Etienne Stephane Tarnier (1828–1897) [1]

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Etienne Stephane Tarnier was a physician who worked with premature infants in France during the nineteenth century. He worked at the Maternité Port-Royal in Paris, France, a hospital for poor pregnant women. Tarnier developed and introduced prototypes of infant incubators to the Maternité in 1881. Tarnier's incubators became standard in neonatal care, especially for premature infants, enabling doctors to save many such infants that previously would have died.

Tarnier was born in Aiserey in eastern France on 29 April 1828. His family then moved to Arc-sur-Tille, France, where Tarnier grew up. He attended secondary school in Dijon, France. In 1845, Tarnier left to study medicine in Paris, but returned a year later to help his physician father treat patients when cholera broke out in the Dijon region. Tarnier then returned to Paris and completed his medical studies around 1850, and in 1856 began working at the Maternité Port Royal hospital. Tarnier intended to gain obstetric experience at the Maternité before entering general practice.

In 1857, Tarnier presented his dissertation on puerperal fever to the Académie de Médecine (Academy of Medicine) in Paris, France. Puerperal fever (also called childbed fever) is an infection of the female reproductive organs [4] following delivery or miscarriage [5]. Ignaz Semmelweis, a physician in Austria, identified the infectious nature of puerperal fever in the 1840s and developed a hand washing technique to prevent the spread of the disease. But by 1857, when Tarnier presented his research, one in six women still died from puerperal fever. Within his dissertation, Tarnier demonstrated that women who delivered at the Maternité were thirteen times more likely to die from puerperal fever than women who delivered in the district outside the city. Tarnier claimed in his dissertation that the increased number of infected women in city hospitals showed that puerperal fever was contagious. Tarnier's claim impressed the chief of the Maternité, Paul Dubois, who made Tarnier chief of clinic at the hospital. Tarnier published his dissertation in 1857.

Besides his research on puerperal fever, which occurs after delivery, Tarnier also focused on the care of premature infants and aspects of the birthing process. In 1865, Tarnier along with his students Adolphe Lenoir and Marc Sée published *Atlas Complémentaire de tous les Traités D'accouchements* (An Atlas to Complement Treatises on Deliveries). During his time at the Maternité in the 1870s, Tarnier implemented policies to keep premature infants in hygienic isolation and at a warm temperature. He housed premature infants in separate contained units.

While at the Maternité, Tarnier adopted the antisepsis techniques of Joseph Lister and reduced the maternal mortality rates at the hospital. During the twenty-two years following Tarnier's rise to chief surgeon, under his direction the hygiene at the hospital improved significantly. Lister, a physician in England during the eighteenth century, used carbolic acid to sterilize physician's hands and instruments and prevent infection. Tarnier used Lister's methods and also began isolating infected patients to prevent the spread of disease. As a result of using antisepsis, Tarnier dropped the maternal mortality from puerperal infection at the Maternité from ninety-three out of 1000 deliveries to twenty-three out of 1000 deliveries between 1870 and 1880, then to seven of 1000 in the succeeding decade.

Tarnier introduced a new type of forceps in 1877. Physicians used forceps to pull infants out of the birthing canal. Andre Levret, a physician in France during the 1700s, developed a forceps design that was widely used throughout Europe. The forceps developed by Tarnier allowed physicians to pull the fetus [6] from the center of the pelvic cavity and gave the fetal head additional mobility to follow the natural pelvic curve of the pregnant woman. The forceps required less force when used, which spared the maternal tissue and the fetal head any unnecessary damage.

Throughout the 1880s, Tarnier developed an infant warming device to improve the care of infants, later called an infant incubator. Tarnier did not invent the infant incubator. A physician in Russia, Johann Georg von Ruehl, developed an infant warming device in 1835. Ruehl called his device a warming tube, and it was first used at the Imperial Foundling Hospital in St. Petersburg, Russia. A modification of Ruehl's incubator was implemented during the mid-1850s, at Moscow Foundling Hospital in Moscow, Russia. In 1864, Carl Siegmund Franz Credé, working in Berlin, Germany, created a double-wall crib that circulated hot water between the two walls to keep the crib heated. During the late 1800s, Tarnier had little knowledge of earlier incubator developments before applying his prototypes to be used in regular premature infant care.

Tarnier implemented his first infant warming device in 1881 at the Maternité. Tarnier's device was a double-walled wooden box with a double-thick glass lid that Tarnier called a *couveuse*. The spaces between the walls were filled with sawdust for insulation. Tarnier used a gas burner in a separate lower compartment to heat a reservoir of water. Air circulated through the box at the bottom, was heated by the water reservoir, and pushed through vents to the infant above. Each infant had a thermometer near them inside the incubator, which enabled the nurses or caretakers to monitor the infant's temperature without having to open the box. Nurses periodically filled the reservoir to keep the incubator heated, two to three times a day.

Throughout the late 1880s, Tarnier continued to develop infant warming devices at the Maternité. Tarnier and his intern, Pierre-Victor-Adolph Auvard, created a two tiered sawdust-insulated warming device heated by removable clay water bottles. Tarnier and Auvard's warming device ensured a more constant temperature, preventing infants from overheating. The water bottles could also stay heated for longer periods of time, allowing the nurses on staff to focus on other tasks.

Along with his work on infant warming devices, Tarnier devised several tools to aid in difficult deliveries. Tarnier invented the basiotribe in 1883. A physician used a basiotribe to perforate and crush a fetus [6]'s skull in order to remove thefetus [6] from the birth canal. Tarnier also developed a method of inducing labor by using an intrauterine balloon. In 1882, he published his own work titled *Traité de L'art des Accouchements* (Treatise on the Art of Deliveries).

In Paris in 1891, Tarnier became president of the Académie Nationale de Médecine. In 1894, Tarnier published *De L'asepsie et de L'antisepsie en Obstétrique* (Asepsis and Antisepsis in Obstetrics), detailing his forty years of research on puerperal fever. He retired three years later. On the day of his retirement, he suffered a stroke and died on 22 November 1897 at the age of 69.

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