Emile Roux - Pasteur, Rabies and Diphtheria

Louis Pasteur's chief assistant, Emile Roux - like his mentor - wanted to help people.

At an early age, after losing both his parents when he was around eight, Emile found solace in the great works of classical literature. He read ancient Greek philosophers and asked himself what he "could do to uplift humanity."

When he was a teenager, Emile lost two of his brothers who were fighting for France in a war against Germany. At seventeen, he also joined the French Army. For Emile, however, the war was happily over within months after his enlistment.

After the war, Roux studied in Auvergne where he received a degree in science from the lycée Clermont-Ferrand. Thanks to the recommendation of one of his professors, Emile met the man who would become his significant role model - Professor Émile Duclaux - who had been a lab assistant for Louis Pasteur.

When Duclaux was assisting Pasteur, around 1862, conditions at the École Normale (where Pasteur was then the sub-director of sciences) were primitive. The men were too busy to mind; they were keen to discover nature's secrets.

Pasteur and his assistant shared other aspects of their lives. Both were from rural areas of France, where they each had humble beginnings, and both were close to their fathers. After Duclaux lost his Dad, while working for Pasteur, the two men became even closer.

When Duclaux became a professor himself, one of his students was Emile Roux. He told his pupil about Pasteur and his theories opposing spontaneous generation.

As time passed, Duclaux received an appointment to lecture at the Sorbonne (in Paris). Needing a lab, he called on his friend, Pasteur, who was still working at 45 Rue d'Ulm (the address for École Normale).

Needing a lab assistant, Duclaux asked Emile Roux to work with him both at the Sorbonne and at Pasteur's lab.

By this series of circumstances, Pasteur met the man who would forever after be his right-hand assistant.

There is something significant to keep in mind regarding this story. Pasteur was not a medical doctor; he was a chemist. At the time Roux began working in Pasteur's lab, around 1878, Pasteur was critical of how medical doctors cared-for their patients if they employed unsterile conditions.

Many doctors neither washed their hands nor sterilized their medical instruments. Pasteur believed these doctors were harming their patients.

The first rule of medicine is "Do no harm." Medical doctors in France, however, did not appreciate being instructed (or criticized) by a chemist ... no matter how significant his insights or important his theories.

The climate in Paris, between the medical establishment and Pasteur, thus deteriorated and sometimes became downright hostile. It helped, somewhat, that Roux was himself a medical physician.

Initially, he could become Pasteur's hands when a medical situation developed; soon he became a true collaborator and thinker in his own right. When he disagreed with Pasteur, he told him so.

Roux, and Charles Chamberland (another Pasteur assistant) significantly helped Pasteur with his work on sheep cholera, anthrax and rabies. They prepared the vaccines for the sheep-and-anthrax experiment at Pouilly-le-Fort - now legendary in the annals of science - and Roux, on his own, inoculated the sheep.

When France wanted to honor Pasteur with the Legion of Honor, for his success with the anthrax experiments, he could not accept without insisting that Roux and Chamberland also receive the recognition they deserved. Pasteur took the blue ribbon; his assistants took the red.

Two years later, in 1883, Roux finished a doctoral thesis which he'd started nearly a decade before. His subject was rabies.

He had firsthand experience with Pasteur as the now-famous chemist worked-up his theories about rabies. It was Roux who had vaccinated Joseph Meister and Jean-Baptiste Jupille. And it would be Roux and Duclaux who

helped Pasteur launch the new Pasteur Institute where their life-saving work could continue in world-class fashion.

In 1888, Roux invited Alexandre Yersin - whose remarkable work studying bubonic plague, known as “The Black Death,” is borne-out by the name of the baterium (*Yersinia pestis*) - to the Pasteur Institute. Not only was Yersin a trained bacteriologist, he believed in Pasteur’s theories.

Yersin and Roux then collaborated on another key illness which was killing children: Diphtheria.

Using the key studies of German pathologists (Klebs and Loeffler), who had isolated the diphtheria bacillus and demonstrated that it caused the illness, Yersin and Roux found something very interesting. The bacillus itself does not enter a victim’s bloodstream. Instead, the bacillus produces a poison which is the disease.

How did they determine this rather surprising fact? When they filtered the culture of the diphtheria bacillus, thereby removing all the microbes believed to cause the illness, their experiments with the microbe-free cultures still caused animals to develop symptoms and die.

So ... the question became ... perhaps the agent causing the illness was not the bacillus (or spore) itself but rather the toxin it produced?

And ... if it was the toxin, which the diphtheria bacillus produced, was there an antitoxin which could fight it?

The answer, to both questions, was (and still is): Yes.

A German named Behring discovered the antitoxin. With Louis Martin, Roux repeated Behring’s experiments on horses. They found that when horses were inoculated, the horses’ white blood cells were producing a serum which seemed to resist the disease-causing toxin.

How could this be? Roux believed that the horses’ bodies were developing a mechanism to neutralize the poison generated by the diphtheria bacillus.

Would this idea also work on the children of Paris? Roux agreed to try small amounts of the serum on around three hundred Parisian children. Every single one was saved from death caused by diphtheria.

Roux always acknowledged that his breakthrough with diphtheria originated with Behring. But he carried the antitoxin theory further, leading to one of medicine’s paramount achievements. There were issues he had to confirm, however, including these:

- "He had to be sure that the true antitoxin was the serum produced by the white blood cells and not a chemical reaction of toxin-antitoxin canceling each other out."

- "He found that injecting animals with both toxin and antitoxins resulted in immunization all the same, and yet, that blood could still pass the toxin to a weaker animal."

- "Thus Roux demonstrated that the toxin is always present and never chemically changed, and that the body accustoms itself to the threat, continually producing the antitoxin serum."

What was Roux actually witnessing? The body’s immune system - which researchers were just beginning to understand - was at work.

Roux’s methods about the treatment of diphtheria didn’t just stay with the treatment of that dreaded disease. They could also be applied to other fatal illnesses like cholera and typhoid fever.

Honors upon honors came to Roux. Some people began to resent him as media-of-the-day pointed-out the prior work by German scientists. Roux always credited the work of those who had gone before, but it was his intuitive breakthroughs which led to such incredible results.

The Kaiser of Germany recognized Roux’s significant contribution when he awarded Emile the Medal of Honor in 1896.

Roux became the Director of the Pasteur Institute after Professor Duclaux (who had assumed the role after Pasteur’s death). Roux spent nearly fifty years of his life there.

Although he had chronic pulmonary disease throughout his adulthood, Roux did not allow his own illness to slow-down his work. Even when he was frail, or bedridden, he continued with his efforts.

With his unyielding spirit, fueling him forward, Roux lived to be 79 years old. Beyond industrious, his contemporaries said that he was generous and courageous. When he had only one hour left, in his life, it is said that he yelled-out these words from his bed:

Are we working in the laboratories? We have to work!

Credits:

Image of Dr. Emile Roux, online via the Pasteur Institute.

Image of Dr. Emile Duclaux, as he appeared circa 1890, online via the Pasteur Institute.

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