Cover story
Swabbing for science

Growing up, asthma was not common among my friends. As an adult, with a career photographing global health issues, I've noticed increasing numbers of children being diagnosed with asthma throughout the USA, an observation that is backed up by national statistics. Washington DC has one of the highest rates of childhood asthma in the USA. After learning about the high prevalence of respiratory diseases in the capital region, I visited one of the foremost paediatric hospitals in the country, DC's Children's National Health System. Respiratory diseases—asthma, pneumonia, and bronchitis—are the top reason for admission of young patients to this facility.

A team of scientists and doctors from Children's are researching causes of respiratory diseases in young people. The project is led by Dr Geovanny Perez and Dr Gustavo Nino. Both are paediatric pulmonologists and part of the Pulmonary and Sleep Medicine group at Children's. Funding comes from the National Heart, Lung and Blood Institute of The National Institutes of Health.

The team swabs the noses of newborn babies and uses the samples to build DNA methylation profiles. The aim is to explore epigenomic signatures in early life and to assess sex differences in respiratory diseases.

The ultimate goal of the team is to "design and evaluate a predictive model of respiratory infection risk in the first year of life" to better help both parents and medical caregivers in treating these young patients.

Karen Kasmauski

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Karen Kasmauski is a filmmaker, photographer, and educator. During her two decades as a National Geographic photographer, Karen produced 25 major stories on topics including migration, viruses, ageing, and genetics. Karen's travels have taken her from the rainforests of Malaysia, to the megacities of India, and to the North Slope of Alaska. When not travelling, she is based in Washington, DC, USA.

For the **CDC statistics on asthma in the USA** see https://www.cdc.gov/vitalsigns/asthma/index.html

Pulmonary tuberculosis in Pope Clement XI

In Europe, the incidence of tuberculosis increased progressively after the Middle Ages, peaking between the eighteenth and nineteenth century. The spread of tuberculosis in historical populations is generally studied by analysing the frequency of tuberculosis-related skeletal lesions in human remains. These studies are usually based on the remains of people buried in cemeteries and mass graves, so the epidemiology of tuberculosis among the upper-classes, who were generally buried in private chapels and churches, has rarely been investigated. Autopsy reports about popes could be a useful historical source in this regard. The practice of autopsy of the pope's corpse dates from the sixteenth century, and was usually done to confirm that the pope was not murdered.

Clement XI (1649–1721), born Giovanni Francesco Albani, was one of the youngest popes in the history of the Church; he was aged 51 years when the cardinals elected him in 1700. His long reign (21 years) was full of political complications. A few months after his accession to the pontificate, the War of the Spanish Succession (1701–14) broke out. His apostolic constitution *Unigenitus Dei Filius* condemned the Jansenism, a Catholic theological movement, as heretical. Furthermore, he blocked the French tendencies to Gallicanism—ie, the theory that the power of French monarchs is independent of the power of popes, and that the Catholic Church of France should be under the joint control of the pope and the king.

He was a patron of the arts and of science, with a deep interest in archaeology. He ordered a major restoration of the Pantheon in 1705 and was a benefactor of the Vatican Library.

Initially, his young age at election allowed a good state of health. However, according to the Roman Catholic historian Ludwig Von Pastor (1854–1928), from 1710, Clement started to suffer from frequent coughing fits, which were so violent they forced him to sleep in a chair during the night. Von Pastor also stated that his sputum contained streaks of blood. The Pope believed that the heavy air of Rome aggravated his condition, thus in spring and autumn he went out to the Papal Palace of Castel Gandolfo, the summer residence of popes, located 25 km southeast of Rome. After a few weeks' stay there, he always looked better.

The Holy Father also suffered from huge groin hernias that caused leg pains and walking difficulties; he often

Further reading

Von Pastor L. History of the popes. Volume XXXIII. London: Kegan Paul, Trench, Trübner & Company; 1941

Gualino L. Storia medica dei romani pontefici. Torino: Minerva Medica; 1934

Relazione della morte del Sommo Pontefice Clemente Undecimo seguita nell'Alma Città di Roma lì 19 del mese di marzo 1721. Venezia: Angelo Geremia in Campo San Luca; 1721

Cosmacini G. La Medicina dei Papi. Roma-Bari: Laterza, 2018

Wikimedia/Unknown

wore iron trusses to support the hernias. His personal doctor was Giovanni Maria Lancisi (1654–1720), one of the most renowned physicians in Rome in that period, who personally took care of the health of the Pope, especially during his coughing fits. After the death of Lancisi, by the beginning of the winter of 1720, a striking deterioration occurred in the Pope's condition. The coughing attacks became more frequent and his new personal physician, Michel Angelo Paoli, often found him feverish. Furthermore, the Pope continued to spend night times consulting archives in the icy rooms of the Apostolic Palace, aggravating his symptoms. The cough became more productive and convulsive with blood-stained mucus and haemoptysis, as testified by the coeval report on his death (Relazione della morte del Sommo Pontefice Clemente Undecimo seguita nell'Alma Città di Roma lì 19 del mese di marzo 1721). On March 19, 1721, at about 1300 h, Clement XI quietly passed away. The next day, the autopsy showed lung damage; particularly stagnant blood and necrotic tissue were found in the left lung.

Prolonged cough, producing blood-stained sputum, fever, and necroscopy findings could suggest that Clement XI was affected by pulmonary tuberculosis. This theory was also supported by Italian historian of medicine, Giorgio Cosmacini.

Before the works by the Italian scholar Giovan Battista Morgani (1682–1771), who contributed to the development of anatomical pathology with his masterpiece *De sedibus et causis morborum per anatomen indagatis* (1761), physicians did not correlate clinical history with autopsy findings. In that period, autopsies were mainly done for anatomical research or for excluding non-natural causes of death (eg, poisoning), whereas natural causes of death were not commonly investigated. For this reason, simultaneous presence of an accurate description of symptoms or signs and necroscopy findings in Clement XI could be an unexpected opportunity to diagnose a case of pulmonary tuberculosis in the first part of eighteenth century, showing that cases of this disease could be found in upper-class members, such as popes.

Michele Augusto Riva, Michael Belingheri, Giancarlo Cesana
School of Medicine and Surgery, University of Milano Bicocca, Monza, Italy
michele.riva@unimib.it