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Bringing (Tracking) polymicrobial biofilms in Biogeosystem Technique methodology

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Organic biodegradation is a microbial controlled process that significantly influences soil fertility. The microorganisms involved are polymicrobial and organized in communities. Beyond this general statement, there are no reliable data available on the occurrence, structure and composition of polymicrobial biofilms in soil. The few published data are based on sequence analysis of unsystematically raised soil samples and provide no information to the involved biofilms, their structural organization or adherence to particles, which they are biodegrading.

The objective of the following proposal is tracking down polymicrobial communities and biofilms, which are responsible for biodegradation and which in turn, can be used as starter, indicator, and control tools for the targeted soil- and landscaping.

Over the last 30 years, the laboratory of polymicrobial infections and biofilms of the Charité hospital has developed multiple skills in identification, characterizing and monitoring of functional activity of polymicrobial biofilms in human body and gut specifically. One of the most striking results of these studies was the assessment, that bacteria within specific habitats of the mouth, tonsils, vagina or gut are not a faceless mixture of the once acquired participants, but structurally strictly ordered polymicrobial communities in which each participant takes its specific functional place.

Since the biofilms do not occur in all systems and at any time in relevant amounts, the mapping of biofilms is unavoidable and intentional. The assessment of polymicrobial communities on the FISH methods basis provides the biofilms mapping for the following objectives:

- identification of structured polymicrobial biofilms responsible for optimal composting, maximal soil fecundity, and reduction of environmental soil burden;
- modeling of soil fecundity based on polymicrobial starter and defined factors controlling their

activity such as water supply, aerobe/anaerobe conditioning, pH, humic acids additives and other;

- testing of substrate bound polymicrobial biofilms as starter for the shaping of different lands and agricultures;

- development of soil-microbiological theoretical and technical fundamentals for the long-term soil improvement and efficient environmentally safe organic wastes recycling into the synthesized soil aggregate system under minimal sufficient intra-soil moistening and appropriate intra-soil mineral and organic matter, and waste load (Biogeosystem Technique – BGT*).

The biochemical activity of the microorganisms till now is investigated solely in pure cultures. As soon as more than three different taxa are involved, the cultivation of microorganisms got problematic.

The main objective is the development of soil-microbiological theoretical and technical fundamentals for the long-term soil improvement and efficient environmentally safe organic wastes recycling in the synthesized soil aggregate system, for which microbial activity is decisive for polymicrobial infections and biofilms transformation into safe fertile substances.

Till now nothing is known about homology or interactions in arrangement and functioning of polymicrobial communities of colon and soil, and a new knowledge to fill this is needed.

Objectives of the study: to comparatively describe polymicrobial community dynamics in colon and soils; using BGT* methodology, to promote the function of polymicrobial biofilms in soil as a specific starter to insure the soil fertility, and to improve the human and soil health.