A major outbreak of gastroenteritis in Réunion Island in 2012: first identification of G12 rotavirus on the Island

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Between August and November 2012 a severe outbreak of gastroenteritis occurred on Réunion Island, affecting more than 50,000 cases, particularly young children. Virological analyses showed that the virus responsible for this epidemic was rotavirus. Genotyping of stool samples indicated circulation of rotavirus type G3P[8] but also G12P[8], highlighting the risk of global emergence of this genotype in the coming years.

On Réunion Island, a French overseas administrated territory located in the south-western Indian Ocean, gastroenteritis outbreaks are usually observed during the austral winter, between the months of August and November. While outbreaks of gastroenteritis had been of moderate severity on the island between 2008 and 2011 [1], an intense epidemic occurred in 2012. Monitoring has been in place for several years, involving many professionals and coordinated by the Indian Ocean Regional Office (Cellule de l’InVS en région Océan Indien: Cire OI) of the French Institute for Public Health Surveillance. This system allowed to detect in mid-August 2012 an unusual increase in gastroenteritis cases that exceeded seasonal averages, and to inform the public health authorities and the population in a reactive way.

Population and healthcare system on Réunion Island
Réunion Island is located in the south-western Indian Ocean, at 5,900 miles from France and 500 miles from Madagascar, with a population of 830,000 inhabitants in 2012. The population is younger than in mainland France. In 2010, 41% of the population was younger than 25 years, and only 11% were older than 60 years. Medical facilities are similar to those in France, and there are more than 890 general practitioners and more than 80 pediatricians distributed throughout the island, as well as four hospitals and six emergency departments.

Surveillance system
Gastroenteritis surveillance on Réunion Island is based on different complementary systems:

A syndromic surveillance system is based on all emergency departments (ED) on the island (Organisation de la surveillance coordonnée des urgences (OSCOUR) network). Data are collected daily directly from patients’ computerised medical files that are filled in during medical consultations at ED [1-3]. Among the collected variables, the diagnosis is categorised according the 10th revision of the international Classification of Diseases (ICD-10)[4]. Several indicators are routinely monitored, including the number of ED visits for gastroenteritis (ICD-10 codes A08 and A09).

A network of sentinel general practitioners of Réunion Island reports every week the numbers of consultations for acute diarrhoea [1,5]. A case of acute diarrhoea is defined as a patient having more than three liquid stools per day during the past 15 days and motivating consultation.

The national health insurance centre of Réunion Island (Caisse générale de sécurité sociale; CGSS) sends to the Cire OI every week the numbers of consultations made by general practitioners and paediatricians of the island. These consultation data, coupled with those from sentinel practitioners, allow to estimate by extrapolation the total weekly number of consultations for acute diarrhoea on the whole island [1,6,7].

Three sentinel hospital laboratories report to the Cire OI the monthly percentage of samples positive for rotavirus, adenovirus and norovirus to ensure virological surveillance of viral gastroenteritis. In addition, a selection of rotavirus-positive samples was sent, as part of this outbreak investigation in 2012, by the laboratories of the hospitals of Saint-Denis and Saint-Pierre to the National Reference Centre for Enteric Viruses in order to determine the G and P genotypes of rotavirus strains. Genotyping was performed by RT-PCR according to the EuroRotaNet protocol [8-14] and confirmed by sequencing the partial VP7 and VP4 coding genes.

A surveillance of deaths possibly related to gastroenteritis is achieved via monitoring of death certificates.
received by the Health Agency of the Indian Ocean (Agence de Santé Océan Indien; ARS OI).

Each week, data from these different surveillance systems are collected, validated, analysed and interpreted. During outbreaks, a weekly epidemiological report is written, presenting the results of these analyses and the appropriate recommendations.

Outbreak description

In 2012, an increase in gastroenteritis cases on Réunion Island was detected in week 33 (week starting 13 August) by the OSCOUR network (Figure 1). During that same week, the percentage of consultations for acute diarrhoea reported by sentinel practitioners was about 2.1%, exceeding the seasonal average of 1.6%. Analysis of the data by age showed that children five years-old and younger were most affected throughout the epidemic period (Figure 1). In fact, 73% of ED visits for gastroenteritis were observed among children of this age.

According to the two surveillance systems, the outbreak peak was reached in week 39 (last week of September). During that week, more than 230 ED visits for gastroenteritis were recorded, representing more than 7% of the total attendance. Among these 230, 187 involved children aged five years and younger, representing 27% of the total attendance for this age group. Moreover, for the same week, the percentage of consultations for acute diarrhoea identified by sentinel practitioners was 6% and the total number of consultations for this pathology on the whole island was estimated to be nearly 8,000.

Over the entire outbreak period from week 35 to week 44, nearly 1,600 ED visits for gastroenteritis were recorded, and it was estimated that more than 53,500 general practitioner consultations for acute diarrhoea took place on the whole island. Among the ED visits for gastroenteritis, 74% were concerning children aged five years and younger; 56% of them were boys.

The virological surveillance rapidly revealed high rates of samples positive for rotavirus. Retrospective analysis of weekly data showed an increase in this rate at the end of July, the rate exceeded more than 30% in week 33 (week starting August 13). The peak was reached in week 36 (first week of September), with a value of 44%
(Figure 2). This rate was maintained at a level greater than 35% before declining gradually after week 41.

Percentages of samples positive for adenovirus and norovirus were lower (7% and 3%, respectively, from July to October), suggesting that the outbreak of gastroenteritis was mainly due to the circulation of rotavirus on the island. In December, genotyping of 20 rotavirus-positive samples, randomly selected, was carried out by the National Reference Centre for Enteric Viruses. Four of them were genotype G12P[8], one was a co-infection of genotypes G12, G1 and G3 associated with P[8], and the 15 others were G3P[8] strains. Phylogenetic analysis of the partial VP7 coding gene revealed that the G12 strains from the Réunion Island clustered in lineage III (Figure 3).

During the whole outbreak period, six death certificates mentioning gastroenteritis as one of the potential causes of death were identified. Three of them involved children younger than two years, and the other three affected individuals older than 70 years. One child and one elderly person died of dehydration, the other two children had underlying medical conditions, and the other two elderly people were suffering from comorbidities such as diabetes and hypertension.

Discussion
The surveillance based on networks from different health providers on Réunion Island highlighted an outbreak of gastroenteritis of unusual intensity, which lasted about 10 weeks, extending from late August to early November 2012. This outbreak was characterised by intense circulation of rotavirus and a high proportion of young cases, as well as by its severity, reflected in the occurrence of several deaths. This underlines the importance of not neglecting this risk when such epidemics occur.

This study reports for the first time the occurrence of the G and P genotypes of rotavirus strains on Réunion Island and revealed circulation of rotavirus genotype G12 at a significant level (5/20), although the high activity of rotavirus observed on the island does not seem to be the result of a high prevalence of this emerging genotype only. The G12 strains from Réunion Island clustered in lineage III, as previously observed for G12 strains from other European countries and worldwide. According to the National Reference Centre for Enteric Viruses, G12 genotypes circulated with a low prevalence of 3.5% during the previous season in mainland France (data not shown), but their emergence as the most prevalent rotavirus genotypes has
Nevertheless, it should be emphasised that knowledge about vaccine efficacy against the G12 genotype is limited and there is a need for further study. However, in our study conducted in Réunion Island, G12 genotype was associated with P[8]. Since the P[8] genotype is present in both licensed vaccines, these vaccines should be effective against these G12P[8] strains.

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Authors’ contributions

Nadège Caillère has made contributions to the epidemiological analyses, to the interpretation of results and to the writing of the manuscript. Pascal Vilain has made contributions to the epidemiological analyses, to the interpretation of results and to the writing of the manuscript. Elise Brottet has made contributions to the virological analyzes and interpretations of results and has been involved in revising the manuscript critically for important intellectual content. Jérôme Kaplon has made contributions to the virological analyzes, to the interpretation of results of virological analyzes and to the writing of the manuscript. Katia Ambert-Balay has made contributions to the virological analyzes, to the interpretation of results of virological analyzes and to the writing of the manuscript. Laurent Filleul has made contributions to the interpretation of results of epidemiological analyzes, and to the writing of the manuscript.

Conflict of interest

None declared.

*Authors’ correction

Bootstrap values and lineages were added to the figure on 13 May 2013.

References


