Job description Postdoc

Themes	Food Safety and Preservation; Functional Fermentation
Project title	Predictive Modelling; Optimal dairy fermentation
Sub-project	Sporulation, Germination Kinetics and functional dairy fermentation

FTE	**1.0**	
Tariff	**Postdoc <6 yrs experience**	Based on tariff scale TIFN
Location	**RU Groningen**	
Supervisors	**Prof. O. Kuipers** **Prof. J. Kok**	**o.p.kuipers@rug.nl** **jan.kok@rug.nl**
Start date	**a.s.a.p.**	
Period	**2012-2014**	3 years assignment

Introduction to the projects

(I) - Healthy and safe foods are in increasingly more demand by health-concerned consumers. Novel fermentation processes and improved technologies aim at, for instance, low fat and/or low salt milk fermentation products like cheese. Cheese starter cultures consist of simple or complex mixtures of *a.o. Lactococcus lactis* strains. Recently, it became clear that even pure cultures of single bacterial strains are not homogeneous in terms of gene-expression, metabolic activity and physiological state; they consist of phenotypically diverse sub-populations. Within the Theme Functional Fermentation a systems biology approach is employed to understand the mechanisms governing the behavior and biological activity of microbial consortia. Knowledge of parameters that affect heterogeneity at the single cell and culture levels should deliver tools to control and steer starter cultures with respect to robust performance and optimal functionality such as *e.g.* in flavor formation.

(II) - Food safety is of eminent importance for the protection of brands, especially if they lean on a "healthy" image. Insight in food safety control (*e.g.* minimal processing) can result in development of specific product groups with better characteristics that can occupy new niches. Since many pathogenic and spoilage bacteria can cause problems, generic models are necessary to carry out quantitative risk assessment. General approaches are required to develop these models, which need to be fed with specific detailed knowledge to improve accuracy. Also, specific practical detection methods are required to collect information on contaminants in food chains. Therefore, within the Theme Food Safety and Preservation 4 strongly linked projects are set up on: predictive modeling, biofilms, spores and detection. Results of all 4 projects will be combined to successfully implement the tools for food safety control. Information and knowledge obtained about spores, biofilms and detection methods need to be combined within food chain analyses to optimally control the presence, recontamination, outgrowth and inactivation of spoilers and pathogens.
All information collated in the projects above is being translated into models, which predict the behavior of the spores in defined environmental settings. This part is crucial for making the accumulated scientific knowledge available for industrial application.

Subproject - Improving *L. lactis* gene regulatory model
Deep RNA sequencing of transcriptomes of *L. lactis* will be performed during growth on a number of (industrial) media and at different growth stages and -conditions. Data needs to be analyzed in order to unravel operon structures, to identify low abundant, potentially noisy transcripts and to recognize sORF and sRNA (non-coding RNAs; antisense RNAs). Predictions of sORF and sRNA function, on the basis of e.g. target predictions, genomic localization and phylogentic leads will be made to help the biologists in the project. The knowledge of sRNA and sORF will be used to refine the existing regulatory model of *L. lactis*, which is of great importance to industrial application research.

Subproject - Sporulation and germination regulatory network modeling

Mechanisms for germination and outgrowth are very relevant to be included in generic tools to describe the behavior of spores in food chains, firstly to fine-tune these models and secondly to extract generalising concepts. A strong link exists with the spores chain model sub-project. However, also links with other sub-projects within this TIFN theme are foreseen, for example about damage repair, recovery or inactivation by disinfectants.

Research objectives of the specific sub-projects

- Identification of operon structures, low abundant transcripts, sORF and sRNA in *L. lactis*
- Refinement the *L. lactis* gene regulatory model.
- Functional genomics data (transcriptome analysis and deep RNA sequencing), physiological mechanisms (tested with flow cytometry, fluorescence microscopy, promoter-FP fusions) are analysed using bioinformatics analysis; regulation mechanisms are modelled in detail and are combined with macroscopic kinetics through physiological experiments.
- Construction of a generic model that extensively describes the regulatory network and heterogeneity in sporulation and germination of *Bacillus* species and provides clues for effective counteractions on spores. This model is used to develop strategies to prevent spores to germinate and harm the integrity of food products. Furthermore, this model functions as important input for Spores subproject 1.5 in which important findings obtained from the model organisms *B. subtilis* and *B. cereus* will be translated towards industrially relevant species and strains
- Generation of quantitative inputs for greatly improved accuracy of microbiological risk assessment.

Role Description

Development, planning and performing of specific research tasks within the sub-projects.

Main Tasks and responsibilities

The Post Doc is furthermore responsible for:

- Contributing to the full project plan
- Staying abreast of developments in his scientific discipline by keeping up with the scientific literature in his field and visiting scientific meetings
- Generating ideas within the scope of the defined subject
- Supervising of research assistants and students, where appropriate
- Delivering results in line with the project plan milestones and deliverables
- Converting data and results of the sub-project into overview reports
- Keeping traceable records of all results and analyses according to the lab journal procedure
- Writing high-quality clearly written papers about the results obtained and getting these published in high–impact scientific journals.
- Communicating results to the project leader for clearance before publication.
- Regular reporting of scientific results to TIFN management.
- Looking out for appropriate conferences and workshops to present TIFN results.

Reporting Lines

The Post Doc reports directly to the project leader or to a Principle Scientist stationed on the sub-project location.

Candidate Profile

- PhD in one of the Life Sciences with specialization in mathematical modeling, bioinformatics and/or molecular genetics
- experience with and profound knowledge of (molecular) modelling techniques
- experience with and profound knowledge of bioinformatics in the field of molecular microbiology
- experience with microbiological experimentation and food technology is a plus
- demonstrated experience as team player
- good communication skills both in writing and speaking (English)

Contact details

Please send applications to Marion Coeleman at coeleman@tifn.nl