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1. Microbial colonies represent macroscopic bodies usually originated by coordinated growth from a single cell or a group of cells belonging to a single species (or clone). They are commonplace in basic and applied biological research, and serve, before all, for diagnostics based on the shape, growth on defined media, gene expression, antibiotic resistance, mutagenesis, genetic polymorphism (heritable or not), etc. And yet, their very existence, morphogenesis, and structure became a matter of interest only to a handful of investigators even if processes in the background are far from being understood in detail. Changes in colony shape were studied, caused by mutations either in mother colony, or upon long-term cultivation16-18

Bacteria typically dwell not in colonies but in multi-species consortia, like biofilms, stromatolites, bowel assemblages, etc., where isolation—the necessary precondition for early morphogenesis—cannot be guaranteed. Obviously, in such ecosystems they are unable to display structures typical for a colony, like symmetry, coloring and/or structural patterning, defined growth pattern, or maintaining its individuality when faced with neighbors. Their survival and reproduction under such conditions is thus independent on their capacity of colony-building, and natural selection may be indifferent toward such traits. From this viewpoint, bacterial colonies may be taken for (i) an extremely reduced biofilm, or (ii) a multicellular body with controlled morphogenesis that cannot come to realization when hampered by the presence of partners in the consortium. Our previous work encourages us to prefer the second interpretation. What is important, ontogenesis of multicellular body is uncoupled from natural selection: an ability to build colony is rarely a matter of survival—hence rich patterns and the play of variations.

The colony shape even in well-established bacterial clones exerts an array of variations typical for a “morphospace” of a given clone. Variations may be grounded in stochastic deviations from a “norm” (reversible in the next generation), or caused by mutations that appear with a given frequency—in that case they become irreversible. Here we pay attention to such variability and its constraints, and map the space of possibilities (i.e. the morphospace) available for both kinds of variability. The results suggest that bacterial colonies may become a valuable model for the morphogenesis of multicellular organisms.

2. Bacterial recombination is atype of genetic recombination in the bacteria characterized by the DNA transfer from one organism called donor to another organism as recipient. This process occur in three main ways:

Transformation, the uptake of exogenouns DNA from the surrounding environment.

Transduction, the virus mediated transfer of the DNA between bacteria.

Conjuction, the transfer of DNA from one bacterium to another via cell to cell contact.

 Final result is production of genetic recombinants individuals that carry not only the genes they inherited from their parent cells but also the genes introduced to their genomes by conjuctions transduction and transformation.