REVIEW

# Spectrum of enteropathogens detected by the FilmArray GI Panel in a multicentre study of community-acquired gastroenteritis

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## Abstract

The European, multicentre, quarterly point-prevalence study of community-acquired diarrhoea (EUCODI) analysed stool samples received at ten participating clinical microbiology laboratories (Austria, Finland, France, Germany, Greece, Ireland, Italy, Portugal, Romania, and the UK) in 2014. On four specified days, each local laboratory submitted samples from ≤20 consecutive patients to the Austrian Study Centre for further testing with the FilmArray GI Panel (BioFire Diagnostics, Salt Lake City, UT, USA). Of the 709 samples from as many patients received, 325 (45.8%) tested negative, 268 (37.8%) yielded only one organism, and 116 (16.4%) yielded multiple organisms. Positivity rates ranged from 41% (30 of 73 samples) in France to 74% (59 of 80 samples) in Romania. With the exception of *Entamoeba histolytica* and *Vibrio cholerae*, all of the 22 targeted pathogens were detected at least once. Enteropathogenic *Escherichia coli*, *Campylobacter* species, toxigenic *Clostridium difficile*, enteroaggregative *E. coli*, norovirus and enterotoxigenic *E. coli* were the six most commonly detected pathogens. When tested according to local protocols, seven of 128 positive samples (5.5%) yielded multiple organisms. Overall, the FilmArray GI Panel detected at least one organism in 54.2% (384/709) of the samples, as compared with 18.1% (128/709) when testing was performed with conventional techniques locally. This underlines the considerable potential of multiplex PCR to improve routine stool diagnostics in community-acquired diarrhoea. Classic culture methods directed at the isolation of specific pathogens are increasingly becoming second-line tools, being deployed when rapid molecular tests give positive results. This optimizes the yield from stool examinations and dramatically improves the timeliness of diagnosis.



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## Introduction

Data regarding the enteric pathogens responsible for community-acquired diarrhoeal illness in Europe are scarce, and most published studies report single-country data [1–6]. Even when diagnostic efforts are pursued aggressively, an agent cannot be identified for almost half of diarrhoeal cases if conventional methods, such as culture, enzyme immunoassay, or microscopy, are relied on for the detection of enteropathogens, either because the pathogen is not detected or because the aetiology is non-infectious [7–11]. Numerous publications have already shown the added value of molecular multiplex detection of enteropathogens in comparison with conventional methods [12–14]. We report the first European, multicentre, cross-sectional quarterly point-prevalence study of community-acquired diarrhoea



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(EUCODI) to determine the spectrum of possible pathogens in acute community-acquired gastroenteritis using both conventional laboratory techniques and a commercially available multiplex PCR-based system, in order to obtain insights into the aetiology of enteropathogens in Europe.

## Materials and methods

### Samples

Laboratories (one from each of ten European countries (Fig. 1)) were recruited to collect ≤20 stool samples each, on four days in 2014 (15 January, 16 April, 16 July, and 15 October), reflecting seasonal variation in disease incidence. Countries were chosen to reflect a wide geographical and socio-economic range. Laboratories in each country were identified pragmatically on the basis of established links and willingness to participate. All unformed faecal samples from outpatients or inpatients (within 48 h of admission) of all ages admitted with community-acquired acute gastroenteritis were eligible for inclusion. Second or subsequent samples from identical patients, solid samples and samples with clinical histories suggesting non-infectious causes of diarrhoea were excluded.

### Microbiology

Samples were routinely tested at local laboratories according to the individual laboratories' standard operating procedures. Thereafter, each local laboratory transferred 500-µL (or gram-equivalent) aliquots into 2 mL of modified Cary–Blair medium (LBM FecalSwabs; Copan Diagnostics, Murieta, CA, USA) for transport via courier service to the central study laboratory in Vienna, Austria. At the central study laboratory, all stool samples were tested with a development version of a commercially available multiplex PCR system, the FilmArray GI Panel (BioFire

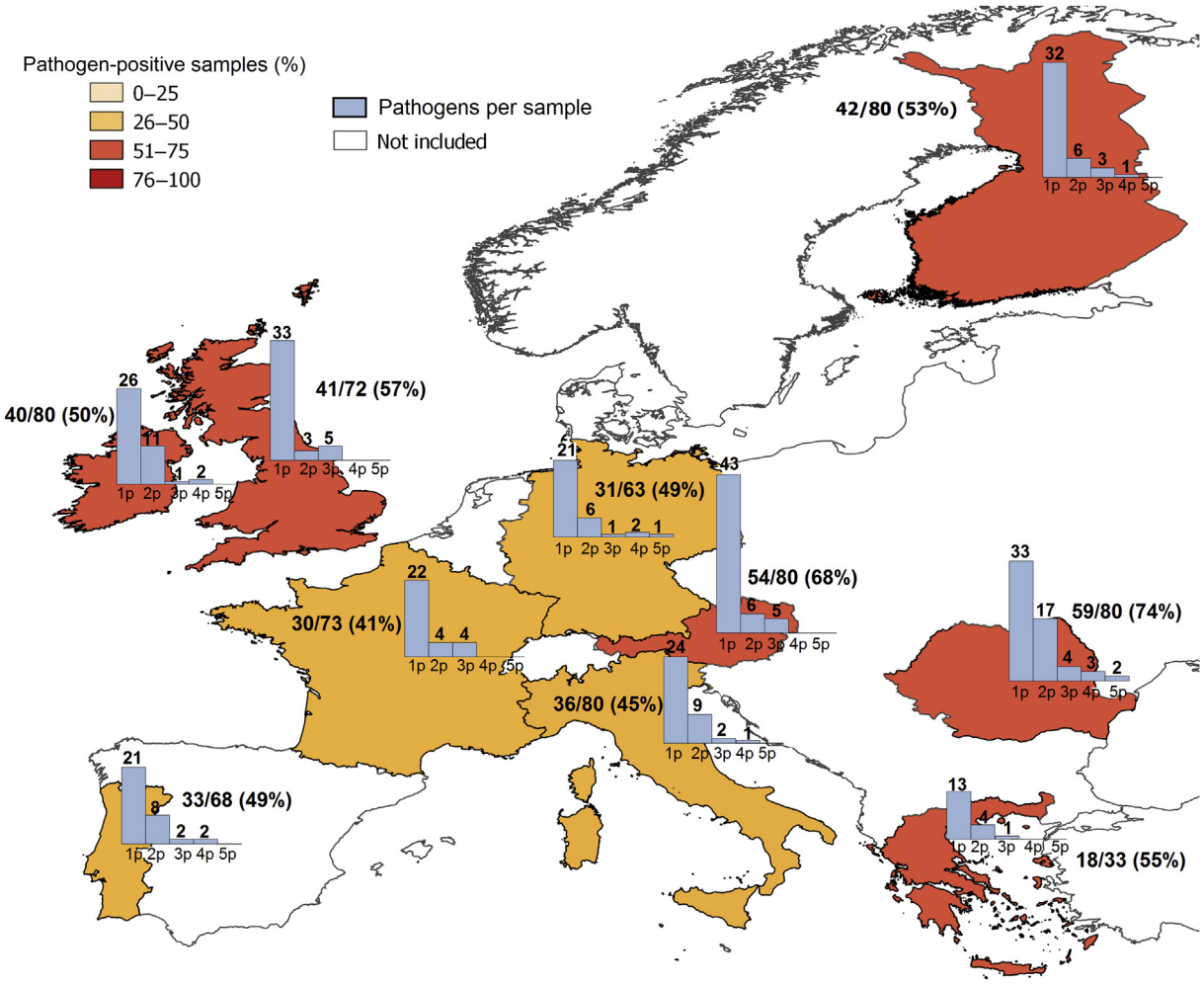


**FIG. 1.** Proportion of positive samples and pathogens per sample by country (Austria, Finland, France, Germany, Greece, Ireland, Italy, Portugal, Romania, and the UK; overall positivity rate = 384/709; 54.2%).