Introducing GUt Low-Density Array (GULDA) - a validated approach for qPCR-based intestinal microbial community analysis

Alterations in the human gut microbiota caused, for example, by diet, functional foods, antibiotics, or occurring as a function of age are now known to be of relevance for host health. Therefore, there is a strong need for methods to detect such alterations in a rapid and comprehensive manner. In the present study, we developed and validated a high-throughput real-time quantitative PCR-based analysis platform, termed ‘GUt Low-Density Array’ (GULDA). The platform was designed for simultaneous analysis of the change in the abundance of 31 different microbial 16S rRNA gene targets in fecal samples obtained from individuals at various points in time. The target genes represent important phyla, genera, species, or other taxonomic groups within the five predominant bacterial phyla of the gut, Firmicutes, Bacteroidetes, Actinobacteria, Proteobacteria, and Verrucomicrobia and also Euryarchaeota. To demonstrate the applicability of GULDA, analysis of fecal samples obtained from six healthy infants at both 9 and 18 months of age was performed and showed a significant increase over time of the relative abundance of bacteria belonging to Clostridial cluster IV (Clostridia leptum group) and Bifidobacterium bifidum and concurrent decrease in the abundance of Clostridium butyricum and a tendency for decrease in Enterobacteriaceae over the 9-month period.
Xylo-oligosaccharides inhibit pathogen adhesion to enterocytes in vitro

We previously reported that the non-digestible carbohydrates inulin and apple pectin promoted Listeria monocytogenes infection in guinea pigs, whereas xylo- and galacto-oligosaccharides (XOS and GOS), prevented infection by this pathogen. In the present study, mechanisms that could explain the previous in vivo observations were explored. Mixing bacterial cultures with XOS significantly (P <0.05) decreased the ability of two out of three strains of L. monocytogenes to adhere to Caco-2 cells. Additionally, 2 h incubation with XOS followed by washing of the bacteria significantly (P <0.05) decreased the ability of all three strains to adhere to Caco-2 cells. Consistently, expression of the adhesion-relevant genes
inLA and lap was reduced by the presence of XOS. The observation that XOS inhibit the adhesion of Listeria to the intestinal epithelium in vitro may explain the reported preventive effect of XOS on Listeria infection in guinea pigs in vivo, while the preventive effect of GOS was not explicable by the assays chosen here.
Effect of the vitamin B12-binding protein haptocorrin present in human milk on a panel of commensal and pathogenic bacteria

Background: Haptocorrin is a vitamin B12-binding protein present in high amounts in different body fluids including human milk. Haptocorrin has previously been shown to inhibit the growth of specific E. coli strains, and the aim of the present study was to elucidate whether the antibacterial properties of this protein may exert a general defense against pathogens and/or affect the composition of the developing microbiota in the gastrointestinal tracts of breastfed infants. Findings: The present work was the first systematic study of the effect of haptocorrin on bacterial growth, and included 34 commensal and pathogenic bacteria to which infants are likely to be exposed. Well-diffusion assays addressing antibacterial effects were performed with human milk, haptocorrin-free human milk, porcine holo-haptocorrin (saturated with B-12) and human apo-haptocorrin (unsaturated). Human milk inhibited the growth of S. thermophilus and the pathogenic strains L. monocytogenes LO28, L. monocytogenes 4446 and L. monocytogenes 7291, but the inhibition could not be ascribed to haptocorrin. Human apo-haptocorrin inhibited the growth of only a single bacterial strain (Bifidobacterium breve), while porcine holo-haptocorrin did not show any inhibitory effect. Conclusions: Our results suggest that haptocorrin does not have a general antibacterial activity, and thereby contradict the existing hypothesis implicating such an effect. The study contributes to the knowledge on the potential impact of breastfeeding on the establishment of a healthy microbiota in infants.
Causal relationships between the vast numbers of bacterial species present in the human intestines contain a lot of potential information on the regulation of the gut in the healthy as well as in diseased states. Based on the hypothesis that the human gut microbiota constitutes a dynamic ecosystem, interesting correlations between the presences of the given species should exist at any time. However, due to technical restrictions, it has not previously been possible to analyze such intrinsic bacterial patterns and correlations rapidly for a sufficiently large number of samples. To this purpose, we developed GULDA; a qPCR low-density array with particular focus on bacteria of relevance to the human gut microbiota. The output is given as arbitrary bacterial quantities, which for large sample numbers allow for further characterization of the gut microbiota by uni- and multivariate statistical methods.

**General information**

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Organisations: Division of Microbiology and Risk Assessment, National Food Institute
Authors: Bergström, A. (Intern), Andersen, J. B. (Intern), Licht, T. R. (Intern)
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Event: Abstract from Keystone symposium on Microbial Communities as Drivers of Ecosystem Complexity, Colorado, Denver, USA.
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Quantification of specific E. coli in gut mucosa from Crohn's disease patients

We here present a method based on qRT-PCR to quantify E. coli LF82 in intestinal human samples. Two different primer-probe sets were designed to detect LF82, and a third to target total E. coli. The assay showed high robustness and specificity for detection of LF82 in the presence of intestinal tissue.

**General information**

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Event: Abstract from 9th Symposium on Food Microbiology, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
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Thioredoxin 80-Activated-Monocytes (TAMs) Inhibit the Replication of Intracellular Pathogens

Background: Thioredoxin 80 (Trx80) is an 80 amino acid natural cleavage product of Trx, produced primarily by monocytes. Trx80 induces differentiation of human monocytes into a novel cell type, named Trx80-activated-monocytes (TAMs). Principal Findings: In this investigation we present evidence for a role of TAMs in the control of intracellular bacterial infections. As model pathogens we have chosen Listeria monocytogenes and Brucella abortus which replicate in the cytosol and the endoplasmic reticulum respectively. Our data indicate that TAMs efficiently inhibit intracellular growth of both L. monocytogenes and B. abortus. Further analysis shows that Trx80 activation prevents the escape of GFP-tagged L. monocytogenes into the cytosol, and induces accumulation of the bacteria within the lysosomes. Inhibition of the lysosomal activity by chloroquine treatment resulted in higher replication of bacteria in TAMs compared to that observed in control cells 24 h post-infection, indicating that TAMs kill bacteria by preventing their escape from the endosomal compartments, which progress into a highly degradative phagolysosome. Significance: Our results show that Trx80 potentiates the bactericidal activities of professional phagocytes, and contributes to the first line of defense against intracellular bacteria.

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Authors: Cortes-Bratti, X. (Ekstern), Brasseres, E. (Ekstern), Herrera-Rodriquez, F. (Ekstern), Botero-Kleiven, S. (Ekstern), Coppotelli, G. (Ekstern), Andersen, J. B. (Intern), G. Masucci, M. (Ekstern), Holmgren, A. (Ekstern), Chaves-Olarte, E. (Ekstern), Frisan, T. (Ekstern), Avila-Carino, J. (Ekstern)
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.545 SNIP 1.141 CiteScore 3.54
Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 1.74 SNIP 1.147 CiteScore 3.94
Analysis of the intestinal microbiota of oligo-saccharide fed mice exhibiting reduced resistance to Salmonella infection

Certain indigestible carbohydrates, known as prebiotics, are claimed to be beneficial for gut health through a selective stimulation of certain gut microbes including bifidobacteria. However, stimulation of such microbes does not necessarily imply a preventive effect against pathogen infection. We recently demonstrated a reduced resistance to Salmonella infection in mice fed diets containing fructo-oligosaccharides (FOS) or xylo-oligosaccharides (XOS). In the present study, faecal and caecal samples from the same mice were analysed in order to study microbial changes potentially explaining the observed effects on the pathogenesis of Salmonella. Denaturing gradient gel electrophoresis revealed that the microbiota in faecal samples from mice fed FOS or XOS were different from faecal samples collected before the feeding trial as well as from faecal profiles generated from control animals. This difference was not seen for caecal profiles. Further analysis of faecal samples by real-time PCR demonstrated a significant increase in the Bacteroides phylum, the Bacteroides fragilis group and in Bifidobacterium spp. in mice fed FOS or XOS. The observed bifidogenic effect was more pronounced for XOS than for FOS. The Firmicutes phylum and the Clostridium cocoides group were reduced by both FOS and XOS. Surprisingly, no significant differences were detected between faecal samples collected before and after pathogen challenge in any of the groups. Furthermore, no effect of diets on caecal concentrations of short-chain fatty acids was recorded. In conclusion, diets supplemented with FOS or XOS induced a number of microbial changes in the faecal microbiota of mice. The observed effects of XOS were qualitatively similar to those of FOS, but the most prominent bifidogenic effect was seen for XOS. An increased level of bifidobacteria is thus not in itself preventative against Salmonella infection, since the same XOS or FOS-fed mice were previously reported to be more severely affected by Salmonella than control animals.

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Authors: Petersen, A. (Intern), Bergström, A. (Intern), Andersen, J. B. (Intern), Hansen, M. (Intern), Lahtinen, S. J. (Ekstern), Wilcks, A. (Intern), Licht, T. R. (Intern)
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Publication date: 2010
Main Research Area: Technical/natural sciences
Oxygen restriction increases the infection potential of Listeria monocytogenes - a transcriptional analysis.

Listeria monocytogenes has been implicated in several food borne outbreaks as well as sporadic cases of disease during the last two decades. Increased understanding of the biology of this organism is important in the prevention of food borne listeriosis. This is highly relevant for safety assessment of this organism in food. We have previously shown (Andersen et al., BMC Microbiology; 2007, 7:55) that the environmental conditions to which L. monocytogenes is exposed prior to ingestion are decisive for its in vivo infective potential in the gastrointestinal tract after passage of the gastric barrier. Infection of Caco-2 cells revealed that Listeria cultivated under oxygen-restricted conditions were approximately 100 fold more invasive than similar cultures grown without oxygen restriction. This means that not only the number of Listeria present in a given food item, but that also the physiological condition of these bacteria is important for food safety. The in vitro and in vivo data suggest that an oxygen-restricted L. monocytogenes cell represents a significantly higher risk than a cell grown without oxygen restriction. In order to identify transcriptional differences contributing to different invasiveness, microarrray gene chip technology was applied to cDNA created from RNA isolated from oxygen restricted and non-restricted cultures. The analysis confirmed several relevant genes to be differentially transcribed in the two environmental conditions e.g. genes related to virulence potential of Listeria monocytogenes.

The ubiquitin C-terminal hydrolase UCH-L1 promotes bacterial invasion by altering the dynamics of the actin cytoskeleton

Invasion of eukaryotic target cells by pathogenic bacteria requires extensive remodelling of the membrane and actin cytoskeleton. Here we show that the remodelling process is regulated by the ubiquitin C-terminal hydrolase UCH-L1 that promotes the invasion of epithelial cells by Listeria monocytogenes and Salmonella enterica. Knockdown of UCH-L1 reduced the uptake of both bacteria, while expression of the catalytically active enzyme promoted efficient internalization in the UCH-L1-negative HeLa cell line. The entry of L. monocytogenes involves binding to the receptor tyrosine kinase Met, which leads to receptor phosphorylation and ubiquitination. UCH-L1 controls the early membrane-associated events of this triggering cascade since knockdown was associated with altered phosphorylation of the c-cbl docking site on Tyr1003, reduced ubiquitination of the receptor and altered activation of downstream ERK1/2- and AKT-dependent signalling in response to the natural ligand Hepatocyte Growth Factor (HGF). The regulation of cytoskeleton dynamics was further confirmed by the induction of actin stress fibres in HeLa expressing the active enzyme but not the catalytic mutant UCH-L1(C90S) . These findings highlight a previously unrecognized involvement of the ubiquitin cycle in bacterial entry.
UCH-L1 is highly expressed in malignant cells that may therefore be particularly susceptible to invasion by bacteria-based drug delivery systems.
Comparison of three Listeria monocytogenes strains in a guinea-pig model simulating food-borne exposure

Three different Listeria monocytogenes strains, LO28 (a laboratory strain with truncated InlA), 4446 (a clinical isolate) and 7291 (a food isolate), were compared in a guinea-pig model designed to mimic food-borne exposure. The objectives were (1) to verify the applicability of the animal model for distinguishing between Listeria with different virulence properties and (2) to explore whether it was possible to reduce the required number of animals by dosing with mixed cultures instead of monocultures. Consistent with in vitro observations of infectivity in Caco-2 cells, faecal densities and presence in selected organs were considerably lower for LO28 than for the other two strains. Additionally, the animal study revealed a difference in prevalence in faeces as well as in internal organs between the clinical isolate and the food isolate, which was not reproduced in vitro. Dosage with monocultures of Listeria strains gave similar results as dosage with a mixture of the three strains; thus, the mixed infection approach was a feasible way to reduce the number of animals needed for determination of listerial virulence.

General information
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Organisations: National Food Institute, Division of Microbiology and Risk Assessment
Authors: Roldgaard, B. (Intern), Andersen, J. B. (Intern), Hansen, T. B. (Intern), Christensen, B. B. (Intern), Licht, T. R. (Intern)
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Scopus rating (2013): SJR 1.043 SNIP 0.72 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
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Scopus rating (2012): SJR 1.069 SNIP 0.817 CiteScore 2.25
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BFI (2011): BFI-level 1
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BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.07 SNIP 0.756
Web of Science (2010): Indexed yes
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Oxygen restriction and virulence of Listeria monocytogenes: A transcriptome analysis

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Organisations: Division of Microbiology and Risk Assessment, National Food Institute
Authors: Andersen, J. B. (Intern), Licht, T. R. (Intern)
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Oxygen restriction and virulence of Listeria monocytogenes: A transcriptome analysis

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Organisations: Division of Microbiology and Risk Assessment, National Food Institute, Microbial Ecology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Andersen, J. B. (Intern), Bergström, A. (Intern), Hansen, T. B. (Intern), Roldgaard, B. (Intern), Christensen, B. B. (Intern), Boye, M. (Intern), Licht, T. R. (Intern)
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Oxygen restriction increases the infection potential of Listeria monocytogenes – verification of microarray chip data by quantitative real-time PCR

Listeria monocytogenes has been implicated in several food borne outbreaks as well as sporadic cases of disease during the last two decades. Increased understanding of the biology of this organism is important in the prevention of food borne listeriosis. This is highly relevant for safety assessment of this organism in food. We have previously shown (Andersen et al., BMC Microbiology; 2007, 7:55) that the environmental conditions to which L. monocytogenes is exposed prior to ingestion are decisive for its in vivo infective potential in the gastrointestinal tract after passage of the gastric barrier. Infection of Caco-2 cells revealed that Listeria cultivated under oxygen-restricted conditions were approximately 100 fold more invasive than similar cultures grown without oxygen restriction. This means that not only the number of Listeria present in a given food item, but that also the physiological condition of these bacteria is important for food safety. The in vitro and in vivo data suggest that an oxygen-restricted L. monocytogenes cell represents a significantly higher risk than a cell grown without oxygen restriction. In order to identify transcriptional differences contributing to different invasiveness, microarray gene chip technology was applied to cDNA created from RNA isolated from oxygen restricted and non-restricted cultures. The analysis confirmed several relevant genes to be differentially transcribed in the two environmental conditions e.g. genes related to virulence potential of Listeria monocytogenes. Quantitative PCR was used to verify the quantitative differences identified with the microarray chip for a selection of relevant and differentially transcribed genes.

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Authors: Bergström, A. (Intern), Andersen, J. B. (Intern), Christensen, B. B. (Intern), Licht, T. R. (Intern)
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Some putative prebiotics increase the severity of Salmonella enterica serovar Typhimurium infection in mice

Prebiotics are non-digestible food ingredients believed to beneficially affect host health by selectively stimulating the growth of the beneficial bacteria residing in the gut. Such beneficial bacteria have been reported to protect against
pathogenic infections. However, contradicting results on prevention of Salmonella infections with prebiotics have been published. The aim of the present study was to examine whether S. Typhimurium SL1344 infection in mice could be prevented by administration of dietary carbohydrates with different structures and digestibility profiles. BALB/c mice were fed a diet containing 10% of either of the following carbohydrates: inulin, fructo-oligosaccharide, xylo-oligosaccharide, galacto-oligosaccharide, apple pectin, polydextrose or beta-glucan for three weeks prior to oral Salmonella challenge (107 CFU) and compared to mice fed a cornstarch-based control diet. RESULTS: The mice fed with diets containing fructo-oligosaccharide (FOS) or xylo-oligosaccharide (XOS) had significantly higher (P <0.01 and P <0.05) numbers of S. Typhimurium SL1344 in liver, spleen and mesenteric lymph nodes when compared to the mice fed with the cornstarch-based control diet. Significantly increased amounts (P <0.01) of Salmonella were detected in ileal and fecal contents of mice fed with diets supplemented with apple pectin, however these mice did not show significantly higher numbers of S. Typhimurium in liver, spleen and lymph nodes than animals from the control group (P <0.20). The acute-phase protein haptoglobin was a good marker for translocation of S. Typhimurium in mice. In accordance with the increased counts of Salmonella in the organs, serum concentrations of haptoglobin were significantly increased in the mice fed with FOS or XOS (P <0.001). Caecum weight was increased in the mice fed with FOS (P <0.01), XOS (P <0.01), or polydextrose (P <0.001), and caecal pH was reduced in the mice fed with polydextrose (P <0.001). In vitro fermentation in monocultures revealed that S. Typhimurium SL1344 is capable of fermenting FOS, beta-glucan and GOS with a corresponding decline in pH. CONCLUSION: Supplementing a cornstarch-based rodent diet with 10% FOS or XOS was found to increase the translocation of S. Typhimurium SL1344 to internal organs in mice, while 10% apple pectin was found to increase the numbers of S. Typhimurium in intestinal content and feces.

**General information**

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Organisations: Division of Microbiology and Risk Assessment, National Food Institute, Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Department of Systems Biology, Division of Toxicology and Risk Assessment
Authors: Petersen, A. (Intern), Heegaard, P. M. H. (Intern), Pedersen, A. L. (Intern), Andersen, J. B. (Intern), Sørensen, R. B. (Intern), Frekjaer, H. (Ekstern), Lahtinen, S. (Ekstern), Ouwehand, A. (Ekstern), Poulsen, M. (Intern), Licht, T. R. (Intern)
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Web of Science (2016): Indexed yes
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.472 SNIP 1.039 CiteScore 2.95
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Scopus rating (2013): SJR 1.527 SNIP 1.143 CiteScore 3.32
ISI indexed (2013): ISI indexed yes
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Scopus rating (2012): SJR 1.454 SNIP 1.12 CiteScore 3.38
ISI indexed (2012): ISI indexed yes
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Scopus rating (2011): SJR 1.472 SNIP 1.116 CiteScore 3.4
ISI indexed (2011): ISI indexed yes
Oxygen restriction increases the infective potential of Listeria monocytogenes in vitro in Caco-2 cells and in vivo in guinea pigs

Background: Listeria monocytogenes has been implicated in several food borne outbreaks as well as sporadic cases of disease. Increased understanding of the biology of this organism is important in the prevention of food borne listeriosis. The infectivity of Listeria monocytogenes ScottA, cultivated with and without oxygen restriction, was compared in vitro and in vivo. Fluorescent protein labels were applied to allow certain identification of Listeria cells from untagged bacteria in in vivo samples, and to distinguish between cells grown under different conditions in mixed infection experiments. Results: Infection of Caco-2 cells revealed that Listeria cultivated under oxygen-restricted conditions were approximately 100 fold more invasive than similar cultures grown without oxygen restriction. This was observed for exponentially growing bacteria, as well as for stationary-phase cultures. Oral dosage of guinea pigs with Listeria resulted in a significantly higher prevalence \( p < 0.05 \) of these bacteria in jejunum, liver and spleen four and seven days after challenge, when the bacterial cultures had been grown under oxygen-restricted conditions prior to dosage. Additionally, a 10-100 fold higher concentration of Listeria in fecal samples was observed after dosage with oxygen-restricted bacteria. These differences were seen after challenge with single Listeria cultures, as well as with a mixture of two cultures grown with and without oxygen restriction. Conclusion: Our results show for the first time that the environmental conditions to which L. monocytogenes is exposed prior to ingestion are decisive for its in vivo infective potential in the gastrointestinal tract after passage of the gastric barrier. This is highly relevant for safety assessment of this organism in food.

General information

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Organisations: Division of Microbiology and Risk Assessment, National Food Institute
Authors: Andersen, J. B. (Intern), Roldgaard, B. (Intern), Christensen, B. B. (Intern), Licht, T. R. (Intern)
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Scopus rating (2013): SJR 1.527 SNIP 1.143 CiteScore 3.32
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Scopus rating (2012): SJR 1.454 SNIP 1.12 CiteScore 3.38
ISI indexed (2012): ISI indexed yes
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BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.472 SNIP 1.116 CiteScore 3.4
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.405 SNIP 1.03
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.438 SNIP 0.964
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.432 SNIP 0.99
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.354 SNIP 0.949
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.261 SNIP 0.827
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.734 SNIP 0.548
Web of Science (2005): Indexed yes
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Well-known quorum sensing inhibitors do not affect bacterial quorum sensing-regulated bean sprout spoilage

General information
Construction of a multiple fluorescence labeling system for use in co-invasion studies of Listeria monocytogenes

Background Existing virulence models are often difficult to apply for quantitative comparison of invasion potentials of Listeria monocytogenes. Well-to-well variation between cell-line based in vitro assays is practically unavoidable, and variation between individual animals is the cause of large deviations in the observed capacity for infection when animal models are used. One way to circumvent this problem is to carry out virulence studies as competition assays between 2 or more strains. This, however, requires invasion-neutral markers that enable easy discrimination between the different strains. Results A fluorescent marker system, allowing visualization and identification of single L. monocytogenes cells as well as colonies in a non-destructive manner, was developed. Five different fluorescent labels are available, and allowed simultaneous visual discrimination between three differently labelled strains at the single cell level by use of fluorescence microscopy. More than 90% of the L. monocytogenes host cells maintained the fluorescence tags for 40 generations. The fluorescence tags did not alter the invasive capacity of the L. monocytogenes cells in a traditional Caco-2 cell invasion assay, and visual discrimination between invaded bacteria carrying different fluorescent labels inside the cells was possible. Conclusion The constructed fluorescent marker system is stable, easy to use, does not affect the virulence of L. monocytogenes in Caco-2 cell assays, and allows discrimination between differently labelled bacteria after internalization in these cells.

General information
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Organisations: Division of Microbiology and Risk Assessment, National Food Institute
Authors: Andersen, J. B. (Intern), Roldgaard, B. (Intern), Lindner, A. B. (Ekstern), Christensen, B. B. (Intern), Licht, T. R. (Intern)
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Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.472 SNIP 1.116 CiteScore 3.4
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.405 SNIP 1.03
Web of Science (2010): Indexed yes
Internalin A (inlA) plays a key role in the persistence of Listeris monocytogenes in the jejunum of Guinea pigs

General information
State: Published
Organisations: National Food Institute, Division of Microbiology and Risk Assessment
Authors: Roldgaard, B. (Intern), Andersen, J. B. (Intern), Licht, T. R. (Intern), Christensen, B. B. (Intern)
Publication date: 2006
Event: Poster session presented at 4th Symposium on Food Microbiology, Helsingør, Denmark.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 247959
Publication: Research › Poster – Annual report year: 2006

Cell-to-cell communication signals are produced by non-bioluminescent strains of Photobacterium phosphoreum

General information
State: Published
Organisations: Department of Systems Biology, Center for Microbial Biotechnology, Center for Biomedical Microbiology
Authors: Flodgaard, L. (Intern), Dalsgaard, P. (Intern), Jensen, P. (Intern), Andersen, J. B. (Intern), Nielsen, K. F. (Intern), Givskov, M. C. (Intern), Gram, L. (Intern)
Pages: 2113-2120
Publication date: 2005
Main Research Area: Technical/natural sciences
Heterogeneity of biofilms formed by nonmucoid Pseudomonas aeruginosa isolates from patients with cystic fibrosis.

General information
State: Published
Organisations: Center for Biomedical Microbiology, Center for Biomedical Microbiology, Department of Systems Biology, Division of Microbiology and Risk Assessment, National Food Institute
Authors: Lee, B. (Intern), Haagensen, J. A. J. (Intern), Ciofu, O. (Ekstern), Andersen, J. B. (Intern), Hoiby, N. (Ekstern), Molin, S. (Intern)
Pages: 5247-5255
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Clinical Microbiology
ISSN (Print): 0095-1137
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.57 SJR 2.14 SNIP 1.417
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.204 SNIP 1.448 CiteScore 3.56
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.205 SNIP 1.538 CiteScore 3.84
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.414 SNIP 1.646 CiteScore 4.18
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.114 SNIP 1.632 CiteScore 4.11
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.336 SNIP 1.698 CiteScore 4.27
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.303 SNIP 1.727
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 2.173 SNIP 1.694
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 2.239 SNIP 1.621
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.202 SNIP 1.689
Web of Science (2007): Indexed yes
Quorum sensing (QS) communication systems are thought to afford bacteria with a mechanism to strategically cause disease. One example is Pseudomonas aeruginosa, which infects immunocompromised individuals such as cystic fibrosis patients. The authors have previously documented that blockage of the QS systems not only attenuates Ps. aeruginosa but also renders biofilms highly susceptible to treatment with conventional antibiotics. Filamentous fungi produce a battery of secondary metabolites, some of which are already in clinical use as antimicrobial drugs. Fungi coexist with bacteria but lack active immune systems, so instead rely on chemical defence mechanisms. It was speculated that some of these secondary metabolites could interfere with bacterial QS communication. During a screening of 100 extracts from 50 Penicillium species, 33 were found to produce QS inhibitory (QSI) compounds. In two cases, patulin and penicillic acid were identified as being biologically active QSI compounds. Their effect on QS-controlled gene expression in Ps. aeruginosa was verified by DNA microarray transcriptomics. Similar to previously investigated QSI compounds, patulin was found to enhance biofilm susceptibility to tobramycin treatment. Ps. aeruginosa has developed QS-dependent mechanisms that block development of the oxidative burst in PMN neutrophils. Accordingly, when the bacteria were treated with either patulin or penicillic acid, the neutrophils became activated. In a mouse pulmonary infection model, Ps. aeruginosa was more rapidly cleared from the mice that were treated with patulin compared with the placebo group.
Involvement of bacterial quorum-sensing signals in spoilage of bean sprouts

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Division of Microbiology and Risk Assessment, National Food Institute, Center for Microbial Biotechnology, Department of Systems Biology, Section for Aquatic Microbiology and Seafood Hygiene
Authors: Rasch, M. (Intern), Andersen, J. B. (Intern), Nielsen, K. F. (Intern), Flodgaard, L. (Intern), Christensen, H. (Ekstern), Givskov, M. C. (Intern), Gram, L. (Intern)
Pages: 3321-3330
Publication date: 2005
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Applied and Environmental Microbiology
Volume: 71
Issue number: 6
ISSN (Print): 0099-2240
Ratings:
BFI (2018): BFI-level 2
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.08
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.891 SNIP 1.308 CiteScore 4.14
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.857 SNIP 1.384 CiteScore 4.02
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.899 SNIP 1.414 CiteScore 4.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.975 SNIP 1.429 CiteScore 4.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.914 SNIP 1.455 CiteScore 4.12
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.887 SNIP 1.436
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.972 SNIP 1.528
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.156 SNIP 1.572
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.043 SNIP 1.647
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 2.054 SNIP 1.602
Nonbioluminescent strains of Photobacterium phosphoreum produce the cell-to-cell communication signal N-(3-
Hydroxyoctanoyl)homoserine lactone.

Bioluminescence is a common phenotype in marine bacteria, such as Vibrio and Photobacterium species, and can be quorum regulated by N-acylated homoserine lactones (AHLs). We extracted a molecule that induced a bacterial AHL monitor (Agrobacterium tumefaciens NT1 [pZLR4]) from packed cod fillets, which spoil due to growth of Photobacterium phosphoreum. Interestingly, AHLs were produced by 13 nonbioluminescent strains of P. phosphoreum isolated from the product. Of 177 strains of P. phosphoreum (including 18 isolates from this study), none of 74 bioluminescent strains elicited a reaction in the AHL monitor, whereas 48 of 103 nonbioluminescent strains did produce AHLs. AHLs were also detected in Aeromonas spp., but not in Shewanella strains. Thin-layer chromatographic profiles of cod extracts and P. phosphoreum culture supernatants identified a molecule similar in relative mobility (R-f value) and shape to N-(3-hydroxyoctanoyl)homoserine lactone, and the presence of this molecule in culture supernatants from a nonbioluminescent strain of P. phosphoreum was confirmed by high-performance liquid chromatography-positive electrospray high-resolution mass spectrometry. Bioluminescence (in a non-AHL-producing strain of P. phosphoreum) was strongly up-regulated during growth, whereas AHL production in a nonbioluminescent strain of P. phosphoreum appeared constitutive. AHLs apparently did not influence bioluminescence, as the addition of neither synthetic AHLs nor supernatants delayed or reduced this phenotype in luminescent strains of P. phosphoreum. The phenotypes of nonbioluminescent P. phosphoreum strains regulated by AHLs remains to be elucidated.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquatic Microbiology and Seafood Hygiene, Division of Microbiology and Risk Assessment, National Food Institute, Center for Microbial Biotechnology, Department of Systems Biology, Center for Biomedical Microbiology
Authors: Flodgaard, L. (Intern), Dalgaard, P. (Intern), Andersen, J. B. (Intern), Nielsen, K. F. (Intern), Givskov, M. C. (Intern), Gram, L. (Intern)
Pages: 2113-2120
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Applied and Environmental Microbiology
Volume: 71
Issue number: 4
ISSN (Print): 0099-2240
Ratings:
BFI (2018): BFI-level 2
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
Nonmucoid Pseudomonas aeruginosa expresses alginate in the lungs of patients with cystic fibrosis and in a mouse model.
Dynamics and spatial distribution of beta-lactamase expression in Pseudomonas aeruginosa biofilms

The development of resistance to beta-lactam antibiotics is a problem in the treatment of chronic Pseudomonas aeruginosa infection in the lungs of patients with cystic fibrosis. The main resistance mechanism is high-level expression of the chromosomally encoded AmpC beta-lactamase of P. aeruginosa cells growing in biofilms. Several genes have been shown to influence the level of ampC expression, but little is known about the regulation of ampC expression in P. aeruginosa biofilms. To study the expression of ampC in P. aeruginosa biofilms, we constructed a reporter that consisted of the fusion of the ampC promoter to gfp(ASV) encoding an unstable version of the green fluorescent protein. In vitro biofilms of P. aeruginosa were exposed to the beta-lactam antibiotics imipenem and ceftazidime. Sub-MICs of imipenem significantly induced the monitor system of the biofilm bacteria in the peripheries of the microcolonies, but the centers of the microcolonies remained uninduced. However, the centers of the microcolonies were physiologically active, as shown by experiments with another monitor construction consisting of an arabinose-inducible promoter fused to gfp(ASV). The whole biofilm was induced in the presence of increased imipenem concentrations. Ceftazidime induced the monitor system of the biofilm bacteria as well, but only bacteria in the peripheries of the microcolonies were induced in the presence of even very high concentrations. The experiments illustrate for the first time the dynamic and spatial distributions of beta-lactamase induction in P. aeruginosa cells growing in biofilms. Thus, our experiments show that P. aeruginosa cells growing in biofilms constitute a heterogeneous population unit which may create different antibiotic-selective environments for the bacteria in the biofilm.
**Synthetic furanones inhibit quorum-sensing and enhance bacterial clearance in Pseudomonas aeruginosa lung infection in mice**

Introduction: Antibiotics are used to treat bacterial infections by killing the bacteria or inhibiting their growth, but resistance to antibiotics can develop readily. The discovery that bacterial quorum-sensing regulates bacterial virulence as well as the formation of biofilms opens up new ways to control certain bacterial infections. Furanone compounds capable of inhibiting bacterial quorum-sensing systems have been isolated from the marine macro alga Delisea pulchra. Objectives: Two synthetic furanones were tested for their ability to attenuate bacterial virulence in the mouse models of chronic lung infection by targeting bacterial quorum-sensing without directly killing bacteria or inhibiting their growth. Methods: Study I. Mice with Escherichia coli MT102 [luxR-PluxI-gfp(ASV)] lung infection were injected intravenously with N-acyl homoserine lactones with or without furanones to test the interference of furanones with quorum-sensing. Study II. Mice with lung infection by Pseudomonas aeruginosa PAO1 [dsred, lasR-PlasB-gfp(ASV)] were injected intravenously with furanones to evaluate their inhibiting effects on quorum-sensing. Study III. Mice with P. aeruginosa PAO1 lung infection were treated with different doses of furanones to evaluate the therapeutic effects of furanones on the lung infection. Results: Furanones successfully interfered with N-acyl homoserine lactone and suppressed bacterial quorum-sensing in lungs, which resulted in decreases in expression of green fluorescent protein. Furanones accelerated lung bacterial clearance, and reduced the severity of lung pathology. In a lethal P. aeruginosa lung infection, treatment with furanone significantly prolonged the survival time of the mice. Conclusion: Synthetic furanone compounds inhibited bacterial quorum-sensing in P. aeruginosa and exhibited favourable therapeutic effects on P. aeruginosa lung infection.

**General information**

State: Published

Organisations: Center for Biomedical Microbiology, Department of Systems Biology
Attenuation of Pseudomonas aeruginosa virulence by quorum sensing inhibitors

Traditional treatment of infectious diseases is based on compounds that kill or inhibit growth of bacteria. A major concern with this approach is the frequent development of resistance to antibiotics. The discovery of communication systems (quorum sensing systems) regulating bacterial virulence has afforded a novel opportunity to control infectious bacteria without interfering with growth. Compounds that can override communication signals have been found in the marine environment. Using Pseudomonas aeruginosa PAO1 as an example of an opportunistic human pathogen, we show that a synthetic derivative of natural furanone compounds can act as a potent antagonist of bacterial quorum sensing. We employed GeneChip® microarray technology to identify furanone target genes and to map the quorum sensing regulon. The transcriptome analysis showed that the furanone drug specifically targeted quorum sensing systems and inhibited virulence factor expression. Application of the drug to P. aeruginosa biofilms increased bacterial susceptibility to tobramycin and SDS. In a mouse pulmonary infection model, the drug inhibited quorum sensing of the infecting bacteria and promoted their clearance by the mouse immune response.

General information
State: Published
Organisations: Center for Biomedical Microbiology, Department of Systems Biology, Department of Microbiology
Authors: Hentzer, M. (Intern), Wu, H. (Ekstern), Andersen, J. B. (Intern), Riedel, K. (Ekstern), Rasmussen, T. B. (Intern), Bagge, N. (Ekstern), Kumar, N. (Ekstern), Schembri, M. (Intern), Song, Z. (Ekstern), Kristoffersen, P. (Intern), Manefield, M. (Ekstern), Costerton, J. (Ekstern), Molin, S. (Intern), Eberl, L. (Intern), Steinberg, P. (Ekstern), Kjelleberg, S. (Ekstern), Høiby, N. (Ekstern), Givskov, M. C. (Intern)
Pages: 3803-3815
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Embo Journal
Volume: 22
Issue number: 15
ISSN (Print): 0261-4189
Ratings:
BFI (2018): BFI-level 2
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 7.13 SJR 6.57 SNIP 1.508
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 7.352 SNIP 1.71 CiteScore 7.48
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 8.195 SNIP 1.85 CiteScore 8.28
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 8.863 SNIP 1.893 CiteScore 8.84
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 8.267 SNIP 1.874 CiteScore 8.63
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 8.468 SNIP 1.877 CiteScore 8.33
ISI indexed (2011): ISI indexed yes
Surface motility in Pseudomonas sp DSS73 is required for efficient biological containment of the root-pathogenic microfungi Rhizoctonia solani and Pythium ultimum

Pseudomonas sp. DSS73 was isolated from the rhizoplane of sugar beet seedlings. This strain exhibits antagonism towards the root-pathogenic microfungi Pythium ultimum and Rhizoctonia solani. Production of the cyclic lipopeptide amphisin in combination with expression of flagella enables the growing bacterial culture to move readily over the surface of laboratory media. Amphisin is a new member of a group of dual-functioning compounds such as tensin, viscosin and viscosinanid that display both biosurfactant and antifungal properties. The ability of DSS73 to efficiently contain root-pathogenic microfungi is shown to arise from amphisin-dependent surface translocation and growth by which the bacterium can lay siege to the fungi. The synergistic effects of surface motility and synthesis of a battery of antifungal compounds efficiently contain and terminate growth of the microfungi.

General information
State: Published
Organisations: Department of Systems Biology
Authors: Andersen, J. B. (Intern), Koch, B. (Ekstern), Nielsen, T. (Ekstern), Sørensen, D. (Ekstern), Hansen, M. (Ekstern), Nybroe, O. (Ekstern), Christophersen, C. (Ekstern), Sørensen, J. (Ekstern), Molin, S. (Intern), Givskov, M. C. (Intern)
Pages: 37-46
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Microbiology-SGM
Volume: 149
ISSN (Print): 1350-0872
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.56 SJR 0.805 SNIP 0.648
Web of Science (2016): Indexed yes
Antibiotic and biosurfactant properties of cyclic lipopeptides produced by fluorescent Pseudomonas spp. from the sugar beet rhizosphere

General information
State: Published
Organisations: Division of Microbiology and Risk Assessment, National Food Institute, Center for Biomedical Microbiology, Department of Systems Biology
Halogenated furanones inhibit quorum sensing through accelerated LuxR turnover

N-acyl-L-homoserine lactones (AHLs) are co-regulatory ligands required for control of the expression of genes encoding virulence traits in many Gram-negative bacterial species. Recent studies have indicated that AHLs modulate the cellular concentrations of LuxR-type regulatory proteins by binding and fortifying these proteins against proteolytic degradation (Zhu & Winans, 2001). Halogenated furanones produced by the macroalga Delisea pulchra inhibit AHL-dependent gene expression. This study assayed for an in vivo interaction between a tritiated halogenated furanone and the LuxR protein of Vibrio fischeri overproduced in Escherichia coli. Whilst a stable interaction between the algal metabolite and the bacterial protein was not found, it was noted by Western analysis that the half-life of the protein is reduced up to 100-fold in the presence of halogenated furanones. This suggests that halogenated furanones modulate LuxR activity but act to destabilize, rather than protect, the AHL-dependent transcriptional activator. The furanone-dependent reduction in the cellular concentration of the LuxR protein was associated with a reduction in expression of a plasmid encoded P-luxl-gfp(ASV) fusion suggesting that the reduction in LuxR concentration is the mechanism by which furanones control expression of AHL-dependent phenotypes. The mode of action by which halogenated furanones reduce cellular concentrations of the LuxR protein remains to be characterized.
Inhibition of quorum sensing in Pseudomonas aeruginosa biofilm bacteria by a halogenated furanone compound

Novel molecular tools have been constructed which allow for in situ detection of N-acyl homoserine lactone (AHL)-mediated quorum sensing in Pseudomonas aeruginosa biofilms. The reporter responds to AHL activation of LasR by expression of an unstable version of the green-fluorescent protein (Gfp). Gfp-based reporter technology has been applied for non-destructive, single-cell-level detection of quorum sensing in laboratory-based P. aeruginosa biofilms. It is reported that a synthetic halogenated furanone compound, which is a derivative of the secondary metabolites produced by the Australian macroalga Delisea pulchra, is capable of interfering with AHL-mediated quorum sensing in P. aeruginosa. It is demonstrated that the furanone compound specifically represses expression of a PlasB-gfp reporter fusion without affecting growth or protein synthesis. In addition, it reduces the production of important virulence factors, indicating a general effect on target genes of the las quorum sensing circuit. The furanone was applied to P. aeruginosa biofilms established in biofilm flow chambers. The Gfp-based analysis reveals that the compound penetrates microcolonies and blocks cell signalling and quorum sensing in most biofilm cells. The compound did not affect initial attachment to the abiotic substratum. It does, however, affect the architecture of the biofilm and enhances the process of bacterial detachment, leading to a loss of bacterial biomass from the substratum.
Lipopeptide production in Pseudomonas sp strain DSS73 is regulated by components of sugar beet seed exudate via the gac two-component regulatory system

General information
State: Published
Organisations: Department of Systems Biology
Authors: Koch, B. (Ekstern), Nielsen, T. (Ekstern), Sørensen, D. (Ekstern), Andersen, J. B. (Intern), Christophersen, C. (Ekstern), Molin, S. (Intern), Givskov, M. C. (Intern), Sørensen, J. (Ekstern), Nybroe, O. (Ekstern)
Pages: 4509-4516
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: Applied and Environmental Microbiology
Volume: 68
Issue number: 9
ISSN (Print): 0099-2240
Ratings:
BFI (2018): BFI-level 2
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.08
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.891 SNIP 1.308 CiteScore 4.14
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.857 SNIP 1.384 CiteScore 4.02
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.899 SNIP 1.414 CiteScore 4.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.975 SNIP 1.429 CiteScore 4.29
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.914 SNIP 1.455 CiteScore 4.12
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.887 SNIP 1.436
Genetic and chemical tools for investigating signaling processes in biofilms

General information
State: Published
Organisations: Center for Biomedical Microbiology, Department of Systems Biology
Authors: Charlton, T. (Ekstern), Givskov, M. C. (Intern), DeNys, R. (Ekstern), Andersen, J. B. (Intern), Hentzer, M. (Intern), Rice, S. (Ekstern), Kjelleberg, S. (Ekstern)
Pages: 108-128
Publication date: 2001
Main Research Area: Technical/natural sciences

Publication information
Journal: Methods in Enzymology
Volume: 336
ISSN (Print): 0076-6879
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.528 SNIP 0.523 CiteScore 1.83
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.476 SNIP 0.566 CiteScore 1.95
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.393 SNIP 0.64 CiteScore 1.9
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.515 SNIP 0.588 CiteScore 2.09
gfp-based N-acyl homoserine-lactone sensor systems for detection of bacterial communication

In order to perform single-cell analysis and online studies of N-acyl homoserine lactone (AHL)-mediated communication among bacteria, components of the Vibrio fischeri quorum sensor encoded by luxR-P-luxI have been fused to modified versions of gfpmut3* genes encoding unstable green fluorescent proteins. Bacterial strains harboring this green fluorescent sensor detected a broad spectrum of AHL molecules and were capable of sensing the presence of 5 nM N-3-oxohexanoyl-L-homoserine lactone in the surroundings. In combination with epifluorescent microscopy, the sensitivity of the sensor enabled AHL detection at the single-cell level and allowed for real-time measurements of fluctuations in AHL concentrations. This green fluorescent AHL sensor provides a state-of-the-art tool for studies of communication between the individuals present in mixed bacterial communities.

General information
State: Published
Organisations: Division of Microbiology and Risk Assessment, Department of Microbiology, Center for Systems Microbiology, Technische Universität München
Authors: Andersen, J. B. (Intern), Heydorn, A. (Intern), Hentzer, M. (Intern), Eberl, L. (Intern), Geisenberger, O. (Ekstern), Christensen, B. B. (Intern), Molin, S. (Intern), Givskov, M. C. (Intern)
Pages: 575-585
Publication date: 2001
Main Research Area: Technical/natural sciences

Publication Information
Journal: Applied and Environmental Microbiology
Volume: 67
Issue number: 2
ISSN (Print): 0099-2240
Ratings:
BFI (2018): BFI-level 2
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
Detection of N-acylhomoserine lactones in lung tissues of mice infected with Pseudomonas aeruginosa
Development and dynamics of Pseudomonas sp biofilms

General information
State: Published
Organisations: National Food Institute, Division of Microbiology and Risk Assessment, Department of Systems Biology, Center for Systems Microbiology
Authors: Tolker-Nielsen, T. (Intern), Brinch, U. C. (Ekstern), Ragas, P. C. (Intern), Andersen, J. B. (Intern), Jacobsen, C. S. (Ekstern), Molin, S. (Intern)
Pages: 6482-6489
Publication date: 2000
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Bacteriology
Volume: 182
Issue number: 22
ISSN (Print): 0021-9193
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.08 SJR 1.908 SNIP 0.884
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.151 SNIP 0.959 CiteScore 2.84
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 2.069 SNIP 0.937 CiteScore 2.72
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.136 SNIP 1.018 CiteScore 3
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.103 SNIP 1.092 CiteScore 3.42
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.444 SNIP 1.158 CiteScore 3.83
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.6 SNIP 1.147
Web of Science (2010): Indexed yes
How Delisea pulchra furanones affect quorum sensing and swarming motility in Serratia liquefaciens MG1

General information

State: Published
Organisations: National Food Institute, Division of Microbiology and Risk Assessment
Authors: Rasmussen, T. B. (Intern), Manefield, M. (Ekstern), Andersen, J. B. (Intern), Eberl, L. (Intern), Anthoni, U. (Ekstern), Christophersen, C. (Ekstern), Steinberg, P. (Ekstern), Kjelleberg, S. (Ekstern), Givskov, M. C. (Intern)
Pages: 3237-3244
Publication date: 2000
Main Research Area: Technical/natural sciences

Publication information
Journal: Microbiology
Volume: 146
ISSN (Print): 1350-0872
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.56 SJR 0.805 SNIP 0.648
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.136 SNIP 0.834 CiteScore 2.05
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.448 SNIP 0.978 CiteScore 2.69
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Molecular Ecology of Biofilms

General information
State: Published
Organisations: Center for Biomedical Microbiology, Department of Systems Biology, Division of Microbiology and Risk Assessment, National Food Institute, Department of Microbiology
Pages: 89-120
Publication date: 2000

Host publication information
Title of host publication: Biofilms
Monitoring of cellular activities in multispecies bacterial surface communities

General information
State: Published
Organisations: Center for Systems Microbiology, Department of Systems Biology, Division of Microbiology and Risk Assessment, National Food Institute, Department of Microbiology
Pages: 497-502
Publication date: 2000

Host publication information
Title of host publication: Atlantic Canada Society for Microbial Ecology
Place of publication: Halifax, Canada
Publisher: Atlantic Canada Society for Microbial Ecology
Editors: Bell, C. R., Brylinsky, M., Johnson-Green, P.
ISBN (Print): 09-68-67630-8
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 247352
Publication: Research › Article in proceedings – Annual report year: 2000

Bacterial activity in microbial communities analyzed in situ by unstable variants of Green Fluorescent Protein fused to ribosomal promoters

General information
State: Published
Organisations: Center for Systems Microbiology, Department of Systems Biology, Division of Microbiology and Risk Assessment, National Food Institute
Authors: Sternberg, C. (Intern), Christensen, B. B. (Intern), Nielsen, A. T. (Ekstern), Andersen, J. B. (Intern), Givskov, M. C. (Intern), Molin, S. (Intern)
Pages: 4108-4117
Publication date: 1999
Main Research Area: Technical/natural sciences

Publication information
Journal: Applied and Environmental Microbiology
Volume: 65
ISSN (Print): 0099-2240
Ratings:
BFI (2018): BFI-level 2
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.08
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.891 SNIP 1.308 CiteScore 4.14
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.857 SNIP 1.384 CiteScore 4.02
Web of Science (2014): Indexed yes
Distribution of bacterial growth activity in flow-chamber biofilms

In microbial communities such as those found in biofilms, individual organisms most often display heterogeneous behavior with respect to their metabolic activity, growth status, gene expression pattern, etc. In that context, a novel reporter system for monitoring of cellular growth activity has been designed. It comprises a transposon cassette carrying fusions between the growth rate-regulated Escherichia coli rrnBP1 promoter and different variant gfp genes. It is shown that the pi promoter is regulated in the same way in E. coli and Pseudomonas putida, making it useful for monitoring of growth activity in organisms outside the group of enteric bacteria. Construction of fusions to genes encoding unstable Gfp proteins opened up the possibility of the monitoring of rates of rRNA synthesis and, in this way, allowing on-line determination of the distribution of growth activity in a complex community. With the use of these reporter tools, it is demonstrated that individual cells of a toluene-degrading P. putida strain growing in a benzyl alcohol-supplemented biofilm have different levels of growth activity which develop as the biofilm gets older. Cells that eventually grow very slowly or not at all may be stimulated to restart growth if provided with a more easily metabolizable carbon source. Thus, the dynamics of biofilm growth activity has been tracked to the level of individual cells, cell clusters, and microcolonies.
Molecular tools for study of biofilm physiology

General information
State: Published
Organisations: Department of Systems Biology, Center for Systems Microbiology, National Food Institute, Division of Microbiology and Risk Assessment, Fødevaredirektoratet, University of Tennessee
Authors: Christensen, B. B. (Ekstern), Sternberg, C. (Intern), Andersen, J. B. (Intern), Palmer, R. J. (Ekstern), Nielsen, A. T. (Intern), Givskov, M. C. (Intern), Molin, S. (Intern)
Pages: 20-42
Publication date: 1999

Host publication information
Title of host publication: Methods in Enzymology
Publisher: Academic Press
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 174055
Publication: Research - peer-review › Article in proceedings – Annual report year: 1999

Quorum sensing and eukaryote-prokaryote interactions

General information
State: Published
Organisations: National Food Institute, Division of Microbiology and Risk Assessment, Department of Systems Biology, Center for Systems Microbiology, Technical University of Munich, University of New South Wales, University of Copenhagen
Authors: Givskov, M. C. (Intern), Andersen, J. B. (Intern), Hentzer, M. (Intern), Heydorn, A. (Intern), Molin, S. (Intern), Eberl, L. (Ekstern), DeNys, R. (Ekstern), Manefield, M. (Ekstern), Steinberg, P. (Ekstern), Kjelleberg, S. (Ekstern), Wu, H. (Ekstern), Song, Z. (Ekstern), Høiby, N. (Ekstern)
Pages: 5 S6
Publication date: 1999
Main Research Area: Technical/natural sciences

Publication information
Journal: Clinical Microbiology and Infection
Volume: 5
ISSN (Print): 1198-743X
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.99 SJR 2.09 SNIP 1.731
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Use of molecular tools in physiological studies of microbial biofilms

General information
State: Published
Organisations: Division of Microbiology and Risk Assessment, National Food Institute, Center for Systems Microbiology, Department of Systems Biology
Authors: Christensen, B. B. (Intern), Sternberg, C. (Intern), Andersen, J. B. (Intern), Palmer, R. J. (Ekstern), Givskov, M. C. (Intern), Molin, S. (Intern)
Pages: 20-42
Publication date: 1999
Main Research Area: Technical/natural sciences

Publication information
Journal: Methods in Enzymology
Establishment of new genetic traits in a microbial biofilm community

Conjugational transfer of the TOL plasmid (pWWO) was analyzed in a flow chamber biofilm community engaged in benzyl alcohol degradation. The community consisted of three species, Pseudomonas putida RI, Acinetobacter sp. strain C6, and an unidentified isolate, D8. Only P. putida RI could act as a recipient for the TOL plasmid. Cells carrying a chromosomally integrated lacI(q) gene and a lacp-gfp-tagged version of the TOL plasmid were introduced as donor strains in the biofilm community after its formation. The occurrence of plasmid-carrying cells was analyzed by viable-count-based enumeration of donors and transconjugants. Upon transfer of the plasmids to the recipient cells, expression of green fluorescence was activated as a result of zygotic induction of the gfp gene. This allowed a direct in situ identification of cells receiving the gfp-tagged version of the TOL plasmid. Our data suggest that the frequency of horizontal plasmid transfer was low, and growth (vertical transfer) of the recipient strain was the major cause of plasmid establishment in the biofilm community after its formation. The occurrence of plasmid-carrying cells was analyzed by viable-count-based enumeration of donors and transconjugants. Upon transfer of the plasmids to the recipient cells, expression of green fluorescence was activated as a result of zygotic induction of the gfp gene. This allowed a direct in situ identification of cells receiving the gfp-tagged version of the TOL plasmid. Our data suggest that the frequency of horizontal plasmid transfer was low, and growth (vertical transfer) of the recipient strain was the major cause of plasmid establishment in the biofilm community. Employment of scanning confocal laser microscopy on fixed biofilms, combined with simultaneous identification of P. putida cells and transconjugants by 16S rRNA hybridization and expression of green fluorescence, showed that transconjugants were always associated with noninfected P. putida RI recipient microcolonies. Pure colonies of transconjugants were never observed, indicating that proliferation of transconjugant cells preferentially took place on preexisting P. putida RI microcolonies in the biofilm.
In situ detection of gene transfer in a model biofilm engaged in degradation of benzyl alcohol

General information
State: Published
Organisations: Department of Systems Biology, Center for Systems Microbiology, National Food Institute, Division of Microbiology and Risk Assessment
Authors: Christensen, B. B. (Intern), Sternberg, C. (Intern), Andersen, J. B. (Intern), Molin, S. (Intern)
Pages: 25-28
Publication date: 1998
Main Research Area: Technical/natural sciences

Publication information
Journal: APMIS Supplementum
Volume: 106
Issue number: Suppl.84
ISSN (Print): 0903-465X
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.25
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.8
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 0.75
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 0.2
ISI indexed (2012): ISI indexed no
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 0.92
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
In situ gene expression in mixed-culture biofilms: Evidence of metabolic interactions between community members

Microbial communities growing in laboratory-based pow chambers were investigated in order to study compartmentalization of specific gene expression. Among the community members studied, the focus was in particular on Pseudomonas putida and a strain of an Acinetobacter sp., and the genes studied are involved in the biodegradation of toluene and related aromatic compounds. The upper-pathway promoter (Pu) and the meta-pathway promoter (Pm) from the TOL plasmid were fused independently to the gene coding for the green fluorescent protein (GFP), and expression from these promoters was studied in P. putida, which was a dominant community member. Biofilms were cultured in flow chambers, which in combination with scanning confocal laser microscopy allowed direct monitoring of promoter activity with single-cell spatial resolution. Expression from the Pu promoter was homogeneously induced by benzyl alcohol in both community and pure-culture biofilms, while the Pm promoter was induced in the mixed community but not in a pure-culture biofilm. By sequentially adding community members, induction of Pm was shown to be a consequence of direct metabolic interactions between an Acinetobacter species and P. putida. Furthermore, in fixed biofilm samples organism identity was determined and gene expression was visualized at the same time by combining GFP expression with in situ hybridization with fluorescence-labeled 16S rRNA targeting probes. This combination of techniques is a powerful approach for investigating structure-function relationships in microbial communities.
New unstable variants of green fluorescent protein for studies of transient gene expression in bacteria

Use of the green fluorescent protein (Gfp) from the jellyfish Aequorea victoria is a powerful method for nondestructive in situ monitoring, since expression of green fluorescence does not require any substrate addition. To expand the use of Gfp as a reporter protein, new variants have been constructed by the addition of short peptide sequences to the C-terminal end of intact Gfp. This rendered the Gfp susceptible to the action of indigenous housekeeping proteases, resulting in protein variants with half-lives ranging from 40 min to a few hours when synthesized in Escherichia coli and Pseudomonas putida. The new Gfp variants should be useful for in situ studies of temporal gene expression.

General information
State: Published
Organisations: National Food Institute, Division of Microbiology and Risk Assessment, Department of Systems Biology, Center for Systems Microbiology, Novo Nordisk A/S
Authors: Andersen, J. B. (Intern), Sternberg, C. (Intern), Poulsen, L. K. (Ekstern), Bjørn, S. P. (Ekstern), Givskov, M. C. (Intern), Molin, S. (Intern)
Pages: 2240-2246
Publication date: 1998
Serratia liquefaciens swarm cells exhibit enhanced resistance to predation by Tetrahymena sp.

General information
State: Published
Organisations: National Food Institute, Division of Microbiology and Risk Assessment, Technical University of Munich
Authors: Ammendola, A. (Ekstern), Geisenberger, O. (Ekstern), Andersen, J. B. (Intern), Givskov, M. C. (Intern), Schleifer, K. H. (Ekstern), Eberl, L. (Ekstern)
Pages: 69-75
Publication date: 1998
Main Research Area: Technical/natural sciences

Publication information
Journal: F E M S Microbiology Letters
Volume: 164
ISSN (Print): 0378-1097
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.76 SJR 0.747 SNIP 0.597
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.131 SNIP 0.752 CiteScore 2.08
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.122 SNIP 0.767 CiteScore 2.17
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.043 SNIP 0.72 CiteScore 2.25
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.069 SNIP 0.817 CiteScore 2.25
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.096 SNIP 0.761 CiteScore 2.26
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.07 SNIP 0.756
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.11 SNIP 0.835
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.067 SNIP 0.827
Identification of a Bacillus subtilis secretion mutant using a β-galactosidase screening procedure

High-level synthesis of exportable beta-galactosidase (LacZ) fusion proteins in Bacillus subtilis results in a lethal phenotype, and has been suggested as a tool for the selection of secretion mutants. We tested a plasmid-based, inducible lacZ fusion gene system for this purpose, but frequent mutations in cis, which reduced expression of the fusion gene, forced abandonment of the induction-selection strategy. Instead, after modification of the indicator plasmid, a screening procedure for increased basal LacZ activity levels was adopted. This led to the identification of a conditional B. subtilis secretion mutant after nitrosoguanidine mutagenesis. At 42 degrees C, but not at 30 degrees C, this mutant displayed extreme growth retardation when the LacZ fusion protein was produced, and was also defective in the secretion of subtilisin Carlsberg. The processing kinetics and secretion of a subtilisin Carlsberg-alkaline phosphatase fusion derivative were found to be defective specifically at the non-permissive temperature. The secretion defect was not linked to the secA/div locus.

General information
State: Published
Organisations: Department of Microbiology, National Public Health Institute Helsinki
Authors: Jacobs, M. F. (Ekstern), Andersen, J. B. (Intern), Borchert, T. V. (Ekstern), Kontinen, V. P. (Ekstern)
Pages: 1771-1779
Publication date: 1995
Main Research Area: Technical/natural sciences

Publication information
Journal: Microbiology
Volume: 141
ISSN (Print): 1350-0872
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.56 SJR 0.805 SNIP 0.648
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.136 SNIP 0.834 CiteScore 2.05
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.448 SNIP 0.978 CiteScore 2.69
Web of Science (2014): Indexed yes
Bacillus subtilis PrsA is required in vivo as an extracytoplasmic chaperone for secretion of active enzymes synthesized either with or without pro-sequences
Further evidence of long distance airborne transmission of Aujeszky's disease (pseudorabies) virus

In spite of the eradication of Aujeszky's disease in Denmark a single outbreak was recorded in December 1988 and another severe epizootic took place during the winter and spring of 1989/90. The epizootic occurred in nearly the same areas as the preceding epizootic during the winter of 1987/88. Identification of the strains of virus involved eliminated the possibility that the latest epizootic was due to the persistence of virus in the pig population. Furthermore, as during the preceding epizootic, initial recordings of the new strains were found to coincide with periods with southerly winds. It was concluded from circumstantial evidence that the concurrent introductions of virus to several farms played a major role during the epizootic.

General information
State: Published
Organisations: Division of Microbiology and Risk Assessment, National Food Institute, Sektion for Eksotiske Virussygdomme, Division of Virology, National Veterinary Institute
Authors: Christensen, L. S. (Intern), Mortensen, S. (Ekstern), Bøtner, A. (Intern), Strandbygaard, B. (Intern), Rønsholt, L. (Ekstern), Henriksen, C. A. (Ekstern), Andersen, J. B. (Intern)
Pages: 317-321
Publication date: 1993
Main Research Area: Technical/natural sciences

Publication information
Journal: Veterinary Record
Volume: 132
Issue number: 13
ISSN (Print): 0042-4900
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.442 SNIP 0.692 CiteScore 0.3
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.509 SNIP 0.794 CiteScore 0.39
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.469 SNIP 0.839 CiteScore 0.41
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.474 SNIP 0.821 CiteScore 0.5
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.491 SNIP 0.883 CiteScore 0.52
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.563 SNIP 0.9 CiteScore 0.62
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.574 SNIP 0.835
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.642 SNIP 0.996
Web of Science (2009): Indexed yes
Projects:

**Effect of bovine milk oligosaccharides on infant microbiota**

Division of Microbiology and Risk Assessment

National Food Institute
Period: 01/01/2010 → 31/12/2012
Number of participants: 2
Project ID: 12436 X2
Project participant:
Andersen, Jens Bo (Intern)
Project Manager, organisational:
Wilcks, Andrea (Intern)

Financing sources
Source: Sam.arb.aftaler, Private danske - Andre virksomheder
Name of research programme: Sam.arb.aftaler, Private danske - Andre virksomheder
Source: Forsk. Andre statslige danske i øvrigt
Name of research programme: Forsk. Andre statslige danske i øvrigt

**Nutritional Immunology**

This project runs under the FoodDTU umbrella, and one of its purposes is to create new collaborations between different DTU institutes with ongoing research related to food science. The participating institutes are DTU-Food, DTU-Biosys and DTU-Aqua. The purpose is to elucidate the impact of specific dietary components including e.g. fish oil on the intestinal microbiota and thereby on the development of the immune system in early life. The results are expected to create a basis for better nutritional advice for pregnant women.

National Food Institute
Period: 01/08/2007 → 31/12/2011
Number of participants: 13
Project participant:
Nutritional Immunology
National Food Institute
Department of Systems Biology
National Institute of Aquatic Resources
Period: 04/01/2007 → 31/12/2011
Number of participants: 10
Project participant:
Wilcks, Andrea (Intern)
Bergström, Anders (Intern)
Andersen, Jens Bo (Intern)
Metzdorff, Stine Broeng (Intern)
Fink, Lisbeth Nielsen (Intern)
Nielsen, Nina Skall (Intern)
Project Manager, organisational:
Licht, Tine Rask (Intern)

Financing sources
Source: [Ordinær drift UK 10]
Name of research programme: [Ordinær drift UK 10]
Amount: 3,250,000.00 Danish Kroner

Prebiotics for Prevention of Gastrointestinal Infections
National Food Institute
Department of Systems Biology
Period: 01/01/2007 → 01/09/2011
Number of participants: 7
Acronym: PreGI
Project participant:
Wilcks, Andrea (Intern)
Bergström, Anders (Intern)
Andersen, Jens Bo (Intern)
Poulsen, Morten (Intern)
Project Manager, organisational:
Licht, Tine Rask (Intern)
Influence of Food Environment on the infective potential of Listeria

National Food Institute
Division of Veterinary Diagnostics and Research

Period: 01/01/2004 → 31/12/2006
Number of participants: 4

Project participant:
Andersen, Jens Bo (Intern)
Christensen, Bjarke Bak (Intern)
Boye, Mette (Intern)

Project Manager, organisational:
Licht, Tine Rask (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 8,500,000.00 Danish Kroner

Influence of food environment on the infective potential of Listeria monocytogenes

The main hypothesis behind this project is that not only the number of pathogenic bacteria in a given food product, but also their physiological condition, is decisive for whether or not the contaminated food will cause disease after ingestion. The influence of a number of food-related environmental conditions on the infectivity of Listeria in vitro and in vivo is investigated. The observations of infectivity are coupled to the expression patterns of Listeria monocytogenes as monitored by use of micro arrays. The obtained results will be highly relevant for risk assessment of Listeria in various types of food.

National Food Institute
Period: 01/03/2003 → 31/12/2006
Number of participants: 4

Project participant:
Andersen, Jens Bo (Intern)
Boye, Mette (Intern)
Christensen, Bjarke Bak (Intern)

Project Manager, organisational:
Licht, Tine Rask (Intern)

Financing sources
Source: Forskningsrådene - Andre
Name of research programme: Forskningsrådene - Andre
Amount: 2,100,000.00 Danish Kroner

Activity and environmental properties of microbial pesticides for control of root pathogenic microfungi in sugar beet

In modern agriculture the application of soil bacteria for biological control of root pathogenic microfungi has attracted increasing attention. Basically this promising biotechnology involves coating of crop seeds with antagonistic bacteria, which subsequently develop into root-colonizing populations and protect the seedlings against fungal attack. In Danish agriculture, sugar beet is an important crop and strong efforts, on Danish as well as European scales, are presently being made to develop a biotechnology-based protection system of this crop against fungal diseases. In the present program, three research groups at KVL (Soil Microbiology), DTU (Molecular Microbial Ecology) and KU (Organic Chemistry) focus on the activity and effect of microbial pesticides in protection of sugar beet against fungal root diseases. The research program takes advantage of our experience in: 1. Rhizosphere microbiology, including associated aspects of root colonization, antibiotic production and bacterial as well as fungal stress responses. 2. Control of gene expression, bacterial motility, and intercellular communication in complex microbial communities and construction/application of reporter systems. 3. Structural analysis of bioactive metabolites and production of labeled compounds. The research program is thus based on the application of modern chemical and molecular biological techniques in combination with advanced microscopy to study biocontrol bacteria and their gene expression at the single cell level.
Impact of small molecule mediated cell-cell communication on the efficacy of inoculant bacteria in the rhizosphere

In recent years several reports have shown that small molecules - homoserine lactone derivatives - are excreted from bacteria and received by neighbouring cells in which they cause induction or repression of specific genes. The major goal of the project is to investigate the impact of these molecules in the plant root environment with respect to the physiological performance of root associated bacteria, the effect on virulence, secondary metabolite production, motility and exoenzyme production, and the activation of pathogenesis traits. A first important objective for the DTU group is to construct a specific monitoring system for homoserine lactones based on the green fluorescent protein in order to make detection of these signals compatible with the fluorescence microscopes. The project was terminated by a contractors' meeting in Copenhagen in December 1999.

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 1,860,000.00 Danish Kroner
Project
**Bacterial physiology in biofilms**

We have studied a microbial community capable of degrading toluene and derivative compounds through the use of quantitative in situ rRNA hybridization, gene expression using fluorescent reporters and gene transfer. The community is composed of 7 members of which 3 organisms are capable of degrading toluene to carbon dioxide and water. The community is grown as continuous surface cultures in flow chambers with benzyl alcohol as the only carbon source. Population structure (relative proportions of the 7 species as well as their positions in three dimensions) are determined using in situ rRNA hybridization and confocal microscopy. Physiological activity is determined through quantitative rRNA hybridizations in single cells, from which growth rates are estimated. Specific gene expression is monitored through the use of green fluorescent protein as a reporter (allows single cell detection). Transfer of conjugative plasmids is followed as zygotic induction of GFP in transconjugant cells in the community. All methods used have been developed for applications in single cells for inspection in the fluorescence or confocal microscope. The goal is to build up an understanding of the way bacteria organise their activities in complex communities, and eventually to understand the coordinative aspects of this type of 'social life'. This first phase of the project was terminated at the end of 1999, due to the run-out of the Biotech framework grant. A new phase of this project financed through the anchoring of the Biotech grant will be initiated in 2000.

**Department of Systems Biology**

Spanish National Research Council  
Period: 01/01/1996 → 31/12/1999  
Number of participants: 10  
Project participant:  
Sternberg, Claus (Intern)  
Andersen, Jens Bo (Intern)  
Christensen, Bjarke Bak (Intern)  
Givskov, Michael Christian (Intern)  
Johansen, Tove (Intern)  
Nielsen, Alex Toftgaard (Intern)  
Heydorn, Arne (Intern)  
de Lorenzo, Victor (Ekstern)  
Ramos, Juan Luis (Ekstern)  
Project Manager, organisational:  
Molin, Søren (Intern)

**Financing sources**

Source: Unknown  
Name of research programme: Ukendt  
Amount: 6,000,000.00 Danish Kroner

**Activities:**

**An epizootic of pseudorabies in Denmark: epizootiological investigations providing further evidence of long distance airborne transmission of virus**

Period: 1 Jan 1991 → ...

Jens Bo Andersen (Speaker)

National Food Institute  
Division of Microbiology and Risk Assessment

**Description**

Place: The 1st International Symposium on the Eradication of Pseudorabies (Aujeszky’s) virus

**Related external organisation**

Unknown external organisation  
Activity: Talks and presentations › Conference presentations