

## Advancing Medical Science and Practice in Anesthesiology: Karolinska

**T**HIS year, Karolinska Institutet in Stockholm celebrates its 200-yr anniversary as a medical school and medical university. Coincidentally, it is 70 yr since anesthesia was introduced in Sweden as a medical profession. As in many other countries, our specialty rapidly played key roles in the development of modern health care and academic medicine in Sweden.

The pioneer behind the introduction of anesthesia in Sweden was Torsten Gordh, M.D., Ph.D. (1907–2010), who returned to the Karolinska Hospital in 1940 after a 2-yr training with Ralph Waters, M.D., in the United States to become the first anesthesiologist in the country. As the first Chairman of the Department of Anesthesia at the Karolinska Hospital and the first Professor of Anesthesiology at the Karolinska Institutet in 1964, Torsten Gordh's professional life and work spanned several generations of anesthesiologists. The early scientific work generated by him and others truly paved the way to introduce anesthesiology not only within the faculty of the Karolinska Institutet, but also in Sweden, Scandinavia, and beyond.<sup>1</sup>

In this issue of ANESTHESIOLOGY, one of the earliest publications from Torsten Gordh is republished.<sup>2</sup> This now-classic paper, which describes the first clinical trial of the novel local anesthetic lidocaine and the series of initial pivotal works in regional anesthesia pharmacology that followed, stands as an example of academic research that created a basis for a rapid development of novel local anesthetics and their introduction into clinical practice. About the same time, neuromuscular pharmacology came in focus as succinylcholine was introduced throughout the world in the early 1950s. Otto von Dardel, M.D., and Stephen Thesleff, M.D., Ph.D. (later Professor of Pharmacology at Lund University) published a 500-patient clinical study in 1952 on the clinical pharmacology of succinylcholine.<sup>3</sup> At that time, this investigation represented a clinical drug trial of unusual size, and this study was subsequently highlighted in the 200-yr anniversary historical proceedings of the Karolinska Institutet.

Starting during the polio epidemic in the late 1950s, respiratory physiology and pharmacology within an intensive care context gradually grew as a research focus in the department, driven by the rapid introduction of intensive care units, postoperative care facilities, and an intense technical development in

respiratory therapeutics. Taking over the chair in 1974, Professor Olof Norlander, M.D., Ph.D. (1922–1988), built a strong core of senior academic anesthesiologists that for many years was the driving force behind a series of Ph.D.-projects and educational efforts in intensive care medicine, respiratory physiology and pharmacology, anesthesia pharmacology, and pain medicine. With his many national and international research collaborations, Olof Norlander took the next step to further broaden the base and networks for academics at the department. To meet a gradually increased demand for more diversified and specialized clinical services, the department formed clinical sections for general intensive care; thoracic, neurosurgical, and pediatric anesthesia and intensive care; multidisciplinary pain management; and obstetric anesthesia, all of which were aimed at providing continuous academic activities in research and education. During these years, the department research included circulatory and respiratory effects of anesthesia, renal physiology in anesthesia and intensive care, and pain research. In addition, early pioneer work in the generation and examination of large-scale databases for anesthetic complications and outcomes was performed and recognized internationally.

In 1990, Sten Lindahl, M.D., Ph.D., F.R.C.A., became the third clinical and academic chair. During an 11-yr period, Dr. Lindahl placed a strong focus on academic development within the department to provide opportunities for young anesthesiologists to combine a clinical career with academic anesthesiology and intensive care and to improve departmental funding for research in anesthesiology and intensive care. His leadership of the department was combined with membership in the Nobel Assembly and chairmanship of the Nobel Committee for Physiology or Medicine, and he also initiated a novel academic healthcare organization within the Stockholm County Council. The department also took an active part in the design of advanced postgraduate education in intensive care medicine throughout Scandinavia. In addition, this initiative supported improved clinical services in the Intensive Care Unit and stimulated young faculty to start academic work in critical care in addition to their clinical duties. Altogether, these efforts yielded a new generation of young and enthusiastic anesthesiologists and intensivists, capable of combining clinical practice and research to tremendous benefit for both clinical care and research within the department. New academic positions were also established, and as a result, academic productivity rapidly increased in many areas, *e.g.*, nitric oxide pharmacology, sepsis, neuromuscular physiology and pharmacology, oxygen biology,

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and respiratory physiology. During this time period, the first clinical application of nitric oxide was established (and later received an award\*) in joint cooperation with scientists at Harvard Medical School, Boston, Massachusetts, showing the beneficial effects of nitric oxide administration to neonates with pulmonary hypertension.

In 2002, the growth and diversity of the department had come to a point where the academic and clinical leadership was divided between a clinical and an academic chairperson, both working jointly with the department and Karolinska Institutet. This marked the start of the fourth phase of academic development, driven by the need for increased funding and more advanced infrastructure for translational research and networks. A steadily growing number of M.D.-Ph.D.s worked with the current academic leadership at the department to facilitate a better incorporation of basic scientists, core facilities, cell and molecular techniques, imaging and epidemiology, and other essential specialties outside anesthesiology and intensive care medicine to further develop departmental contributions. It became apparent for us that these challenges could not successfully be solved without a closer association between anesthesia and intensive care and basic scientists at the Karolinska Institutet campus. In 2005 the current academic chair and the Dean of the Institution for Physiology and Pharmacology therefore decided to ask the Karolinska Institutet for permission to merge and, for the first time, form a novel and combined preclinical and clinical institution, where research and education could be carried out in a truly translational manner. Thanks to the work and support by the institutional leadership and many members of the department across all personnel (nurses, M.D.s, Ph.D.s, laboratory staff, and administrative personnel), we have built a strong academic infrastructure for experimental and clinical research during this 5-yr period, powered to meet the needs of our patients and the future. Open to all researchers at the department, these units are a part of the Karolinska Institutet and are cross-financed between departmental and university funds. Here, a multitude of novel research projects and areas have developed, some of them being published or reviewed in this issue of ANESTHESIOLOGY. The department also strongly believes in the importance of globally sharing and exchanging knowledge. In this context, faculty members have developed close academic collaborations with international institutions, including the University of California San Francisco, San Francisco, California; Mayo Clinic, Rochester, Minnesota; Harvard Medical School, Boston, Massachusetts; Feinstein Institute, New York, New York; University of Washington, Seattle, Washington; Pasteur Institute, Paris, France; Nippon Medical School, Tokyo, Japan; University of Melbourne, Melbourne, Australia; and joint projects within the frame of the European Union. Members of the department have also expanded their involvement into educational projects in Africa and within global international aid organizations.

\* www.ipo.org. Zapol W, Frostell C. 2003 Intellectual property owner award. Accessed September 9, 2010.

Thanks to the initiative by Professor Eisenach and the Editorial Board of ANESTHESIOLOGY to present works from various academic institutions, we can now look forward to multiple issues of the Journal with lessons of how individual departments have grown, what we see as our threats, and how we have tried to solve various challenges to maintain a productive academic department. As for many institutions worldwide, we see the competition between expectations and demands for clinical and academic work, on both an individual and a departmental level, as the most important challenge to a university department. Fundamentally, the department must recognize and be organized to meet its three main missions: patient care, research, and education, each of them being of equal importance for our patients and our society. Needless to say, there is no perfect solution to fulfill the tripartite mission. Our department has dealt with the continuous struggle to promote high academic activities in research and education along with a steadily increased clinical work load by consciously separating funding and budget processes for patient care, research, and education. Funding for research and education is allocated separately and is used mainly to provide time and infrastructure for academic activities according to individual and departmental needs. Moreover, time for research and educational activities is monitored and the output measured annually *via* transparent application and reporting systems, providing incentives for individual and group career development. This also allows the department to review and allocate its academic resources annually to best fit our missions and goals. The department has striven to maintain an active academic culture, even in times of high clinical demands. Novel and emerging projects, as well as grant proposals from junior doctor and nurse investigators, have received support from established groups and individuals. Finally, although it is difficult to achieve at all times, our daily work environment should contain elements of all three key missions!

We strongly believe that by maintaining and constantly reviewing this academic culture and strategy, the department will provide a close integration of patient care processes with preclinical and applied clinical sciences and education. With this strategy, we will provide a platform upon which anesthesiology, surgical services, and intensive care medicine can build excellent clinical and academic patient care, research, and education within the new Karolinska University Hospital, currently under construction and scheduled to open in 2015–2017.

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## References

1. Eriksson LI, Frostell C, Irestedt L, Lindahl S, Weitzberg E: In memoriam: Torsten Gordh (1907–2010). ANESTHESIOLOGY 2010; 113:1438
2. Gordh T: Xylocain, a new local analgesic. Anaesthesia 1949; 4:4–9
3. von Dardel O, Thesleff S: Succinylcholine iodide as a muscular relaxant; a report of 500 surgical cases. Acta Chir Scand 1952; 103:321–36