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Full Length Research Paper

Evaluation of the dry sheet medium (Compact Dry LS) for screening of total *Listeria* count in food samples

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The Compact Dry LS (CD-LS), ready-to-use dry sheet selective medium for *Listeria* species, was evaluated for inclusivity and exclusivity by using 107 strains including 20 *Listeria* species strains. All tested *Listeria* species strains other than *Listeria seeligeri* that grew as blue colored colony on CD-LS. CD-LS were compared with those on Oxford agar and ALOA agar as conventional methods using *Listeria* species inoculated from 100 food samples. The correlation coefficients between CD-LS and Oxford agar, and CD-LS and ALOA agar were 0.983 and 0.978, respectively. Our results suggested CD-LS was a suitable alternative medium for screening of *Listeria* species.

Key words: Chromogenic selective medium, ready-to-use medium, *Listeria*, compact dry.

INTRODUCTION

Listeria monocytogenes is known as one of major food-borne pathogen worldwide which causes cepticemia, meningitis and encephalitis through the consumption of contaminated foods (Barancelli et al., 2011; Inoue et al., 2000; Makino et al., 2005; Swaminathan et al., 2007). In addition *L. monocytogenes* can grow in cold condition (Carpentier and Cerf, 2011). Hence, the control of contamination by *L. monocytogenes* is a very important issue for food safety (Becker et al., 2006; Midelet-Bourdin et al., 2007; Vermeulen et al., 2011).

Both Oxford agar and PALCAM agar have been used for detection of *Listeria* species for a long time (Beumer and Curtis, 2003; Reissbrodt, 2004). Recently, several chromogenic agar media such as ALOA agar have been developed (Jantzen et al., 2006; Vlaemynck et al., 2000). These chromogenic media can not only detect more quickly than Oxford agar and PALCAM agar, but also differentiate *L. monocytogenes* from other *Listeria* species strains. However, these agar media have high cost for daily screening tests and short shelf life of prepared plate since these media contain several antibiotics as selective agents. What is more, long shelf life and cost effective medium is needed for screening tests in food processing facilities.

In consideration of these points, Compact Dry LS method (CD-LS; Nissui Pharmaceutical Co., Ltd., Tokyo, Japan) has been developed based on the unique Compact Dry system (Mizuochi and Kodaka, 2000) as a more cost effective screening dry sheet medium for *Listeria* species. 1 ml amount can be inoculated onto CD-LS after 1 h of pre-incubation at 20°C by Buffered Peptone Water (BPW; Nissui Pharmaceutical Co., Ltd.). *Listeria* species strains grow as blue colored colonies on CD-LS after 24 h of incubation at 37°C. This method eliminates the disadvantages of conventional methods since CD-LS is a cost effective pre-sterilized ready-to-use medium with long shelf life. CD-LS was developed primarily for selective medium for *Listeria*. CD-LS system consists of a unique dish, self diffusible fabric sheet, peptone, salts, chromogenic substrate and two kinds of antibiotic. The chromogenic substrate for β－glucosidase can differentiate *Listeria* species strains from other bacteria which may grow on CD-LS plate. The two kinds of antibiotic inhibit the growth of bacteria other than *Listeria* strains.

The purpose of this study was to evaluate the performance of CD-LS method for the detection and enumeration of *Listeria* species strains in comparison to conventional methods.

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Figure 1. Typical appearance of *L. monocytogenes* JCM 7680 on a CD-LS plate.

MATERIALS AND METHODS

Samples

For comparison studies, 38 processed meat products, 15 processed fish products, 34 cheese products, 6 ready-to-eat vegetables and 6 delicatessen products were purchased from retail stores in Japan.

Inclusivity and exclusivity studies

20 strains of *Listeria* spp. were used for the inclusivity study. For the exclusivity study, 41 Gram-positive bacterial strains other than *Listeria* spp., 43 Gram-negative bacterial strains and 3 yeast strains were inoculated, respectively. Bacterial strains were prepared in Tryptic Soy Broth (Difco, Becton Dickinson, Detroit, MI, USA) at 37°C for 24 h, and yeast strains were cultured in Sabouraud Dextrose Broth (Difco) at 25°C for 72 h. Each culture was diluted serially by saline (0.85% NaCl). 1 ml of each suspension was inoculated onto CD-LS. After 24 h of incubation at 37°C, the blue colored colonies (Figure. 1) were read as *Listeria* species. For the two other methods, Oxford agar (Difco) and ALOA agar (Merck Ltd. Japan, Tokyo) were inoculated 0.1 ml of each suspension onto the surface of each medium with sterilized plastic bacterial spreader (Nissui Pharmaceutical Co., Ltd.). After 24 h of incubation at 37°C, the characteristics and the number of colonies were examined. Inoculated bacterial number was confirmed by Tryptic Soy Agar (TSA; Difco) under the same conditions.

Method comparison study

The CD-LS method was compared with Oxford agar and ALOA agar methods using artificially contaminated food samples. 100 samples (38 processed meat products, 15 processed fish products, 34 cheese products, 6 ready-to-eat vegetables and 6 delicatessen products) were purchased from retail stores in Japan. For confirmation that these samples were negative for *Listeria* spp., after 25 g of each sample was homogenized with 9-fold volume of half Fraser Broth (Difco) for 1 min by a homogenizer (Pro-media SH-001, ELMEX LIMITED, Tokyo, Japan), homogenized samples were incubated for 24 h at 30°C. Subsequently, 0.1 ml of each sample was transferred into Fraser Broth (Difco). After 48 h of incubation at 37°C, each sample was streaked onto Oxford agar and ALOA agar and incubated for 24 h at 37°C.

For the comparison experiments, three strains of *L. monocytogenes* (JCM 7680, NS 5197, NS 5116, JCM; Japan Collection of Microorganisms, Saitama, Japan, NS; isolated strains of clinical specimens) were used randomly for inoculation. Each 25

Table 1a. Gram positive bacteria[ab] strains tested for color and growth using CD-LS.

Bacteria	CD-LS[c]		Oxford agar		ALOA agar		TSA
***Listeria* spp.**	**Color**	**logCFU/ml**	**Color**	**logCFU/ml**	**Color**	**logCFU/ml**	**logCFU/ml**
L. grayi ATCC 19120	blue	9.23	black	9.20	blue	9.11	9.18
L. grayi NS 5165	blue	7.92	black	6.48	light blue	7.61	7.88
L. innocua ATCC 33090	blue	9.43	black	9.36	blue	9.36	9.35
L. innocua NS 5166	blue	9.47	black	9.40	blue	9.42	9.41
L. ivanovii JCM 7681	light blue	9.19	black	8.91	blue + halo	9.23	9.42
L. ivanovii NS 5167	blue	9.01	black	8.80	blue + halo	9.26	9.39
L. monocytogenes ATCC 15313	blue	8.62	black	8.66	blue + halo	9.00	8.16
L. monocytogenes JCM 7671	blue	9.22	black	9.40	blue + halo	9.36	9.41
L. monocytogenes JCM 7679	blue	9.02	black	9.20	blue + halo	9.58	9.55
L. monocytogenes JCM 7680	blue	9.50	black	9.53	blue + halo	9.65	9.47
L. monocytogenes NS 5057	blue	8.43	black	8.53	blue + halo	8.74	8.01
L. monocytogenes NS 5168	blue	9.60	black	9.36	blue + halo	9.56	9.55
L. monocytogenes NS 5169	blue	9.37	black	9.18	blue + halo	9.22	9.30
L. monocytogenes NS 5170	blue	9.51	black	9.31	blue + halo	9.33	9.37
L. monocytogenes NS 5197	blue	9.14	black	9.19	blue + halo	9.14	8.91
L. monocytogenes NS 5199	blue	8.89	black	9.03	blue + halo	9.04	8.66
L. seeligeri ATCC 35967	not grown	–	not grown	–	not grown	–	8.96
L. seeligeri NS 5171	not grown	–	not grown	–	not grown	–	9.06
L. welshimeri ATCC 35897	blue	9.01	black	8.91	blue	9.19	9.12
L. welshimeri NS 5172	blue	9.24	black	9.23	blue	9.27	9.22
Non-*Listeria* spp. bacteria							
Bacillus cereus ATCC 19637	not grown	–	not grown	–	not grown	–	5.74
B. licheniformis ATCC 14580	not grown	–	not grown	–	not grown	–	7.06
B. subtilis ATCC 6633	not grown	–	not grown	–	not grown	–	6.56
Corynebacterium renale ATCC 19412	not grown	–	not grown	–	not grown	–	7.73
C. minutissimum ATCC 23348	not grown	–	not grown	–	not grown	–	7.06
C. xerosis ATCC 373	not grown	–	not grown	–	not grown	–	7.51
Enterococcus avium ATCC 14025	not grown	–	not grown	–	not grown	–	7.52
E. durans ATCC 19432	not grown	–	not grown	–	not grown	–	7.42
E. casseliflavus ATCC 51328	not grown	–	not grown	–	not grown	–	7.49
E. faecalis ATCC 19433	not grown		not grown		not grown		8.53

Table 1. Contd.

E. faecalis ATCC 29212	not grown	–	not grown	–	not grown	–	8.56
E. faecium ATCC 19434	not grown	–	not grown	–	not grown	–	8.48
E. gallinarum ATCC 49608	not grown	–	not grown	–	not grown	–	6.82
E. hirae ATCC 8043	not grown	–	not grown	–	not grown	–	7.69
E. mundtii ATCC 43186	not grown	–	not grown	–	not grown	–	7.89
E. raffinosus ATCC 49427	not grown	–	not grown	–	not grown	–	7.05
Lactobacillus lactis ATCC 12315	not grown	–	not grown	–	not grown	–	6.73
Leuconostoc citreum JCM 9698	not grown	–	not grown	–	not grown	–	8.05
L. mesenteroides ATCC 27258	not grown	–	not grown	–	not grown	–	7.99
Micrococcus luteus ATCC 9341	not grown	–	not grown	–	not grown	–	7.51
Pediococcus acidilactici JCM 5885	not grown	–	not grown	–	not grown	–	7.88
Staphylococcus aureus ATCC 12600	not grown	–	not grown	–	not grown	–	7.81
S. aureus ATCC 25923	not grown	–	not grown	–	not grown	–	8.16
S. aureus ATCC 29213	not grown	–	not grown	–	not grown	–	7.72
S. aureus ATCC 6538	not grown	–	not grown	–	not grown	–	8.11
S. aureus ATCC 6538P	not grown	–	not grown	–	not grown	–	7.83
S. aureus MRSA NS 7167	not grown	–	not grown	–	not grown	–	8.04
S. auricularis ATCC 33753	not grown	–	not grown	–	not grown	–	6.56
S. capitis ATCC 27840	not grown	–	not grown	–	not grown	–	8.21
S. epidermidis ATCC 12228	not grown	–	not grown	–	not grown	–	7.33
S. epidermidis ATCC 14990	not grown	–	not grown	–	not grown	–	7.44
S. haemolyticus ATCC 29970	not grown	–	not grown	–	not grown	–	6.52
S. intermedius ATCC 29663	not grown	–	not grown	–	not grown	–	7.51
S. lentus ATCC 29070	not grown	–	not grown	–	not grown	–	7.28
S. saprophyticus ATCC 15305	not grown	–	not grown	–	not grown	–	7.44
S. sciuri ATCC 29062	not grown	–	not grown	–	not grown	–	7.48
S. simulans ATCC 27848	not grown	–	not grown	–	not grown	–	7.84
S. warneri ATCC 27836	not grown		not grown	–	not grown	–	7.51
S. xylosus ATCC 29971	not grown	–	not grown	–	not grown	–	6.59
S. thermophilus ATCC 14485	not grown	–	not grown	–	not grown	–	7.56

g sample was randomly inoculated at the following levels: 2 to 3, 3 to 4, 4 to 5 and 5 to 6 log CFU/g. After 3 days of preservation at 4°C, each artificially contaminated sample was added to 9-fold volume of BPW and was homogenized for 1 min with a homogenizer. After 1 h of incubation at 20°C for resuscitation, each homogenized sample was subjected to 10-fold serial dilution by BPW. Dual measurements were then carried out for each method. 1 ml of each dilution was inoculated onto the CD-LS plate. For the two other methods, Oxford

Table 1b. Gram negative bacteria[ab] strains tested for color and growth using CD-LS**.**

Gram negative bacteria	CD-LS		Oxford agar		ALOA agar		TSA
	Color	logCFU/ml	Color	logCFU/ml	Color	logCFU/ml	logCFU/ml
Aeromonas hydrophila JCM 3976	not grown	–	not grown	–	not grown	–	8.51
Alcaligenes denitrifyicans JCM 5490	not grown	–	not grown	–	not grown	–	7.06
A. xylosoxidans JCM 9659	not grown	–	not grown	–	not grown	–	6.56
A. facealis JCM 1474	not grown	–	not grown	–	not grown	–	7.73
Citrobacter amalonaticus ATCC 25405	not grown	–	not grown	–	not grown	–	7.06
C. freundii ATCC 8090	not grown	–	not grown	–	not grown	–	7.51
C. koseri ATCC 25408	not grown	–	not grown	–	not grown	–	7.52
Enterobacter aerogenes ATCC 13048	not grown	–	not grown	–	not grown	–	7.42
E. amnigenus ATCC 33072	not grown	–	not grown	–	not grown	–	7.49
E. cloacae ATCC 13047	not grown	–	not grown	–	not grown	–	8.53
E. intermedius ATCC 33423	not grown	–	not grown	–	not grown	–	8.56
E. intermedius ATCC 33110	not grown	–	not grown	–	not grown	–	8.48
E. sakazakii ATCC 29544	not grown	–	not grown	–	not grown	–	6.82
Escherichia blattae JCM 1650	not grown	–	not grown	–	not grown	–	7.69
E. coli ATCC 11775	not grown	–	not grown	–	not grown	–	7.89
E. coli ATCC 25922	not grown	–	not grown	–	not grown	–	7.05
E. coli ATCC 8739	not grown	–	not grown	–	not grown	–	6.73
E. coli ATCC 9637	not grown	–	not grown	–	not grown	–	8.05
E. coli Serotype O157 ATCC 35150	not grown	–	not grown	–	not grown	–	7.99
E. coli Serotype O157 ATCC 43888	not grown	–	not grown	–	not grown	–	7.51
E. fergusonii JCM 5897	not grown	–	not grown	–	not grown	–	7.88
E. fergusonii JCM 5899	not grown	–	not grown	–	not grown	–	7.81
E. Hermannii JCM 1473	not grown	–	not grown	–	not grown	–	8.16
Hafnia alvei ATCC 13337	not grown	–	not grown	–	not grown	–	7.72
Klebsiella oxytoca ATCC 13182	not grown	–	not grown	–	not grown	–	8.11
K. ozaenae ATCC 11296	not grown	–	not grown	–	not grown	–	7.83
K. pneumoniae ATCC 13883	not grown	–	not grown	–	not grown	–	8.04
Kluyvera ascorbata ATCC 33433	not grown	–	not grown	–	not grown	–	6.56
K. cryocrescens ATCC 33435	not grown	–	not grown	–	not grown	–	8.21
Morganella morganii ATCC 25830	not grown	–	not grown	–	not grown	–	7.33
Proteus mirabilis ATCC 29906	not grown	–	not grown	–	not grown	–	7.44

Table 1B. Cont.

P. vulgaris ATCC 13315	not grown	–	not grown	–	not grown	–	6.52
S. hominis ATCC 27844	not grown	–	not grown	–	not grown	–	7.32
Pseudomonas aeruginosa ATCC 10145	not grown	–	not grown	–	not grown	–	7.51
P. aeruginosa ATCC 9721	not grown	–	not grown	–	not grown	–	7.28
P. aeruginosa ATCC 27853	not grown	–	not grown	–	not grown	–	7.44
P. aeruginosa ATCC 9027	not grown	–	not grown	–	not grown	–	7.48
P. putida ATCC 12633	not grown	–	not grown	–	not grown	–	7.84
Rahnella aquatilis ATCC 33071	not grown	–	not grown	–	not grown	–	7.51
Salmonella Typhimurium ATCC 13311	not grown	–	not grown	–	not grown	–	6.59
Serratia fonticola ATCC 29844	not grown	–	not grown	–	not grown	–	7.56
S. liquefaciens ATCC 29844	not grown	–	not grown	–	not grown	–	7.56
S. marcescens ATCC 13880	not grown	–	not grown	–	not grown	–	7.56
S. marcescens ATCC 8100	not grown	–	not grown	–	not grown	–	7.56
Yeasts							
Candida albicans ATCC 2091	not grown	–	not grown	–	not grown	–	7.56
C. albicans ATCC 10231	not grown	–	not grown	–	not grown	–	7.56
Saccharomyces cerevisiae ATCC 9080	not grown	–	not grown	–	not grown	–	7.56

[a] Standard strains were derived from ATCC (American Type Culture Collection) and JCM (Japan Collection of Microorganisms) and NBRC (NITE Biological Resource Center, Japan).
[b] NS strains were isolated from clinical specimens.[c] Recovered bacterial number is represented as logCFU/ml.

agar and ALOA agar were inoculated onto the surface of each medium with sterilized plastic bacterial spreader, blue colonies on CD-LS and ALOA agar, and black colonies on Oxford agar were read as *Listeria* strains, respectively.

Statistical analysis

Results from method comparison study were converted into log CFU of *Listeria* per gram of each tested food. All statistical analyses were carried out with the Microsoft Excel 2000 at the significance level of $P = 0.05$. The linear correlation coefficients (r), slopes, intercepts between CD-LS and Oxford agar, and CD-LS and ALOA agar were calculated, respectively. A one-way analysis of variance (ANOVA) was performed to determine differences between CD-LS and both methods.

RESULTS

Results from both inclusivity and exclusivity studies are shown in Table 1. Of 20 *Listeria* species strains, 18 strains (90%) grew as blue colored colony on CD-LS. *L. seeligeri* strains used in this study were not grown on CD-LS, Oxford agar and ALOA agar. 18 *Listeria* species strains other than *L. seeligeri* also grew as typical colony on Oxford agar and ALOA agar, respectively. Especially only ALOA agar differentiated *L. monocytogenes* from other *Listeria* species strains. A total of 41 Gram-positive bacteria other than *Listeria* species, 43 Gram-negative bacteria and 3 yeasts failed to grow on all tested selective media.

Figure 2 shows the liner regression lines, correlation coefficients (r), slopes, intercepts between CD-LS and Oxford agar, and CD-LS and ALOA agar from method comparison study. The r between CD-LS and Oxford agar, and CD-LS and ALOA agar, were 0.983 and 0.978, respectively. No significant difference was shown between CD-LS and both methods by one-way ANOVA ($P > 0.05$).

DISCUSSION

For the control of *L. monocytogenes* and *Listeria*

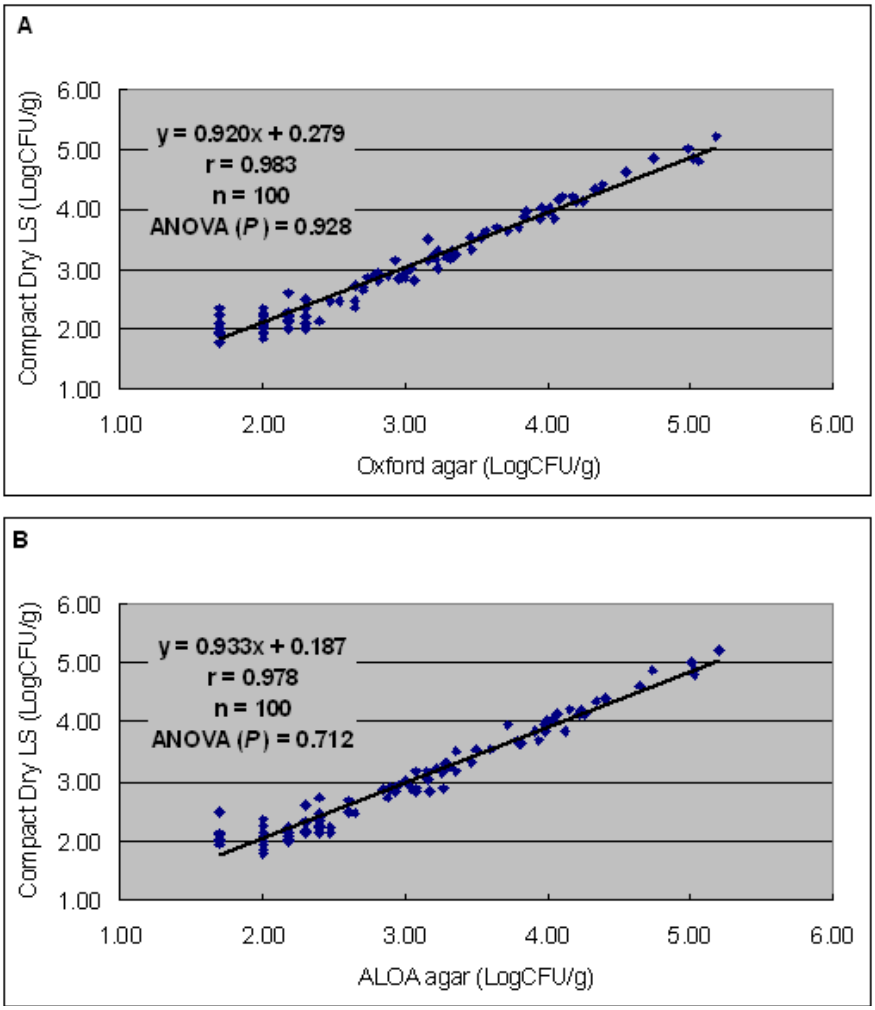

Figure 2. Regression line for data from CD-LS method plotted against Oxford agar method (A) and ALOA agar method (B) for determining population of *L. monocytogenes* in 100 artificially contaminated food samples. ANOVA (one way analysis of variance) was performed at a significance level of 0.05. $P < 0.05$ is a statistically significant difference between two methods.

species, PCR-based methods (Mafu et al., 2009; Traunsek et al., 2011; Wallace et al., 2011) and chromogenic selective culture methods (Greenwood et al., 2005; Hegde et al., 2007; Willis et al., 2006) have been developed. These molecular methods such as PCR-based methods can differentiate *L. monocytogenes* from other *Listeria* species rapidly but they need specific devices, skills and have high costs for daily hygiene control. The chromogenic selective culture methods can also detect *L. monocytogenes* and other *Listeria* species separately. However these methods need preparation of medium and have short shelf life and relatively high cost. CD-LS can not differentiate *L. monocytogenes* from other *Listeria* species. However CD-LS makes operations more cost-effective, and comparatively detect the existence of *Listeria* species easily and rapidly, since CD-LS is ready-to-use chromogenic selective medium and has long shelf life of 1 year at room temperature. Moreover CD-LS has both high selectivity and a good correlation with conventional methods. Therefore our results suggest that CD-LS is a suitable alternative medium for the screening of *Listeria* species in daily hygiene control.

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REFERENCES

Barancelli GV, Camargo TM, Reis CMF, Porto E, Hofer E, Oliveira CAF

(2011). Incidence of *Listeria monocytogenes* in cheese manufacturing plants from the northeast region of Sao Paulo, Brazil. J. Food Prot., 74: 816-819.
Becker B, Schuler S, Lohneis M, Sabrowski A, Curtis GDW, Holzapfel WH (2006). Comparison of two chromogenic media for the detection of *Listeria monocytogenes* with the plating media recommended by EN/DIN 11290-1. Int. J. Food Microbiol., 109: 127-131.
Beumer RR, Curtis GDW (2003). Culture media and methods for the isolation of *Listeria monocytogenes*. In: Corry JEL, Curtis GDW, Baird RM (eds) Handbook of culture media for food microbiology, Elsevier Science, Amsterdam, pp. 79-90.
Carpentier B, Cerf O (2011). Review—Persistence of *Listeria monocytogenes* in food Industry equipment and premises. Int. J. Food Microbiol., 4145: 1-8.
Greenwood M, Willis C, Doswell P, Allen G, Pathak K (2005). Evaluation of chromogenic media for the detection of *Listeria* species in food. J. Appl. Microbiol., 99: 1340-1345.
Hegde V, Leon-Velarde CG, Stam CM, Jaykus L-A, Odumeru JA (2007). Evaluation of BBL CHROMagar Listeria agar for the isolation and identifyication of *Listeria monocytogenes* from food and environmental samples. J. Microbiol. Methods, 68: 82-87.
Inoue S, Nakama A, Arai Y, Kokubo Y, Maruyama T, Saito A, Yoshida T, Terao M, Yamamoto S, Kumagai S (2000). Prevalence and contamination levels of *Listeria monocytogenes* in retail foods in Japan. Int. J. Food Microbiol., 59: 73-77.
Jantzen MM, Navas J, de Paz M, Rodriguez B, da Silva WP, Nunez M, Martinez-Suarez JV (2006). Evaluation of ALOA plating medium for its suitability to recover high pressure-injured *Listeria monocytogenes* from ground chicken meat. Lett. Appl. Microbiol., 43: 313-317.
Mafu AA, Pitre M, Sirois S (2009). Real-Time PCR as a tool for detection of pathogenic bacteria on contaminated food contact surfaces by using a single enrichment medium. J. Food Prot., 72: 1310-1314.
Makino SI, Kawamoto K, Takeshi K, Okada Y, Yamasaki M, Yamamoto S, Igimi S (2005). An outbreak of food-borne Listeriosis due to cheese in Japan, during 2001. Int. J. Food Microbiol., 104: 189-196.
Midelet-Bourdin G, Leleu G, Malle P (2007). Evaluation of the international reference methods NF EN ISO 11290-1 and 11290-2 and an in-house method for the isolation of *Listeria monocytogenes* from retail seafood products in France. J. Food Prot., 70: 891-900.
Mizuochi S, Kodaka H (2000). Evaluation of dry sheet medium culture plate (Compactdry TC) method for determining numbers of bacteria in food samples. J. Food Prot., 63: 665-667.
Reissbrodt R (2004). New chromogenic plating media for detection and enumeration of *Listeria* spp. — an overview. Int. J. Food Microbiol., 95: 1-9.
Swaminathan B, Cabanes D, Zhang W, Cossart P (2007). *Listeria monocytogenes*. In: Doyle MP, Beuchat LR (eds) Food microbiology: fundamentals and frontiers, 3rd Ed, ASM Press, Washington, DC, pp. 457-491.
Traunsek U, Toplak N, Jersek B, Lapanje A, Majstorovic T, Kovac M (2011). Novel cost-efficient real-time PCR assays for detection and quantitation of *Listeria monocytogenes*. J. Microbiol. Methods, 85: 40-46.
Vermeulen A, Devlieghere F, De Loy-Hendrickx A, Uyttendaele M (2011). Critical evaluation of the EU-technical guidance on shelf-life studies for *L. monocytogenes* on RTE-foods: A case study for smoked salmom. Int. J. Food Microbiol., 145: 176-185.
Vlaemynck G, Lafarge V, Scotter S (2000). Improvement of the detection of *Listeria monocytogenes* by the application of ALOA, a diagnostic, chromogenic isolation medium. J. Appl. Microbiol., 88: 430-441.
Wallace FM, Fallon D, DeMarco D, Varkey S (2011). DuPont Qualicon BAX System assay for genus *Listeria* 24E. J. AOAC Int., 94: 863-871.
Willis C, Baalham T, Greenwood M, Presland F (2006). Evaluation of a new chromogenic agar for the detection of *Listeria* in food. J. Appl. Microbiol., 101: 711-717.