

## Battling the *Variola*: Charles Marie de La Condamine Chevalier de l'Ordre de Saint Lazare

Charles Savona-Ventura

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Variola or smallpox is an infectious disease caused by two *Variola virus* variants. The infection probably reached significance in human communities soon after 10,000 BCE when the cultivation of land required permanent settlements bringing mankind closer to a growing pool of animal pathogens. Smallpox is believed to have most likely evolved from a rodent virus between 68,000 and 16,000 years ago.<sup>1</sup> The disease was certainly extant in Egypt during the second millennium BCE. Skin rashes on Egyptian mummies, including the Pharaoh Ramses V (died 1145 BCE), suggest that ancient Egypt may have been the earliest smallpox endemic region; though it may have been imported from the eastern lands since the earliest medical literature describing smallpox-like disease comes from ancient China (1122 BCE) and India (as early as 1500 BCE).<sup>2</sup> Smallpox is an acute highly infectious specific fever characterized by a peripherally distributed deep-seated disfiguring eruption associated with very severe systemic manifestations. The *Variola virus major* infection was associated with a high mortality reaching 25-50% in adults and over 80% in children. The minor variety *Variola virus minor* was associated with a relatively mild course and a low mortality of 0.5-2.0%.<sup>3</sup> The infection is estimated to have killed about 400,000 Europeans annually during the closing years of the 18<sup>th</sup>

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<sup>1</sup> Li Y., Carroll D.S., Gardner S.N., Walsh M.C., Vitalis E.A., Damon I.K. *On the origin of smallpox: correlating variola phylogenies with historical smallpox records*. Proceedings of the National Academy of Science of USA, 2007, 104 (40):pp.15787–15792

<sup>2</sup> Fenner F., Henderson D.A., Arita I., Jezek Z., Ladnyi I.D.. In: F. Fenner (editor). *Smallpox and Its Eradication*. WHO, Geneva, 1988; D.R. Hopkins. *The Greatest Killer – Smallpox in History*. University of Chicago Press, Chicago, 1983

<sup>3</sup> Price F.W.. *A Textbook of the Practice of Medicine*. Oxford University Publications, London, 1950, pp.172-184

century. It did not spare any social class and smallpox was the cause of death of five reigning monarchs.<sup>4</sup>

The infection imparts a natural immunity in the survivors of the disease. This observation led to efforts at artificially imparting a natural immunity by purposefully infecting individuals through inoculation. The practice of inoculation against smallpox was described in China as early as the late 10<sup>th</sup> century and was widely practised during the Ming dynasty in the 16<sup>th</sup> century.<sup>5</sup> The procedure was introduced to Europe in 1717 by Lady Mary Wortley Montagu, wife to the ambassador to the Ottoman Empire. She herself undertook to get her son inoculated during her stay in the Turkey.<sup>6</sup> Inoculation was, however, associated with a 2-3% mortality and this led to resistance to its widespread adoption with different countries showed a variable response.<sup>7</sup> By 1769, 200,000 inoculations had been carried out in England. In contrast, only 15,000 inoculations had been carried out in France. In 1752, an outbreak of smallpox in Paris killed Anne Henriette de France, daughter of King Louis XV. This led to the eventual inoculation of Louis, Dauphin of France in 1756 – a move that helped to promote the procedure in France.<sup>8</sup> The French Royal family had had bad experiences with smallpox. The disease had been the cause of death of Louis, Dauphin of France, his wife Marie Adélaïde of Savoy and their son Louis in 1712.<sup>9</sup> It eventually also was to be the cause of death of King Louis XV of France in 1774.

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<sup>4</sup> Hays J.N.. *Epidemics and pandemics: their impacts on human history*. ABC-CLIO, California, 2005, pp.151-161

<sup>5</sup> Temple R. *The Genius of China: 3,000 Years of Science, Discovery, and Invention*. Simon and Schuster, New York, 1986, pp.135–137.

<sup>6</sup> *Letters of the Right Honourable Lady M--y W--y M--e: Written During her Travels in Europe, Asia and Africa*. M. Cooper, London, 1775, pp.107-110 [available at <http://digital.library.lse.ac.uk/objects/lse:raw722gux>]

<sup>7</sup> Price, *op. cit.*, p.183

<sup>8</sup> Fenner *et al*, *op. cit.*

<sup>9</sup> Some authors attribute these deaths to measles.

One active French exponent for inoculation during the period 1754-1773 was Charles Marie de la Condamine. Charles Marie was born in Paris on the 28 January 1701 to Charles de la Condamine who served as the Councillor Secretary to the King and Louise-Marguerite de Chourses de Beauregard. He received his education in the humanities and mathematics at the Lycée Louis-le-Grand, a public secondary school located in the heart of the Quartier Latin in Paris, widely regarded as one



of the most prestigious in France. In 1719, he enlisted in the army as lieutenant to the Clermont regiment, while on the 27 February 1719 he was admitted a member in the Ordre de Saint Lazare.<sup>10</sup> Soon after his enlistment, he was sent to fight in the War of the Quadruple Alliance (1718–1720) that arose as a result of the ambitions of King Philip V of Spain to retake territories in Italy and to claim the French throne then under the 5-year King Louis XV of France. Once the plot was discovered, France declared war on Spain to be joined on the 17 December 1718 by England and Austria. In April 1719, the Duc

d'Orléans ordered a French army under the Duke of Berwick to invade the western Basque districts of Spain. The French army met with very little resistance, but was forced back by heavy losses due to disease. Subsequent campaigns went against the Spanish forces, and displeased with his kingdom's military performance, Philip made peace with the allies with the Treaty of The Hague on the 17 February 1720.

<sup>10</sup> de Marsy A. *Liste des Chevaliers de l'Ordre de Saint-Lazare de Jérusalem et de Notre-Dame du Mont-Carmel de 1610 a 1736 publiée d'après les registres de l'Ordre*. J.B. Dumoulin, Paris, 1875, p.62

After returning from the war, de la Condamine involved himself with French academic circles and on the 12 December 1730 was admitted a member of the *Académie royale des Sciences* and appointed Assistant Chemist at the Academy. In May 1731, he travelled to Constantinople where he stayed for five months making further exploratory trips to Algiers, Alexandria, Palestine, and Cyprus. After his return to Paris, he submitted in November 1732 a paper to the Academy entitled *Mathematical and Physical Observations made during a Visit of the Levant in 1731 and 1732*.<sup>11</sup> This launched his career as an explorer, geographer, and mathematician. His next important academic opportunity came in 1735 when he was chosen by the Louis XV and the *Académie* to join one of two teams set up to make measurements to check whether the Earth was a perfect sphere or was flattened at the poles.<sup>12</sup> One team of scientists – Pierre Louis Maupertuis, Alexis Claude Clairaut, and Pierre Charles Le Monnier – was to travel to Lapland to measure the length of several degrees of latitude orthogonal to the Arctic Circle; while a second team – Louis Godin, Pierre Bouguer, and de la Condamine – were to proceed to South America to perform similar measurements around the equator. The latter group left France in May 1735. They landed in Colombia, travelled overland to Panama, and then sailed on to Ecuador. They arrived in Quito, Ecuador on the 4 June 1736. They finished measuring the length of an arc of one degree at the equator by 1739, thus completing their assigned mission. De la Condamine remained in South America for four more years, doing scientific work and mapping some of the Andes and much of the Amazon River. He returned to France arriving in Paris in 1745 bringing with him many notes, art objects, and natural history specimens that he donated to the naturalist Georges-Louis Leclerc, Comte de Buffon. De la Condamine published the results of his measurements and travels with a map of the Amazon in the *Mémoires de l'Académie des Sciences* in

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<sup>11</sup> de la Condamine C.M. *Mathematical and Physical Observations made during a Visit of the Levant in 1731 and 1732*. Paris, 1732.

<sup>12</sup> The prediction that the Earth should be shaped as an oblate spheroid was first made by Sir Isaac Newton in his *Philosophiæ Naturalis Principia Mathematica* published in 1687.

1745.<sup>13</sup> This was eventually translated to English.<sup>14</sup> This work included the first descriptions of the Casiquiare canal and the curare arrow poison. He also noted the correct use of quinine to fight malaria. He followed his geographical studies by a tour of Italy, publishing his observations in 1763.<sup>15</sup> On the 29 November 1760 he was elected a member of the *Académie Française*.

After the 1752 outbreak of smallpox in Paris, de la Condamine initiated a campaign to promote widespread inoculation. Charles Marie had himself contracted smallpox in his youth and survived the episode. The first appeal was made in a paper read before the *Académie royal des sciences* in 1754 and subsequently published in the *Mémoires*. This first paper entitled *Mémoire sur l'inoculation de la petite vérole* was dedicated to Her Royal Highness Madame La Margrave de Bareith.<sup>16</sup> The work was divided into three parts: the first dealing with the principal historical facts relating to inoculation; the second dealing with the objections that detractors of inoculation had put forward and discusses

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<sup>13</sup> de la Condamine [C.M.]. *Relation abrégée d'un voyage fait dans l'intérieur de l'Amérique Méridionale: Depuis la côte de la mer du Sud, jusqu'aux côtes du Brésil & de la Guiane, en descendant la rivière des Amazones; lûe à l'Assemblée publique de l'Académie des sciences, le 28. avril 1745*. Possot, Paris, 1745 [available at [https://archive.org/details/relationabregedun00laco\\_0](https://archive.org/details/relationabregedun00laco_0)]

<sup>14</sup> de la Condamine [C.M.]. *Abridged narrative of travels through the interior of South America from the shores of the Pacific Ocean to the coasts of Brazil and Guyana, descending the river of Amazons*. In: J. Pinkerton. *A general collection of the best and most interesting voyages and travels in all parts of the world*. Longman, London, 1813, vol. 14, pp.211-269 [<https://archive.org/details/abridgednarrativ00lacorich>]

<sup>15</sup> de la Condamine [C.M.]. *Journal of a tour to Italy : containing (among many other interesting and curious particulars) an account of the eruptions of Mount Vesuvius, of the curiosities discovered at Herculanium, of the leaning towers of Pisa and Bologna, detection of the impositions used in the pretended liquefying of the blood of St. Januarius, parallel between the horseraces at Rome and Newmarket, description of Port Specia and the neighbouring coast, of the famous emerald, or holy vessel, at Genoa, remarks on the mountains and ice vallies of Swisserland, &c. &c.* T. Lewis, London, 1763 [[https://archive.org/details/gri\\_33125010866842](https://archive.org/details/gri_33125010866842)]

<sup>16</sup> Princess Wilhelmine of Prussia (born 3 July 1709; died 14 October 1758) was the eldest daughter of Frederick William I of Prussia and Sophia Dorothea of Hanover. In 1731, she married Frederick, Margrave of Brandenburg-Bayreuth.

these in depth; and the third reviewing new answers and reflections on the consequences arising from the facts.<sup>17</sup>

The series of objection related to Physical and Moral Objections addressed by de la Condamine in his memoir included:

- “First Objection. Is it the small-pox that is communicated by inoculation? And may not the distemper communicated be more dangerous than that which is intended to be prevented?”
- “Second Objection. Does the inoculated small-pox save from the natural?”
- “Third Objection. The small parcel of venom, transmitted into the blood by the way of inoculation, may be the bud or feed of other distempers, which may be contaminated the same way, such as scurvy, King’s evil, &c.”
- “Fourth Objection. Inoculation is sometimes attended with troublesome consequences, as wounds, tumours, &s.”
- “Fifth Objection. It would be an usurpation of the rights of the Divinity to afflict with a disease one who has it not, or to endeavour to withdraw him from it, who, in the order of Providence, was naturally destined for having it.”
- “Sixth Objection. It is not allowable to infect with a cruel and dangerous disease one who perhaps may never have it.”
- “Seventh Objection. It is not allowable to do a less evil, to procure a greater good.”
- “Eighth Objection. Inoculation is a moral evil; as a proof of which, it cannot be denied but some inoculated persons have died; the success of the method is therefore not infallible; one cannot subject himself to it without exposing his life, which he is not allowed to dispose of: Therefore inoculation runs counter to the principles of morality.”
- “What can be the danger of inoculation? Is it in the operation or in its effect? New Objection. It is in both: A purulent matter, taken from a body

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<sup>17</sup> de la Condamine [C.M.]. *Mémoire sur l'inoculation de la petite vérole. Lu à l'Assemblée publique de l'Académie Royale des Sciences, le Mercredi 24 Avril 1754.* Paris, 1754; reprinted Nicholas van Daalen, La Haye, 1754. English translations: *The History of Inoculation.* New Haven, 1754; reprinted 1773; *A discourse on inoculation.* London, 1755

infected with a dangerous disease, is infected into the blood of a sound person. Must not this create horror? A like cause cannot fail of producing a pernicious effect.”

- “Last Objection. It is supposed that inoculation of itself is never mortal, but it may said, that he who might not have died perhaps of the natural small-pox till the age of fifty, after having children, after having served his country, would be left for society, if he died in his infancy of the inoculated small-pox.”

A second memoire was read in 1758 where an update was given on the situation relative to inoculation during the period 1754-1758 and further question were raised and answered including:<sup>18</sup>

- “First Question. If inoculation is permitted by the Divine Lord?”
- “Second Question. If with inoculation one conserves more lives than the effect of nature?”
- “Third Question. If it is certain that almost all men should have the pox sooner or later?”
- “Fourth Question. If it is beyond doubt that inoculation, followed or not by smallpox, gives protection for the rest of life?”

In addition to these publications, de la Condamine further entered into correspondence with a number of individuals including Abbe Trublet in Rome (1755)<sup>19</sup>, M. Roques, ecclesiastical counsellor of the Prince of Hesse-Hombourg and pastor of the French church of Zell (1756)<sup>20</sup>; and M. Daniel Bernouilli (1759/1760)<sup>21</sup>; and M. de le Dr Maty

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<sup>18</sup> de la Condamine [C.M.]. *Second Mémoire sur l'inoculation de la petite vérole*. Paris, 1759

<sup>19</sup> *Lettre de Mr. de La Condamine ... à M. l' Abbe Trublet a Rome, le 20 Aout 1755*. Paris, 1755

<sup>20</sup> *Lettre de Mr. de La Condamine à Mr. Roques conseiller ecclesiastique du prince de Hesse-Hombourg & pasteur de l'église Française de Zell. A livri prés Paris, le 30 Sept. 1756*. Paris, 1756

<sup>21</sup> *Premier lettre de M. de la Condamie á m. Daniel Bernouilli de Paris, 15 Decembre 1759*. *Mercure de Paris*, Mars 7 Avril 1760, Paris, 1759; *Seconde lettre de M. de la Condamie á m. Daniel Bernouilli . Paris le 3 Janvier 1760*. *Mercure de Paris*, Mars 7 Avril 1760. Daniel Bernoulli [born 8 February 1700; died 17 March 1782) was a Swiss

(1764).<sup>22</sup> De la Condamine's publications generated controversy in academic circles eliciting a critical response from opponents of inoculation. One such response was received from M. Gaullard Ordinary Physician to the King and his son, an arts teacher at the University of Paris.<sup>23</sup> De la Condamine responded to the criticisms raised by these individuals.<sup>24</sup> Further correspondence was received by de la Condamine from M. de Baux a doctor of Medicine from the Medical College of Marseille in July 1760.<sup>25</sup>

The campaign towards the promotion of inoculation received a setback after a smallpox epidemic outbreak in late 1762 was attributed to individuals who had been inoculated and who failed to quarantine themselves as prescribed. The *président à mortier* Joseph Omer Joly de Fleury responded by proposing that the Parliament of Paris would refer the matter of the safety of inoculation to the Faculties of Medicine and Theology at the Sorbonne. In June 1763 the Parliament ordered that no further inoculations were to take place in Paris until the Faculties had

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mathematician and physicist who was a proponent of inoculation contributing further to the discussion with his analysis of smallpox morbidity and mortality data to demonstrate the efficacy of vaccination. Vide: *Reflexions sur les avantages de l'inoculation de M. Daniel Bernoulli*. *Mercur de France*, June 1760.

<sup>22</sup> *Lettres de M. de La Condamine à M. le Dr Maty sur l'état présent de l'inoculation en France*. Paris, 1764

<sup>23</sup> *Lettre de M. Gaullard Médecin ordinaire du Roi pour servir d'éclaircissement à celle qu'il a inserée dans le Mercure du mois d'Avril 1759*. Paris, 1759; *Lettre de M. Gaullard Médecin ordinaire du Roi pour servir d'éclaircissement à celle qu'il a inserée dans le Mercure du mois de June 1759*. Paris, 1759; *Lettre Apologetique de M. Gaullard Fils; Maitre-és-Arts de l'Université de Paris, à M.M. MédicIn: pour servir de réponse à la lettre de M. de la C. inserée dans la Mercure du mois de Mars 1760*. Paris, 1760

<sup>24</sup> *Premiere lettre de M. de la Condamine à m \*\*\* Conseiller au Parlement de Dijon, servant de réponse à lettre de M. Gaullard, inserée dans le Mercure de France, du mois de Février 1759, sur la maladie du fils de M. Delatour*. *Mercur de France*, June 1759 Paris, 1759; *Réponse de M. La Condamine au défi de M. Gaullard, Mercur de France, September, 1759*. Paris, 1759; *Seconde lettre de M. de la Condamine à m \*\*\* Conseiller au Parlement de Dijon, pour servire de servant de Réponse à seconde lettre de M. Gaullard, à son dési*. Paris, 15 aout 1759. *Mercur de France*, Octobre, 1759 Paris, 1759

<sup>25</sup> *Extrait d'une lettre de m. de Baux, Docteur en Medicine, Aggrégé au Collège de Médecine de Marseille, à M. de La Condamine*. *Mercur de France*, Juillet 1760



rendered their judgement on the matter. Inoculations were allowed to continue outside the city, and those already inoculated were required to maintain quarantine for six weeks.<sup>26</sup> This pragmatic approach however was not effective since it resulted in a war of polemics between proponents and opponents of inoculation. Joly de Fleury ended up being the object of abuse in these exchanges especially by François-Marie Arouet *sive* Voltaire who was in favor of inoculation.

The opponents of inoculations were also apparently supported by the *Comité de Librairie* of the *Académie royal des sciences* who censured what was published in the *Mémoires*. In 1764, de la Condamine applied to present a third memoire relating to inoculation updating his previous presentations for the years 1758-1764. De la Comdamine's paper was scheduled for a public meeting but this was forestalled and read in a closed session in late November 1764. On reviewing his paper, the *Comité* ruled that it "will not be published either separately or in the *Mémoires* except after the report of Messrs Camus and Petit" – basically referring the paper to referees.<sup>27</sup> The *Comité* also rejected another paper on inoculation forwarded by de la Condamine in 1765.<sup>28</sup>

Charles Étienne Louis Camus and Antoine Petit failed to submit their report and three years later La Condamine protested to the *Comité*. This appeal was turned down on the basis that "this work by M. de la Condamine contains only excerpts from different published works on inoculation, it would seem more fitting to insert it in the public press than in the *Mémoires* of the Academy".<sup>29</sup>

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<sup>26</sup> Bazin H. *Vaccination: A History from Lady Montagu to Genetic Engineering*. Lohn Libby Eurotext, Montrouge, 2011. p.44

<sup>27</sup> *Registres des Délibérations du Comité de Libraire*: volume 1 manuscript 139 (November 1764) as reported in: J.E. McClellan III. *Specialist Control. The Publications Committee of the Académie Royale des Sciences (Paris), 1700-1793*. American Philosophical Society, 2003, pp.69-71

<sup>28</sup> *Registres des Délibérations du Comité de Libraire*: volume 1 manuscript 146 (July 1765) as reported in: J.E. McClellan, *ibid*.

<sup>29</sup> *Registres des Délibérations du Comité de Libraire*: volume 1 manuscript 169 (December 1767) as reported in: J.E. McClellan, *ibid*.

De la Condamine referred the issue to the *Académie* and pressed to get the report by the referees Camus and Petit read in the meeting held on the 9 January 1768. The Camus and Petit report stated that “We believe that this memoir by Mr. de La Condamine not only contains nothing that could hinder its publication, but on the contrary that it contains a large number of useful points which bring honor to the author and which make it worthy of a place in the collection of memoirs published by the Academy”.<sup>30</sup>

The Academy initially procrastinated and La Condamine protested again.<sup>31</sup> On 23 January 1768, the Academy decided “that with regard to the circumstances surrounding his *Mémoire* and the favorable report made by the reviewers, it would be published...” in the volume for 1765.<sup>32</sup> Charles Marie de la Condamine’s final publication compiling all the relevant previous publications on the subject was published in 1773.<sup>33</sup> At this point of life, now aged 62 years, the Scottish biographer and diarist James Boswell described de la Condamine as “very old, and so deaf the he could hear only by the assistance of a horn”. He died in Paris a year later on the 4 February 1774 following a hernia operation. A few months later on the 10 May 1774 Louis XV died of smallpox giving credence to the importance of introducing inoculation.

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<sup>30</sup> *Procés verbaux des séances*: 87 (1768), pp.2-3 as reported in: J.E. McClellan, *ibid.*

Antoine Petit was a proponent of inoculation and was to subsequently publish two publications in its favour. Petit A. *Premier rapport en faveur de l'inoculation lu dans l'Assemblée de la Faculté de Médecine de Paris en l'année 1764*. Dessain junior, Paris, 1766; Petit A. *Lettre de M. A. Petit à M. le Doyen de la Faculté de Médecine sur quelques faits relatifs à la pratique de l'inoculation*. Vallat-la-Chapelle, Amsterdam, 1767

<sup>31</sup> *Pochettes de Séance*: January 20, 1768 as reported in: J.E. McClellan, *op. cit.*

<sup>32</sup> *Procés verbaux des séances*: 87 (1768), fol.15v. as reported in: J.E. McClellan, *ibid.*; de la Condamine [C.M.]. *Suite de l'histoire de l'inoculation de la petite verole. . . Troisième mémoire* Paris, 1768, pp.505-532; de la Condamine [C.M.]. *Mémoires pour servir à l'histoire de l'inoculation de la petite vérole ...*, Paris, 1768

<sup>33</sup> de la Condamine [C.M.]. *Histoire de l'inoculation de la petite vérole ou recueil de Mémoires, lettres, extraits et autres écrits sur la Petite Vérole Artificielle* Amsterdam 1773

The French writer Louis Petit de Bachaumont [1690-1771] referred to Charles Marie de la Condamine as the “Don Quixote of inoculation” fighting a lost battle. However, de la Condamine was vindicated in his views with the introduction of a safer method of vaccination using cowpox by Edward Jenner in 1796 and the eventual worldwide eradication of the disease in 1979 – 225 years later – through the widespread vaccination proposed by de la Condamine. This determined scientist was honored by having a lunar crater named in his memory. The crater La Condamine is a small 67-kilometer diameter crater that is located on the southern edge of the Mare Frigoris, in the northern part of the Moon. It lies to the northeast of the mountain-rimmed Sinus Iridum formation in the northwest part of the Mare Imbrium.