

PLANT BACTERIAL ENDOPHYTES AS IMPORTANT ANTIBIOTIC-RESISTANCE DISSEMINATION VECTOR

Many years of misuse of antibacterial agents, particularly antibiotics, reduced their effectiveness in livestock farming and breeding. Livestock manure is an excellent fertilizer for the cultivation of crops. Unfortunately, undigested antibiotic residues are being released with animal feces and urine. Manure is also the habitat of antibiotic-resistant bacteria, which can additionally carry antibiotic resistance genes. Potentially harmless bacteria that carry resistance genes can become reservoirs for pathogens for both humans and animals. The phenomenon of horizontal gene transfer causes bacteria that previously did not have resistance to acquire it. The soil amended with natural fertilizer is an excellent platform for the occurrence of the above-described events; drug-resistant microorganisms meet the naturally occurring microflora in the soil and are subject to the selection pressure of the antibiotics and heavy metals. Then, plants, often also eaten by humans as raw products, are planted on such soil. It has been proven that plants can uptake from the soil not only nutrients but various types of contaminants - in this case, the remains of antibiotics that got into the soil along with animal feces; and bacteria - including drug-resistant environmental bacteria or potential pathogens. The effectiveness of this uptake depends on many factors, such as the type of plant or the environmental conditions. Although bacterial epiphytes have more contact with soil or manure particles, they are removed by simply washing vegetables before eating. Endophytes, however, stays inside plants and may directly affect consumers' health. In the research, the risks associated with using natural fertilizers for consumers will be determined.

The proposed study aims to determine whether the antimicrobial resistance genes transfer from manure-amended soil to plant endophytes and differ between vegetable types, such as beetroot, spinach, and tomato.

The project addresses three principal objectives:

- O1. Determination of differences between microbiomes and resistomes of beetroot, spinach, and tomato, grown on soil with and without fertilization with cattle manure
- O2. Determination of susceptibility profiles and antibiotic resistance mechanisms in endophytes isolated from plants growing on fertilized and unfertilized soil
- O3. The analysis of isolated plant endophytes dissemination within host tissue after soil fertilization with cattle manure in a vegetable-dependent pattern

The project will focus on dairy cattle manure. Although fattening pigs are dominated in Poland, cattle receive the highest amounts of antibiotics, and cattle manure is the most frequently used natural fertilizer. It has been shown that high-yielding dairy cows are susceptible to udder-related diseases, which means they receive very high doses of antibiotics. This research will provide answers to the following questions: (i) what are the risks of antibiotic resistance acquisition from using cow manure for the field amendment for crops and whether it differs with plant type; (ii) how actual plant bacterial endophytes are disseminated within the plant and whether it changes after fertilization.