PROTOCOL FOR IDENTIFICATION OF *C. JEJUNI*, *C. COLI* AND *C. LARI* BY GEL-BASED PCR

Version 2

Publication history

Version	Sections changed	Description	Date
Version 2	All	Editorial changes and information on controls.	2025-06-11
Version 1		This protocol is aligned with the SOP for the interlaboratory study performed 2021 to validate the method.	2021-04-21

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Scope of the method

This protocol describes a gel-based multiplex PCR assay for confirmation and identification of *Campylobacter jejuni*, *C. coli* and *C. lari*. It also targets *C. upsaliensis*, but it is not as specific for this species. The method both detects the 23S rRNA of *Campylobacterales* and specific species targets.

Protocol

This protocol is based on ISO/CD 10272:2017/Amd1 [1], Wang et al. 2002 [2], and Chaban et al. 2009 [3].

3.1 DNA extraction

Transfer one sterile loop with approximately 1 µl colony material into 1 ml of 0.1xTE buffer (10 mM Tris and 0.1 mM EDTA, pH 8.0) and try to make a homogeneous suspension. Extract DNA with a thermal lysis step (15 min at 95 °C). After centrifugation for 3 min at 10 000 x g, the supernatant is used as DNA template. If the PCR analysis is not run on the same day, the template shall be stored at -20 °C.

3.2 PCR set-up

Prepare the master mix as described in Table 2 using the primers described in Table 1. The DNA template is used undiluted for this PCR, but in case of only one band detected (species target or 23S target), dilute it and repeat the test.

3.3 Controls

Suitable positive and negative PCR controls shall be included in each test. The primer-system for detection of 23S rRNA of *Campylobacter* genus is used as internal amplification control.

3.4 Amplification

Any well-maintained and calibrated cycler instrument can be used as long as it is appropriate for the method. Use the amplification program described in Table 3.

3.5 Electrophoresis

The amplified PCR products are detected using a 1,5 % agarose gel. For example, the GeneRuler 100bp ready-to-use DNA ladder can be used for determination of size.

3.5 Results

The target sequences are detected if the sizes of the PCR product correspond to the expected length of the target DNA sequences (see Table 1). This should be determined using an appropriate DNA ladder and positive controls for each target. The detection of both species target and Campylobacterales 23S target are

required for a positive result. If only one of the bands is detected, the analysis should be re-run with a dilution of the template DNA. If still not detecting both targets, the sample is considered negative for *C. jejuni, C. coli*, *C. lari* and *C. upsalinensis.*

TABLE 1. Description of oligonucleotides and amplicons.

Species (gene)	Primer	Sequence (5′-3′)	Amplicon size (bp)
C. jejuni (*hipO*)	CJF	ACT TCT TTA TTG CTT GCT GC	323
	CJR	GCC ACA ACA AGT AAA GAA GC	
C. coli (glyA)	CCF	GTA AAA CCA AAG CTT ATC GTG	126
	CCR	TCC AGC AAT GTG TGC AAT G	
C. lari (*cpn60*)[a]	JH0015	TCT GCA AAT TCA GAT GAG AAA A	180
	JH0016	TTT TTC AGT ATT TGT AAT GAA ATA TGG	
C. upsaliensis (glyA)	CUF	AAT TGA AAC TCT TGC TAT CC	204
	CUR	TCA TAC ATT TTA CCC GAG CT	
Campylobacterales (23S rRNA)	23SF	TAT ACC GGT AAG GAG TGC TGG AG	650
	23SR	ATC AAT TAA CCT TCG AGC ACC G	

[a] These primers, from reference [3], have replaced those in reference [2] since they detect both *C. lari* subsp. *lari* and *C. lari* subsp. *concheus*.

TABLE 2. Reagents.

Reagent	Final concentration	Volume per sample (µl)
Template DNA	Maximum 250 ng	2,5 µl
PCR grade water	---	As required
PCR-buffer (without $MgCl_2$)[a]	1 x	As required
$MgCl_2$ solution	2 mM	As required
dNTP solution	0,2 mM of each dNTP	As required
PCR primers *C. jejuni* and *C. lari*	0,5 µM of each primer	As required
PCR primers *C. coli*	1 µM of each primer	As required
PCR primers *C. upsaliensis*	2 µM of each primer	As required
PCR primers 23S rRNA	0,2 µM of each primer	As required
Taq DNA polymerase	1,25 U	As required
Template DNA	Maximum 250 ng	As required
Total volume	----	25

[a] If the PCR buffer solution already contains MgCl2, the final concentration of MgCl2 in the reaction mixture is adjusted to 2 mM.

TABLE 3. Temperature-time programme

Step	Time/temperature
Activation/initial denaturation[a]	3 min/95 °C
Number of cycles (amplification)	30
Amplification	30 s/95 °C 30 s/59 °C 30 s/72 °C
Final extension	7 min/72 °C

[a] Use an initial denaturation time appropriate for the enzyme.

References

[1] ISO/CD 10272:2017/Amd1 "Amendment 1 of Microbiology of food and animal feeding stuffs – Horizontal method for detection and enumeration of *Campylobacter* spp. Part 1: detection method and Part 2: Colony-count technique".

[2] Wang G, Clark CG, Taylor TM, Pucknell C, Barton C, Price L, Woodward DL, Rodgers FG. 2002. Colony multiplex PCR assay for identification and differentiation of *Campylobacter jejuni*, *C. coli*, *C. lari*, *C. upsaliensis*, and *C. fetus* subsp. *fetus*. J Clin Microbiol. 40(12):4744-4747

[3] Chaban B, Musil KM, Himsworth CG, Hill JE. 2009. Development of cpn60-based real-time quantitative PCR assays for the detection of 14 *Campylobacter* species and application to screening of canine fecal samples. Appl Environ Microbiol. 75(10):3055-61. doi: 10.1128/AEM.00101-09.