

Frey's syndrome (gustatory sweating): Lucja Frey (1889-1942)

Stephen G. Reich, MD

The University of Maryland School of Medicine
Baltimore, MD

Following injury to the facial nerve, regenerating fibers may “misdirect” and aberrantly innervate neighboring structures causing several types of synkinesias. The most common is a motor synkinesia in which fibers normally innervating the orbicular oculi also innervate the orbicular oris and vice versa, so that blinking causes the corner of the mouth to contract and smiling causes narrowing of the palpebral fissure. When the sensory and autonomic fibers of the facial nerve aberrantly regenerate it causes two conditions: gustatory tearing and gustatory sweating. The former causes lacrimation while eating, also known as crocodile tears; the latter, known as **Frey's syndrome**, is manifested by facial sweating while eating. Although Lucja Frey was not the first to describe gustatory sweating, she is credited with deciphering its mechanism.

Lucja Frey's career was as remarkably productive as it was tragically foreshortened as she was Holocaust victim. She was born on November 3, 1889 in Lvov, Poland. According to Grzybowski and Sak, referencing Moltrecht's biography of Frey, and other brief biographical sketches in the medical literature (see references), Frey's father, Szymon Symcha was a building contractor and her mother was Dina Weinreb. Her parents were liberal, assimilated Jews who lived outside the traditional Jewish neighborhood. She attended a “Christian/Catholic” elementary school and from ages 11 to 18, the Kammerling Goldblatt Jewish School for Girls. She attended the University of Lvov initially studying philosophy and then mathematics. She reportedly passed an examination in 1913 for secondary teachers in the mathematical-natural science department. She began medical school in Lvov in 1917 and then in Warsaw, graduating in 1923. After graduation, she worked under Kazimierz Orzechowski, a prominent Polish Neurologist. She had previously worked with Orzechowski in the neuropsychiatric ward of the State Hospital of Lvov, before he became head of the university neurologic clinic in Warsaw (he, like Frey, was also a victim of the Holocaust; according to Moltrecht and Michel, he died in the Warsaw Ghetto in 1942, on his 65th birthday). She may have served as Orzechowski's senior assistant from 1921-1928 but this, like many aspects of Frey's career and life have been difficult to confirm.

In 1929 Frey returned to Lvov, married Mark (Mordechaj) Gottesman, an attorney, and she worked at the Jewish Community Hospital. She had a daughter, Danuta, in 1930, at age 41. According to Moltrecht's biography, as cited by Grzybowski and Sak, she reportedly (per a single account by her sister-in-law) had a second child, Jacob, in 1939, which would have made her 50 at the time. There are conflicting accounts about a son; according to Moltrecht and Michel, she reportedly had Jakub in 1919. Frey's husband was arrested in 1939 after the takeover of Lvov by the Soviet Union, and likely murdered. On her Nazi work application (see below), under marital status, Frey entered: “Married, husband arrested by the NKVD [Soviet Secret Police] as a counter revolutionary.” According to Moltrecht and May, “... from May 1929, Frey-Gottesman was working as a deputy senior consultant at a neurologic outpatient clinic in Lwow.”

In 1941, after the German occupation of Lvov, Frey was forced to live in the in Lvov Ghetto where she worked in the Polyclinic. Between 1942 and June 1943, the 130,000 Jews living in the Lvov Ghetto were serially transported to concentration/death camps and many others succumbed to epidemic typhus which broke out in autumn 1942. The last date that Frey was known to be alive, April 1, 1942, comes from the “personal data information sheet” [Fragebogen], used by German authorities to issue work permits (Fig). Four months later, according to Moltrecht, nearly all of the patients and staff of the Polyclinic were murdered. It is not known if this included Frey or if instead she was transported to a death camp and murdered shortly thereafter.

The “syndrome of the auriculo-temporal nerve,” for which Lucja Frey lives on eponymously, was presented at a meeting of the Neurological Association of Warsaw in 1923, published in a Polish journal, and in the same year, also in the *Revue Neurologique*. She was 33 at the time, her first publication,

coinciding with graduation from medical school. She described a 25 year old man who was shot near the left mandible. Persistent swelling of the cheek with pus leaking from the ear led to the diagnosis of a fistula, which was treated surgically. He subsequently developed sweating over the left face while eating. Although Frey was not the first to describe this phenomenon, she is credited with deciphering its pathophysiology, having tested the patient with atropine, physostigmine, and other substances deducing that this resulted from an abnormal communication between parasympathetic and sympathetic fibers innervating the parotid gland.

The form is titled "UMLAGE (KAPITAL)" and "Fragebogen zur erstmaligen Meldung der Heilberufe". It contains the following handwritten entries:

- Gemeindefiskus des Bezirks: *Gelbe*
- Kreis: *Lwow*
- Art des Heilberufes: *Arzt*
- 1. Familienname (bei Frauen auch Geburtsname): *Frey, Yollanora*
- 2. Ständiger Wohnort und Wohnung: *Lwow ul. Belorosska 6 m 12*
- 4. Geburtsort: *Lwow*
- 6. Tag, Monat und Jahr der Geburt: *3.11.1899*
- 7. Kind ein ledig, verh., verwitwet, geschieden: *verwitwet*
- 8. Zahl und Geburtsjahr der Kinder (die Verstorbenen in Klammern): *1. Tochter von 1928*
- 10. Staatsangehörigkeit am 1.9.1938: *polnisch*

Fig. Courtesy of the United States Holocaust Memorial Museum. www.ushmm.org/research/research-in-collections/collections-highlights/who-was-this-woman

Personally, Frey was described as shy, industrious and meticulous. According to Herman, as cited and translated by Montrecht, "Lucja Frey was extraordinarily modest, quiet and as hard working as an ant. She was distinguished to no mean extent by innovative creativity. All her works were characterized by an exceptional accuracy, a seeking for a wide and versatile understanding of the problem under study as well as a deep knowledge of her subject. Although the scientific output of Lucja Frey is not large, each of her works carries a tremendous scientific weight and has left a long-lasting mark on the scientific world."

She published 43 articles between 1923-1928 on a wide variety of subjects including Charcot joints, multiple sclerosis, brain topography, hereditary diseases of the nervous system, effects of vegetable poisons on the spinal cord, ALS, clivus, frontal lobe and retrosplenial tumors. In 1925 she published a book: *First Steps in Learning the Topography of the Brain*.^{*} Gailloud recently brought to light an important and overlooked contribution of Lucja Frey to spinal cord vascular malformations, including what may be the first report of a double synchronous spinal vascular malformation (another Frey syndrome?). This comes from a case first reported in the Polish literature in 1926 and two years later in the French

literature. Her case report was of a 52 year old mason admitted for sudden paraplegia; for the prior nine years he experienced tingling, slowly ascending from his feet to the upper torso. The patient died of pneumonia just over one month after admission. Frey provided a very detailed account of the autopsy findings, which Gailloud refers to as "... one of the earliest accurate anatomopathological depictions of a spinal AVM."

Lucja Frey was one of the first academic neurologists in Poland and Europe. A review of her contributions reveals that she was a careful observer and an astute clinical investigator. Her remarkably productive career came to a premature and tragic ending as a victim of the Holocaust. Fortunately, she lives on eponymously by her accurate description of the pathophysiology of gustatory sweating—Lucja Frey's syndrome.

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