

## OBITUARY



# Ted Kolobow

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Ted Kolobow: many of our young readers do not know this man who passed away on March 24th, aged 87. They should, because extracorporeal oxygenation, CO<sub>2</sub> removal, ventilator-induced lung injury prevention and other aspects of intensive care exist today because of Ted Kolobow. Born in Kadla, Estonia, during World War II, he moved with his family, under pressure from the Russian army, to a refugee camp in Augsburg, Germany, where he stayed from 1940 to 1949. In 1949, at age 19, he moved to the United States with 20 dollars in his pocket [1]. It is difficult today to imagine what it must have meant to grow up in a displaced persons camp in Germany during the war. It is likely, however, that the extremely hard conditions that Kolobow had to overcome contributed to making him solid as a rock and strengthened his ethical stature. For example, when Kolobow sold his spiral coiled membrane lung patent to the US government for 1 dollar, his explanation was straightforward: “I had received a lot from this country; it is time to pay back.”

As a medical student at Case Western Reserve University, he worked to find the best plastic membrane suitable for exchanging respiratory gases [2]. This led to a research position in the Laboratory of Technical Development, National Heart Institute, where he worked from 1962 to 2009. At the National Institutes of Health (NIH), he could follow his inspirations, developing new devices and testing innovative treatments, such as heart-lung support, dialysis and blood cell separation techniques, producing more than 20 patents. Dr. Kolobow’s most important achievement was certainly the design of a successful membrane lung (known as the Kolobow lung), which was responsible for the development

of prolonged extracorporeal circulation for 25 years. He even built a special machine (~12 m long) to cast pin hole-free silicon rubber films of the correct thickness and width to become the blood-air interface of his membrane lungs [3]. According to legend, he dissolved some women’s white Lycra underwear in an appropriate solvent in search of the right, sufficiently strong and elastic material to build spring wire-reinforced catheters to maximize extracorporeal blood flow [4]. Kolobow usually anticipated current thinking by 1 or 2 decades. In his comments on the NIH-sponsored ECMO (extracorporeal membrane oxygenation) trial in the 1970s [5], he underlined the importance of ECMO to avoid ventilator-induced lung injury (not yet defined) instead of curing gas exchange, a concept largely accepted only 2 decades later [6, 7] (Fig. 1).

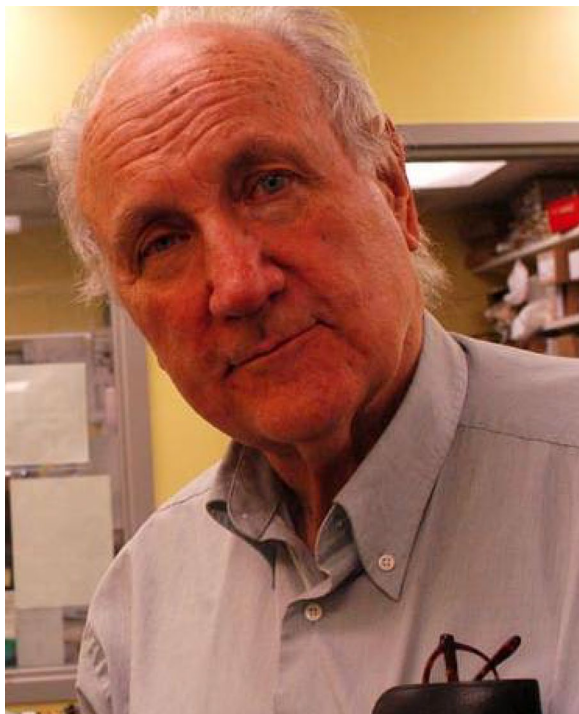
Always aiming for a “gentle lung treatment,” Kolobow described tracheal gas insufflation [8] and new techniques to prevent ventilator-associated pneumonia [9].

The ideal environment for Kolobow was the National Institutes of Health, characterized by less pressure for grant achievement and publication production and more time for thinking and doing. The Kolobow personal kingdom was three square meters on the fifth floor of the main clinical building, with mountains of documents and papers surrounding the desk, a block of yellow notes in hand and a shelf loaded with a mess of supersyringes, pumps and mechanical valves. The nearby machine shop was his favorite place, where he coated tubes, made catheters and built valves and whatever objects he had thought about overnight. Kolobow, “*Homo faber*,” loved to make things with his hands following a simple paradigm: experiment, experiment and experiment again. This was Kolobow’s way whether he was trying to reproduce French bread, cooking the Thanksgiving Day turkey with three thermometers for control or building new silicon membranes, adding different components and using different mixtures to improve the performances of the spiral coil membrane lung.

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**Fig. 1** Ted Kolobow at NIH

At the end of each experiment, the questions Kolobow asked himself and generations of coworkers (at least 50 of whom were Italians) were always the same: “what did you learn?” followed by “do you think or do you know?” The answer conditioned the next experiment through an uninterrupted chain of satisfied curiosities. This unconventional way of proceeding, in which experiment 2 was different from experiment 1, and 3 from 2, and so on, on one side horrified the statisticians and made writing scientific papers very difficult; on the other, it allowed a continuous development of instruments and concepts that made the Kolobow laboratory an advanced source of ideas and instrumentations.

The “communication” (a cornerstone of today’s scientific community) was Kolobow’s last concern. Indeed, what is usually appreciated by audiences, such as a brilliant speech, a charming tone or a persuasive attitude, was alien to Kolobow’s nature. He did not like congresses, he published only when he had something to say, and his lectures did not “sell” anything. To Ted Kolobow,

the man, only substance was important, not appearance. It was not easy to live with him, but the few who had the opportunity to get to really know him found a treasure of humanity and wisdom. Kolobow was one of the few men able to see reality without prejudice and with innocent eyes, and his thinking was always outside the box simply because he never was in a box. Thanks, Dr. Kolobow.

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#### Compliance with ethical standards

#### Conflicts of interest

The authors declared that they have no competing interest.

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#### References

1. Trahanas JM, Kolobow MA, Hardy MA, Berra L, Zapol WM, Bartlett RH (2016) “Treating lungs”: the scientific contributions of Dr. Theodor Kolobow. *ASAIO J* 62:203–210
2. Clowes GHA, Hopkins AL, Kolobow T (1955) Oxygen diffusion through plastic films. *Trans Am Soc Artif Intern Organs* 1:23
3. Kolobow T (2004) The artificial lung: the past. A personal retrospective. *ASAIO J* 50:xlxiii–xlvi
4. Kolobow T, Zapol W (1970) A new thin-walled nonkinking catheter for peripheral vascular cannulation. *Surgery* 68:625–629
5. Zapol WM, Snider MT, Hill JD et al (1979) Extracorporeal membrane oxygenation in severe acute respiratory failure. A randomized prospective study. *JAMA* 242:2193–2196
6. Kolobow T, Solca M, Gattinoni L, Pesenti A (1981) Adult respiratory distress syndrome (ARDS): why did ECMO fail? *Int J Artif Organs* 4:58–59
7. Kolobow T (1988) Acute respiratory failure. On how to injure healthy lungs (and prevent sick lungs from recovering). *ASAIO Trans Am Soc Artif Intern Organs* 34:31–34
8. Kolobow T, Giacomini M, Reali-Forster C, Trawogger R (1995) The current status of intratracheal-pulmonary ventilation (ITPV). *Int J Artif Organs* 18:670–673
9. Berra L, Panigada M, De Marchi L et al (2003) New approaches for the prevention of airway infection in ventilated patients. Lessons learned from laboratory animal studies at the National Institutes of Health. *Minerva Anestesiol* 69:342–347