The global trend that promotes a healthy lifestyle and the growing awareness of the diet impact on human health, resulted in an increase of beverage innovation. However, answering to consumers expectations regarding variety of new products enriched in macronutrients, vitamins, as well as juices and fruit flavors became the reason of the contamination by, previously undescribed in this environment, bacteria of the genus *Asaia*. In the nature, these microorganisms occur as native microflora of fruit, flowers and insects of tropical climate. However, due to the use of additives, aromas and fruit juices, the bacteria colonized technological lines in the beverages industry. It has not been demonstrated whether the adaptability of these bacteria depend on environmental factors such as temperature, pH, availability of carbon sources, the concentrations of disinfectants and preservatives. What is more, only a few of the literature data describe the bacteria of the genus *Asaia* as microbiological contamination of flavored mineral waters. However, the publications do not focus on the physiological, biochemical and metabolic abilities of the microorganisms, enabling the growth in such specific environmental conditions. The impact of environmental factors on the transition from planktonic cells to the structure of aggregates or biofilms formed on abiotic materials, is still unexplained. **What is more, there is a lack of knowledge in the field of impact of antimicrobial and antiadhesive substances, such as plant extracts and fruit juices, on mature biofilm structure.**

The unique subjects related to the occurrence of bacteria of the genus *Asaia* in the flavored mineral waters, the fragmentary knowledge about their adaptation to the environment of beverages, as well as the unclear mechanisms of adhesion and aggregation, become the motivation to undertake the research. **The scientific objective is to explain the impact of environmental factors on growth, physiological, biochemical, metabolic characteristics and processes of adhesion and aggregation of *Asaia* spp. This strategy will contribute to the determination of the relationship between environmental parameters, the ability of bacterial cell adhesion and related process of biofilm formation. This multidimensional approach of the research will allow to determine the effect of selected substances to reduce the process of adhesion and biofilm formation by *Asaia* spp. Examples for this are both, commonly used disinfectants, as well as plant extracts and fruit juices, with documented health-promoting qualities. The use of the plant extracts is a part of a global trend limiting additives such as preservatives and dyes.**

The studies will be conducted with 17 strains of acetic acid bacteria isolated as part of preliminary studies from flavored mineral waters, isotonic drinks and fruits. Bacteria were identified using molecular methods, based on sequence analysis of the 16S rRNA gene, and the obtained nucleotide sequences were deposited in GenBank National Center for Biotechnology Information. In the research will be determined impact of environmental conditions (temperature, pH, carbon sources) on growth, physiological, biochemical and metabolic abilities, as well as cells hydrophobicity and the composition of the extracellular polymeric substances (EPS) produced by acetic acid bacteria. It will allow to determine the optimal conditions for the growth of the bacteria, as well as determine changes in their biochemical and metabolic profiles as a result of external factor action. It will help with defining parameters significantly affecting the analyzed characteristics.

The next part of the study will include an analysis of the adhesion and dynamics of biofilm formation under various environmental conditions on the packaging material commonly used in the food industry. Conducted research will provide knowledge of bacteria of the genus *Asaia* and their adaptability in an environment of flavored mineral waters. Results of the project will expand and complement the knowledge of physiological, biochemical and metabolic characteristics of *Asaia* spp. The project will provide information about the sensitivity of both plankton forms, coaggregates and biofilms to disinfectants and plant extracts. This will allow to develop research related to searching for antimicrobial and anti-adhesive compounds which can act against a broad spectrum of microorganisms. **In addition, the use of plant extracts, that are a rich source of health-promoting compounds, falls perfectly in line with a trend of functional drinks industry development.**

In the research, the viability of planktonic cells and bacteria concentrated in the biofilm structure will be assessed by bioluminescence and measurement of RNA levels. The impact of environmental factors on biochemical abilities of the populations will be defined using biochemical tests, while metabolites will be determined by high performance liquid chromatography (HPLC) and liquid chromatography-mass spectrometry (LC-MS). Analysis of the cells hydrophobicity will be carried out by MATH tests, while composition analysis of the extracellular substance, will be carried out using spectrophotometry in the range of UV light, infrared spectrophotometry combined with the Fourier transform (FT-IR) and chromatographic methods: HPLC and LC-MS. Important stage of research will be to determine the effect of disinfectants used in food industry and natural bioactive compounds contained in plant extracts and fruit juices on the population, physiological and metabolic characteristics and adhesion properties as well as coaggregation of *Asaia* spp.

The use of acetic acid bacteria isolated from different ecosystems and taxonomic affiliations will allow to determine the relationship between their physiological, biochemical, metabolic characteristics, environmental parameters, and their abilities to adhesion, coaggregation and biofilm formation. Determining the usefulness of plant extracts and fruit juices will not only have an important cognitive meaning but may also help provide microbiological stability to flavored mineral waters.