

Protective face masks through centuries, from XVII century plague doctors to current health care professionals managing the COVID-19 pandemic

Andrea Alberto Conti, MD, PhD, MPH

Dipartimento di Medicina Sperimentale e Clinica, Università degli Studi di Firenze, Florence, Italy.

Key words: Face Masks; History of Medicine; Plague; Coronavirus; COVID-19; Epidemics.

The adoption of items similar to face masks by human beings dates back to the remote past.

From the beginning of the XVII century onwards in Europe physicians in charge of curing patients with plague wore a typical costume. The face mask included eye sockets of glass and leather headdresses with long, pointed beaks. These beaks were filled with scented spices and perfumes to filter out the plague and to mask “bad air”. The plague doctor outfit appears, in the history of medicine, as one of the first practical examples of the theoretical concept of full individual protection equipment, since it also comprised shoes, gloves, a robe, a shawl and a top hat in addition to the face mask (1,2).

In the XVIII and XIX centuries a number of advances regarding personal protection devices in health care were achieved, and in 1878 the US physician A.J. Jessup, author of published scientific observations on contagious diseases and their prevention, wrote that cotton gauze stoppers prevented bacteria from entering test tubes. Unfortunately, his proposal to extrapolate this for human protection did not have much success, but the way was paved for future progress (3). In 1897 the Polish surgeon Johannes von Mikulicz-Radecki, a pioneer of antiseptic measures and a creator of innovative surgical techniques, was among the first doctors to use gloves during surgical interventions and he also created a full surgical face mask to prevent infections. In the same year the German bacteriolo-

gist and hygienist Carl Fluegge showed that bacteria-laden droplets coming from the mouth and the nose could easily spread during everyday conversations (4). The term “Fluegge’s droplets” derives precisely from this scientist, who underlined the importance of the prophylaxis of infections by means of preventive measures, in particular face masks, inside and outside the operating rooms (1).

Some years afterwards, the physician Wu Lien-teh further developed, in the course of the Manchurian plague (1910–11), surgical masks that he had already observed in the Western world, turning them into more solid and effective protections with layers of gauze and cotton to filter the air. This typology of face mask was manufactured on a large scale (2,3). In the course of the 1918 influenza pandemic (Spanish flu), health care professionals began to use face masks in a routine way to protect themselves and their patients, and a year later George H. Weaver stated that the incidence of diphtheria contracted by the caregivers of sick persons could be significantly decreased if they wore face masks of double thickness gauze; he also prescribed accurate sterilization of masks after each single application (5). On the wake of Spanish flu, further progress in the elaboration of face masks occurred and, in 1937, J.S. Davis clearly recommended that face masks worn in surgical rooms should be applied not only on the mouth but also on the noses of physicians and nurses (3).

From World War II onwards, the large affirmation and spread of antibiotics indirectly and involuntarily contributed to a decrease in clinical-epidemiological interest and to a reduction of scientific research in the field of face masks. Fortunately, from the sixties onwards, the explosion of health care technology has led to a continuous refinement in the study of individual protection devices (6).

One of the consequences of the 2020 ongoing COVID-19 pandemic, a global emergency determined by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is the fact that face masks have become essential again both inside and outside health care environments, and their use is currently recommended by health authorities both in health care contexts and in public places as a means for containing and reducing the spread of this infection in the community (2).

Even if more than a century has passed from Flügge's historical definition of bacteria-laden droplets, the role of certain medical-preventive achievements of the past, including the paradigmatic model of protective face masks, continues to remain pivotal in this third millennium.

Acknowledgements

The Author would like to thank Professor Luisa Camaiora, B.A., M.Phil., for her correction of the English.

Conflict of Interest

The author declares that he has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

References

1. Conti AA. Historical evolution of the concept of health in Western medicine. *Acta Biomed* 2018; 89: 352–354.
2. Conti AA. Historical and methodological highlights of quarantine measures: from ancient plague epidemics to current Coronavirus disease (COVID-19) pandemic. *Acta Biomed* 2020; 91: 226–9.
3. Spooner JL. History of surgical face masks. *AORN Journal* 1967; 5: 76–80.
4. Flügge C. Ueber Luftinfektion. *Zeitschrift f. Hygiene* 1897; 25: 179–224.
5. Weaver GH. Droplet infection and its prevention by the face mask. *J Infect Dis* 1919; 24: 218–30.
6. Hirshfield JW, Laube PJ. Surgical masks, an experimental study. *Surgery* 1941; 9: 720–30.

Received: 15 July 2020

Accepted: 15 July 2020

Correspondence:

Andrea Alberto Conti, MD, PhD, MPH,
Dipartimento di Medicina Sperimentale e Clinica,
Università degli Studi di Firenze,
Largo Brambilla 3, I-50134,
Florence, Italy.

Tel: +39/055/2758419;

Fax: +39/055/2758411;

E-mail: andrea.conti@unifi.it