

**NEW USES FOR SCIENTIFIC AND HEALTH HERITAGE: A SMALLPOX VACCINE SAMPLE**

**AS AN OBJECT OF INTERDISCIPLINARY STUDY**

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In 1900, Brazil had the hideous titles of a pestilent country and a foreigners' grave, due to the poor sanitary conditions that were a part of the daily life in Rio de Janeiro, the country's capital city. Among the main sanitary/salubrious issues faced by the Carioca people and that concerned the medical officials, there were diseases such as yellow fever, typhoid fever, malaria, smallpox, bubonic plague and tuberculosis. Yellow fever and smallpox, with endemic focal points all over the country, were especially aggressive to foreigners and migrants from other states that had come to the capital looking for work and investment opportunities (1).

To organize the fight against the diseases, which were a huge problem for the country's image and with great impact on its economic activities, President Rodrigues Alves appointed Oswaldo Cruz, MD, to lead the Diretoria Geral de Saúde Pública (Federal Health and Sanitation Department) and promote campaigns against bubonic plague, yellow fever and smallpox in Rio de Janeiro.

Structured in a military way, with brigades and sanitary guards, the division of the city in medical districts, the enforcement of laws and regulations to extinguish the main outbreaks and vectors of those diseases, the sanitary campaigns were successful, but faced a strong rejection and a lot of criticism from medical, political and popular classes in Rio de Janeiro. The local press

recorded the turmoil in articles, editorials, letters from readers and many humorous drawings, which criticized Oswaldo Cruz, his theories and sanitation policies, as extremely authoritarian.

At the same time, the President created the Instituto Soroterápico Federal (Federal Serotherapy Institute) to produce and distribute serums and vaccines to the hygienic services in Rio and other Brazilian states. Oswaldo Cruz was appointed director of the new institution, working simultaneously at both agencies. The Serotherapy Institute, projected to be a simple vaccine plant, was then named after the director as Instituto Oswaldo Cruz in 1908, after its reorganization as a center for experimental medicine, research and professional training for the health services, redefining its attributions and relevance in the scientific research and public health scenario in Brazil.

After Oswaldo Cruz's premature death in 1917, his personal objects and laboratory equipment -including precision instruments, books, photographs and phonographic devices- were brought together in a collection that formed Oswaldo Cruz Museum, whose main focus was preserve and remember the scientist's life and achievements. Over time, the collection has grown with the addition of scientific and medical devices, as well as laboratory and hospital furniture from the divisions, departments and services of Oswaldo Cruz Institute, as well as from other public health institutions.

Currently under the responsibility of Museu da Vida (Life Museum), a department of Casa de Oswaldo Cruz (Oswaldo Cruz House), the museum collection includes around 3,700 items. Tropical diseases, with emphasis on yellow fever, malaria and Chagas disease, are the core of the organizing themes of the collections. Tuberculosis, bubonic plague and smallpox are also represented by a few, but meaningful objects. Medical zoology and pathological anatomy are among the scientific areas of knowledge that encompass the collections, and are represented by microscopes, magnifying glasses, necropsy instruments, as well as several entomological and histological laminae (8).

Among the current actions on the museum collection, we have brought for this meeting the development of interdisciplinary studies that broaden the approaches on its objects, alongside with those related to historical research and heritage preservation. This action has begun with the formation of partnerships aiming to undertake integrated studies with researchers from virology, histopathology and medical entomology areas from Fiocruz, and from other universities and research institutes. Histological and entomological

laminae, and serums and vaccine specimens were chosen not only for their importance as cultural and historical objects, but also because they possessed scientific information rarely explored before.

The participation of Museu da Vida in the research project “The Origin and Evolution of the Smallpox Vaccine through the Molecular and Biological Characterization of Historical Vaccines”(3), coordinated by researchers from Universidade Federal do Rio de Janeiro, Robert Koch Institute and University of Maryland School of Medicine, represents an excellent opportunity to establish new work protocols, as it allows the approach to some aspects, such as phylogenetic analysis and the genome sequence of old serums and vaccines.(4)

This project studies the origin and the evolution of the smallpox vaccine through the molecular and biological characterization of the vaccinia virus from old samples, which belong to health museums and private collections, and whose origin and historical information is easy to be verified.

“Keeping in mind that little is known about the origin and evolution of the smallpox vaccine, we intend to completely characterize the virus present in several historical (old) samples of smallpox vaccine, using New Generation Sequencing technologies (NGS) and, when possible, biological and virologic techniques. With special emphasis on the samples from Museu da Vida, at Fiocruz, RJ, we propose to sequence the genomes of the smallpox vaccine sample(s) of the collection, to better understand the evolutive history and the origins of the Brazilian vaccine. The genome of the vaccine produced by Fiocruz, at the end of the smallpox eradication campaign, is well known and we can state it is a vaccinia virus (IOC strain) similar to the horsepox virus. However, we don't have biological and genetic data on the older vaccines produced by Fiocruz in the beginning of the 19<sup>th</sup> century. This knowledge is extremely valuable as it helps us have an image of the vaccine samples imported by Brazil at that time and later distributed by Fiocruz”. (3,2)

Several historical researches about smallpox, vaccination and the eradication of this disease were done in Brazil. Among them, we refer to the ones done by Nicolau Sevcenko (7) and José Murilo de Carvalho (2) on the Brazilian social, cultural and political history, with emphasis on significant moments, such as the Vaccine Revolt, in Rio de Janeiro, 1904 – a violent popular reaction to the mandatory vaccination imposed by Oswaldo Cruz, when he was in charge of the public health services. Tania Fernandes (5) and Gilberto Hochman (6) have researched on the institutionalization of smallpox vaccine

production, considering its introduction in Brazil in 1804 as a humanized vaccine, the public policies and the vaccination campaigns that ended up in the eradication of the disease in the country, in 1971.

However, an aspect, which is usually neglected in some studies and tangentially mentioned in others, refers to the vaccine and its origins, the origin of the first strains brought to Brazil during the 19<sup>th</sup> century, the distribution and fabrication methods at the vaccine institutes in the Brazilian states, the protocols and tests aiming its control and biosafety, its improvement stages, and finally, its molecular and biological characterization through recent contributions from other areas of knowledge, as proposed by the research project.

It is up to us to research the history of the capillary tubes of the smallpox vaccine, kept in our collection. Until now, we have located references to the vaccine pulp production and distribution between 1894 and 1920, by Instituto Vacínico Municipal, located in the federal capital. The pulp was sent to the regional vaccine institutes to be used in vaccine production, and to Instituto Oswaldo Cruz branch in Belo Horizonte, state of Minas Gerais, where our vaccine samples were produced between 1910 and 1920. The archival and bibliographical sources allow us to know the network of private and public agents involved in the immunobiological production and distribution, the plans to create or strengthen vaccine and serum production centers in other areas of the country, as well as the suppliers of inputs, laboratory equipment and animals used to produce the vaccines. Administrative, research and production reports, mail, photographs, blue prints of the production facilities are the documentary corpus related to the subject. As a complement to the material, there are several hours of interviews with scientists and technicians directly involved in preparing, improving and using the vaccine in the 1960's and 1970's, the result of an oral history project done by Casa de Oswaldo Cruz historians.

Interdisciplinary researches, such as the one we have briefly reported here, reinforce the importance of preserving old samples of biological products, due to their informative potential. As cultural and scientific archives, these objects contribute to a broader vision of Science and Medical History, incorporating new knowledge and expanding the visibility and meaning of museums' collections.

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