

## The SMALTIS'tory – episode #9

### Kitchen Secret & Bacterial Culture

Once upon a time there was Fanny Angelina Hesse who contributed to modern bacterial culture with an idea straight out of a pudding.

We are in the 19<sup>th</sup> century, with the advent of microbiology and its applications in health care. Work in this field is growing exponentially, but one obstacle is blocking the road to discovery: culture media. Indeed, culture media, which are liquid, do not allow the growth of all microorganisms nor the isolation of pure colonies. The race to resolve this major drawback was therefore launched, and numerous attempts were made. Let's go back over the highlights of this path strewn with obstacles.



A first great advance was made in Italy, at Padua, where an epidemic of red bread raged in 1819. The pharmacist Bartolomeo Bizio isolated those responsible on polenta. He managed to transfer these germs successively to various mealy substances, which marked the first attempt to cultivate bacteria on solid media.

A few years later, in Germany, the microbiologist Joseph Schroeter succeeded in separating bacteria of different colours by cultivating them on solid media from cooked potatoes, coagulated egg whites, meat and starch. Schroeter was able to continuously transfer the microorganisms to fresh media.

This work thus laid the foundation stone for pure cultures, but these methods were not universally applicable. It was necessary to continue to improve the techniques, which Rober Koch, a German doctor, did.

This father of medical microbiology sought to develop a solid, transparent, sterile medium. He then had the idea of using gelatin, as mycologists had been doing for more than 30 years. But this development was overshadowed by two major problems: the medium was digested by the enzymes of many bacteria, and did not remain solid at over 28°C. Koch and his associates were somewhat discouraged, but this all changed in 1881 when Walther Hesse joined their laboratory in Berlin.

This community health physician had made air quality his main concern, and it was to study microbial contamination that he joined Koch's team from 1881 to 1882. Behind the scenes, his wife, Fanny Angelina Hesse, assisted him as a scientific illustrator for his publications.

As summer arrived with its high temperatures, Mrs. Hesse saw her husband's experiences ruined by the heat that liquefied culture media. It was then that she came up with the idea that would revolutionize bacteriology. As a child, she had discovered agar-agar in the United States, thanks to neighbours who had immigrated from Indonesia. This polysaccharide from the red algae had been used for generations in the East Indies as a gelling and thickening agent in soups. Thanks to this little culinary secret, Fanny Hesse was able to make jellies and puddings without any heat-related problems.

She suggested to her husband that he use this ingredient for his mediums, which he did. The agar-agar proved to be heat stable, resistant to microbial enzymes, sterilizable and stored for a long time. Fanny and Walther had just created the first solid and transparent medium that maintains its consistency and allows pure cultures.

The discovery was passed on to Koch, enabling him to grow and isolate *Mycobacterium tuberculosis*. This was the subject of a publication in 1882, the first written reference to the use of agar. However, only one line mentions this medium, without detailing its many advantages. Fanny and Walther were never mentioned and received no rewards for this fundamental breakthrough which allowed Koch to isolate the etiological agents of 21 diseases.

Nevertheless, Fanny Hesse's contribution to bacteriology makes her an immortal woman.