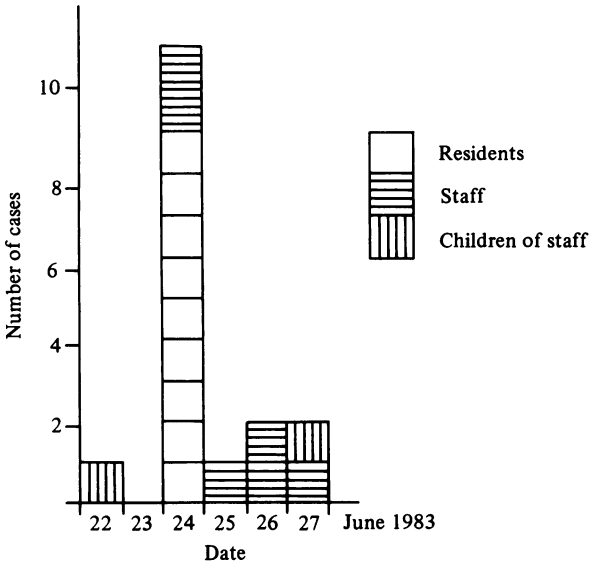

Fig. 1. Pattern of development of outbreak.

Though staff and residents generally ate together, it was not possible to associate any particular meal or food with the onset of symptoms. However, the index human case often played with the household dog, which was in the habit of visiting the residents, who would pat and make much of him. On 21 June, 24 h before the first human case became ill, the dog was violently sick and contaminated the stair carpet and other places in the home comprehensively.

The course of the outbreak is illustrated in Fig. 1. The epidemic curve suggests a point source with a series of secondary cases.

The main features of the outbreak were a very high attack rate (100% of residents and staff), an incubation period of 24–48 h, a brief bout of diarrhoea and vomiting, and a rapid recovery.

LABORATORY INVESTIGATIONS

Standard procedures were carried out to identify bacterial and viral pathogens in the stool specimens.

Two patients, the 95-year-old and the proprietress, agreed to provide convalescent phase samples of blood, which were taken 3 months after the illness. The dog was bled by a veterinary surgeon 1 month after the outbreak. Sera from 21 other healthy adult dogs held in kennels in the U.K. were made available by Dr H. Thompson of Glasgow University.

Sera were tested for antibody to calicivirus by immune electron microscopy using the method of Cubitt, McSwiggan & Moore (1979), against two antigens. Human antigen consisted of partially purified virus particles from the faecal sample of one of the patients. Dog antigen was a canine calicivirus recently isolated in the United States of America from a dog with gastroenteritis (Schaffer, Soergel, Smith,

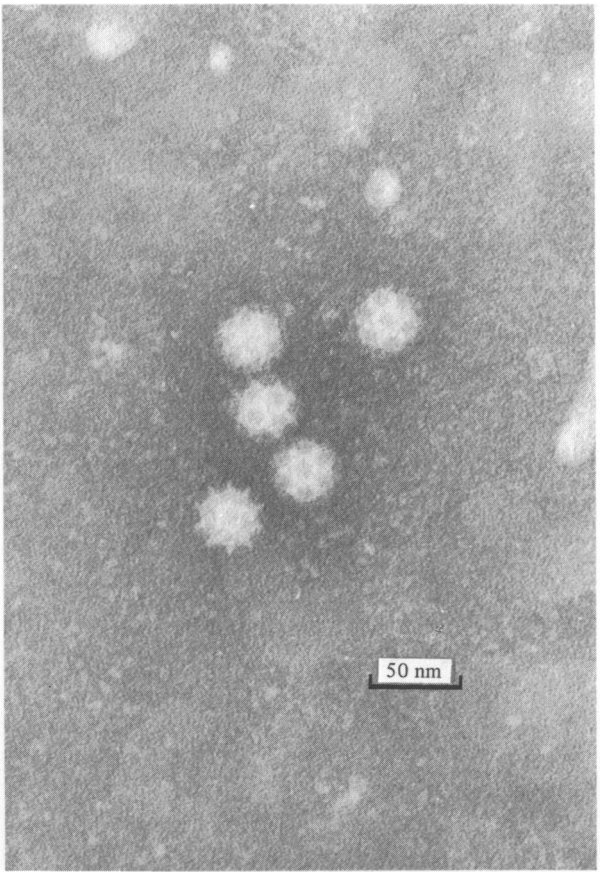

Fig. 2. Caliciviruses from fresh stool.

Skilling & Cubitt, in preparation). The tests were performed using material which had not been frozen. The virus particles were purified by trichlortrifluorethane treatment and differential centrifugation on the day on which a batch of tests was done.

Cross-reactivity tests were carried out to determine whether the calicivirus responsible for this outbreak was related to strains from other reported outbreaks in the U.K. – Shenley and Portsmouth (Cubitt, McSwiggan & Arstall, 1980; Cubitt *et al.* 1981) or to a Japanese strain, Sapporo (Chiba *et al.* 1979) or to the canine calicivirus. The antigens were titrated against single pairs of sera from individual patients shown to be excreting calicivirus in each outbreak. Antiserum to the canine strain was supplied by Dr J. W. Black, University of California.

All serological tests were carried out at the Public Health Laboratory, Central Middlesex Hospital, London.

RESULTS

Calicivirus-like particles were observed by electron microscopy in seven of the 11 samples of faeces examined. No bacterial pathogens were found. The identity of the particles as caliciviruses was confirmed by two reference laboratories (Bristol

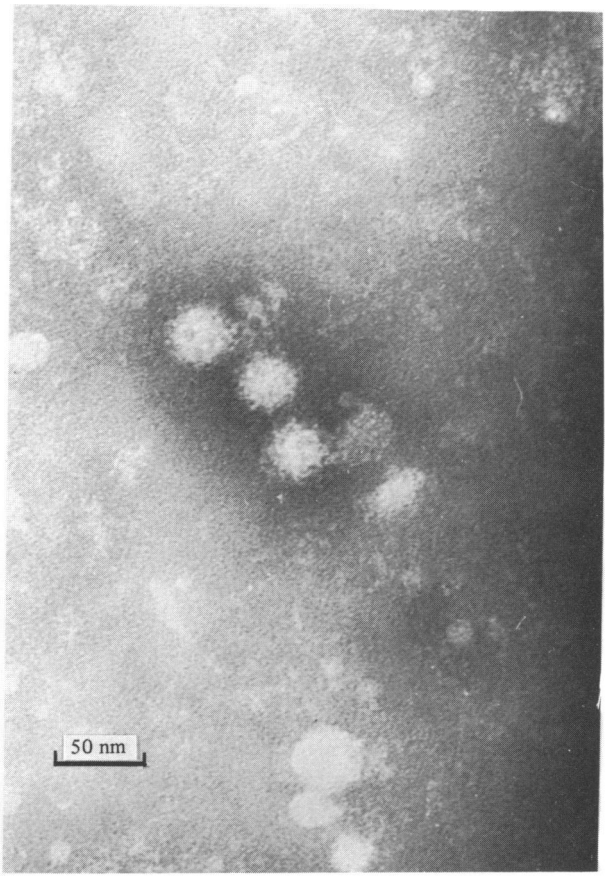

Fig. 3. Calicivirus from same stool but after storage at −70°C.

Public Health Laboratory, England, and Central Public Health Laboratory, Colindale, London). All specimens had been obtained within 36 h of the onset of symptoms. No follow-up samples were examined. When specimens were re-examined after storage at −70°C for a few weeks, it was noticed that the characteristic morphology had become blurred such that the particles closely resembled Norwalk agent (Figs. 2, 3). The results of the serological tests are presented in Table 1. Antibody titres in both patients were compatible with infections with the calicivirus, while that in the dog at the home was considerably higher than in dogs which were not involved and apparently well. The dog calicivirus was clearly different from the strain involved in this outbreak.

The results of the cross-reactivity tests are presented in Table 2. Any rises in antibody titre found occurred only in sera tested against virus antigens from the same outbreak. No rises were demonstrable with the Exeter antigen. It was not possible to test the Exeter sera against the other antigens as stocks of the latter were exhausted.

Table 1. *Titres of antibody to human and canine caliciviruses by immune electron-microscopy in sera from dogs and from two patients involved in the current outbreak*

	Sera					
	Human		Dog			
				Kennels 21 sera		
Antigens	Patient 1	Patient 2	Exeter outbreak	13	8	U.S.A. case
Human	> 160	> 160	80	< 20	⩾ 20*	20
Dog	< 20	< 20	40	NT	NT	160

NT = not tested.

* Three sera were titrated to end points; the titres were 40, 20 and 20.

Table 2. *Cross-reactivity tests between various human caliviruses on the basis of titres of antibody by immune electromicroscopy*

	Sera from patients involved in:					
	Shenley outbreak		Portsmouth outbreak		Sapporo outbreak	
Antigens	Acute	Conv.	Acute	Conv.	Acute	Conv.
Exeter	20	20	160	160	20	20
Shenley	20	160	NT	NT	NT	NT
Portsmouth	20	20	20	320	20	20
Sapporo	40	40	20	20	20	320

NT = not tested.

DISCUSSION

The clinical and epidemiological features of this outbreak were similar to those described by Cubitt *et al.* (1981). The finding of calicivirus particles in quantity in seven of the stool specimens obtained from patients during the acute phase of their illness in the absence of any other pathogens provides further evidence for the pathogenic role of these agents in adults.

Two other outbreaks involving geriatric patients and nursing and medical staff in hospitals in north-west London have been studied (Cubitt, unpublished data). In these episodes too there was a high attack rate and vomiting and diarrhoea were the most common manifestations of illness.

The presence of high levels of antibody in the convalescent phase sera obtained from the two patients is consistent with recent infection, though such titres have been found in apparently healthy adults (Cubitt, McSwiggan & Arstall, 1980; Sakuma *et al.* 1980).

The strain of calicivirus associated with this episode clearly differs antigenically from those causing outbreaks in Shenley, Portsmouth and Sapporo (see Cubitt & McSwiggan, 1981), and it seems likely that there are many types of human

calicivirus circulating in the community, a feature well recognized amongst animal strains (Schaffer, 1979). The relatively high titres found in both the acute and convalescent sera from the Portsmouth outbreak is compatible with past but not current experience with the Exeter virus.

Whilst the origin of the outbreak remains obscure, the possible association with the dog is intriguing. Caliciviruses were recognized in animals well before they were reported in man (see Studdert, 1978, for references), and their role in acute enteritis in calves has been defined experimentally (Woode & Bridger, 1978). Caliciviruses have recently been isolated from dogs with glossitis (Evermann, Bryan & McKeirnan, 1981) and a dog with enteritis (Schaffer *et al.* in preparation). The serological results reported here show that the serum of the dog in the nursing-home contains antibody reacting with both the human and canine isolates to a greater extent than do sera from a random selection of other dogs. The human sera from this outbreak do not cross-react with the cultured canine virus. The calicivirus antibody titres of the dog in the nursing-home are too low to suggest more than that there has at some time been contact with calicivirus. However, that sera from eight unselected kennel dogs contained detectable antibody to the human virus can only be interpreted either that some human and animal strains share cross-reacting antigens or that the same strains may infect either host. Unfortunately the possible relationship was not considered until it was too late to collect stool from the animal. Taking both the laboratory and the epidemiological evidence the involvement of the dog as the source of the outbreak cannot be excluded. Perhaps more attention should be given to such a hypothesis in the future.

Canine sera were supplied by Dr Hal Thompson, Parvovirus Laboratory, Veterinary School, University of Glasgow. The isolate of canine enteric calicivirus and canine antisera were kindly sent by Dr F. Schaffer, Naval Biosciences Laboratory, University of California. The technical assistance of Mr J. Jones and Mr A. W. P. Stephens is gratefully acknowledged. The study was supported by a grant from the World Health Organisation Diarrhoeal Diseases Control Programme.

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