

## Justus von Liebig's life-saving extract

Sunlight was sipping through the tall window, falling onto the book held by a man with an oval face. White hair surrounded his friendly face, focused on the reading. His eyes were quickly running through the lines fulfilled with letters and he was absorbed by the reading.

'Mr Liebig, Mr Muspratt has come', a housemaid had to repeat the sentence twice until the older man could tear himself away from the voluminous book and smiled gently. A guest came in, following the housemaid. Liebig smiled and came near the newcomer.

*'Muspratt! It's so kind of you that you came to see your old friend. How are you?'*, he showed his friend a chair next to the table. They both sat down to drink the served tea.

*'Have you seen how all the factories are growing? There is a new factory in the suburbs. Sometimes it is hard to bear the smoke after the coal burning. The black fog is literally everywhere!'*, Muspratt started to report everything he managed to observe last week. He knew very well that his friend was sometimes so involved in his research that it was hard for him to follow all the information. Liebig looked at his friend with disbelief, as if he wanted to confirm his friend's thoughts.

*'Oh, I haven't been on the streets for so long to feel on my own all these negative consequences of the smog!'*, Liebig sighed and took a sip of the tea.

*'Do not complain, my old friend! such a brilliant mind as yours cannot bother itself with the fumes from the power station. You've got enough work with the new issues of 'Annalen der Chemie' magazine'*, Muspratt looked at his friend with admiration. He admired Liebig's works since long ago and he always claimed that his friend's mind went far beyond the times they lived. Industrial revolution? What was it for the Liebig, he had a lot on his plate.

*I would like to emphasize that your discovery of the process for silvering of glass is brilliant! I have bought recently the modern mirror made using of your method for my daughter. It's amazing how beautiful she is in it!'*, the guest shook his head with disbelief and Liebig only smiled modestly.

*'Ah, I've almost forgotten! I have read recently that you found out why the crops are sometimes worse and sometimes better, and I am sure that this will be of use in farming.'*

*I have been dreaming all my life about supporting the development of farming. I was greatly surprised when I drew the conclusions from my research. Imagine that if there is one mineral less in the soil, the plant develops until it uses this substratum, and afterwards its development stops.'*, Liebig looked at his friend with the same disbelief with which he had looked at his students when he discovered this relationship.

*'I've heard that many people call your discovery The Law of the Minimum. Do I understand well that the mineral which is in the soil in the smallest amount will limit the development of the plant?'*, Muspratt assured himself, trying to understand his friend the best he could. Liebig nodded.

*'That's not all. I've managed to work out the formula of the nitrogen fertilizer. We are producing it for many weeks in the lab. All the students were really involved. Finally, we conducted the experiment on 150 seedlings. We were not only watering, but also fertilizing fifty of them. Another fifty were only watered. The last fifty were watered and fertilized with the animal faeces.'* Liebig took a sip of the tea, looking into his friend's eyes. *'Do you know that the ones fertilized with our fertilizer or natural one were growing faster and more luxuriant? I think that this is my main achievement! Think about it: now the farmers will be able to fertilize their fields even with the excrements of the domestic animals and the crops will be much bigger!'*, the sparks of enthusiasm were dancing in Liebig's eyes when he was talking about his experiments.

*'Liebig, I was always wondering what made you interested in the scientific career. It is clear that your mind is outstanding, but...Have you always wanted to become a scientist?'*, Muspratt looked at his friend with expectation. It seemed that he fi-

nally took courage to ask the question that bothered him for so long.

*‘Not always, but I can say that most of time. It began when I was 13. it was the year 1816. The spring was supposed to come, but the bitter frost remained since January and it didn’t seem that it was going to ease. The stock started to finish and people started starving. The farmers didn’t have the possibility to sow the fields, because the thick coat of snow was everywhere. I lived in Darmstadt then and I was frightened, looking at the crowds of starving, skinny people who were coming to the city. After the frosty winter, the spring finally came, but too late for the farmers for sowing the fields. The starvation was spreading more and more: firstly it touched the poor, then the middle class. I knew what the lack of food feels like. The next winter, although it was lighter, was much worse than the previous one because of the lack of stock. Famishing people were dying on the streets, the disaster hit everyone. Already then I was thinking intensively how to improve the farming, how make the crops bigger, so the people would never starve again.’* Liebig smiled warmly as if another sun rose in the room. Friends were drinking tea, talking about the Liebig’s works and Muspratt’s family for a long time.

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The ringing doorbell interrupted Liebig’s thinking. Who could have come without the announcement? It has been a long time since someone visited the scientist without sending the ticket with the information about the visit. After a while, instead of the housemaid, breathless Muspratt came to the room. His red face immediately revealed that he hadn’t taken the droshky, but he had run as fast as he could. The man couldn’t take a breath for a while, but when he finally looked at Liebig, a scientist was shocked by the despair in his friend’s eyes.

*‘Muspratt! What happened? Sit down, take a breath.’* he waved to the housemaid for the glass of water for the guest. When his friend drunk all the water, he looked at Liebig with grief.

*‘I have no idea what to do! I feel so useless, so awkward... I can’t do anything. All my attempts came to nothing! She is still losing weight, she is weaker and weaker. It is the ghost of her former*

*self!’*, Muspratt hung his head and buried his face in his hands. Liebig was looking at him confused and he didn’t know what was exactly happening. After a while, his friend continued. *‘My dearest Emma! She is dying, Liebig.’*, the pain in his eyes overwhelmed Liebig.

*‘Tell me what’s going on.’*, demanded the scientist. He knew that Muspratt would do everything for his daughter. He would leave no stone unturned for her happiness. If she was dying... Not even a single mean could help.

*‘Emma is ill. At the beginning, we thought it was just a food poisoning, but it continued for too long. Finally, she caught the fever, and we had to realize that she suffered from cholera. Since 1,5 weeks she is lying in her bed and she is losing weight. She looks like the ghost of a person. She is eating the meals, but she can’t keep any food. We don’t know what to do.’*

Liebig didn’t say a single word. He asked his housemaid for a coat, caught his friend’s arm and led him out to the Muspratt’s house.

*‘I will try to help, maybe I will manage to find a solution. I am not a doctor, but...’*, he smiled at his friend, trying to hearten him.

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*‘Darling, Mr Liebig has come to see what’s happening to you’*, Muspratt went down to his knees near the bed of his semiconscious daughter. It seemed that she wasn’t really sure what was happening around.

*‘Tell me exactly what is happening’*, Liebig asked Muspratt and his wife. They briefly told him the story of Emma’s illness. The strangest thing was that she was skinnier and skinnier, and she could not maintain any food. The scientist was silent for a moment, looking at the weak girl in the bed.

*‘This is part of the illness, I know – I think we need to enable her body to assimilate some food. I don’t know why, but it seems that her intestines don’t absorb the nutrients.’*, he rubbed his forehead in meditation. *‘I will try to prepare for her a special broth, maybe it will work.’*, he immediately left the room, leaving Emma’s parents in grief. He couldn’t waste even a single moment.

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'Professor...', a student timidly came to Liebig. 'You should go to bed. You haven't slept for 3 days'. Liebig looked at him feverishly.

'I don't have time, I have to try to save Emma.', Liebig came back to blending the gruel he had been creating for few last days. The student was looking at it with interest. Liebig started to explain everything to the student.

'Firstly, Greta cooked the chicken, then I asked her for grinding it that a person who cannot eat on her own will be able to eat it. When everything was ready, I immersed it in the solution of the hydrochloric acid for the whole night. Now we have to strain the chicken. I will check if Emma will start absorbing this type of food.', the student only nodded his head and started to strain another portion of the extract.

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'Emma, please try to take a few more sips, Muspratt's wife asked semiconscious girl who was lying in the bed. Her daughter was opening her mouths unwillingly, too weak to swallow the gruel. Liebig was observing the action with the anxiety. Finally, they managed to feed her with another portion of the extract.

'It's the third day... Do you think she is getting better?', Liebig asked uncertainly. Muspratt looked at him with the sadness in his eyes.

'At least, she is no longer vomiting.', he said quietly.

'We have to hope for the best, maybe it works. And if not ...' he waved his hand softly, not daring to mention the consequences if the girl would not be able to keep some nourishment. He stood up, hugged Muspratt and kissed his wife's hand. 'Hold on, please', he left quietly, closing the door.

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Three days later, Muspratt was again announced as a visitor to Liebig. Liebig was quick going to the door himself, and when he saw Muspratt, standing there in the door, smiling and joyful, he already knew the news. 'It worked, Liebig, it worked' Muspratt did not need to say more, Liebig quickly grasped his coat and off the two men were.

Being back at Emma's bed, the change could not have been more dramatic – even though the girl was still weak, she had her eyes open, and she was evidently recovering. Liebig smiled, being aware that his desperate attempt might not just have saved Emma, but opened another route to a scientific discovery.

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Few weeks later Emma recovered completely. She was strolling through the park with her father and Liebig while in the scientist's mind a new idea was developing. It was an idea of establishing the company that will produce the extract. While he was looking for the medicine for Emma, he was working not only on the poultry extract, but also beef one. During the experiment, he noticed that the strained meat that was lying on the glasses had a quite hard solid form. He was melting it again in the water.

The scientist was lost in thought for a moment. He thought that it was a great idea to establish his own company producing the stock cubes, especially during the times of the industrial revolution.

## References

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