Bengt Robertson: A Surfactant Pioneer

H.L. Halliday^a C.P. Speer^b

^aRegional Neonatal Unit, Royal Maternity Hospital, Belfast and Department of Child Health, Queens University of Belfast, Northern Ireland, ^bUniversity Children's Hospital, Würzburg, Germany

The international symposium 'Recent Advances in Neonatal Medicine, Würzburg, Germany, October 2002' is dedicated to one of the pioneers in surfactant research, Bengt Robertson, MD, PhD, Professor of Pediatric Pathology at the Karolinska Hospital, Stockholm, Sweden.

Kurt von Neergaard first recognised the importance of pulmonary surfactant for lung function in 1929 [1], just 6 years before another famous Swede, Bengt Robertson, was born. Later, Pattle [2] and Clements [3] confirmed the presence of surfactant and postulated its importance in preventing atelectasis in the newborn. A few years later Mary Ellen Avery and Jere Mead demonstrated that surfactant deficiency was the cause of respiratory distress syndrome (RDS), commonly referred to as hyaline membrane disease in 1959 [4].

Following 2 unsuccessful attempts at surfactant replacement in clinical trials of preterm neonates in the 1960s [5, 6], Bengt Robertson and Goran Enhörning showed that the reason for failure was the choice of surfactant, synthetic rather than natural [7, 8]. The earlier clinical trials had used dipalmitoylphosphatidylcholine which was nebulised into the lungs but Enhörning and Robertson, using natural surfactant containing surfactant proteins as well as phospholipids, were the first to demonstrate that tracheal deposition improved lung expansion in the premature rabbit fetus [7, 8]. This was a major breakthrough and was to lead to the later clinical trials with natural surfactant preparations. They also reported that pharyngeal deposition of surfactant was effective [9,

10] and this is now being explored in clinical trials by Kattwinkel and colleagues.

Gertie Grossmann joined Bengt and Goran in the early 1970s and they worked together as a formidable team until Goran left for North America some years later. Prior to this they had used a primate model in Toronto to confirm the beneficial effects of natural surfactant on lung function and morphology [11, 12]. These studies also

Fig. 1. Bengt Robertson (born 1935).

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H.L. Halliday
Regional Neonatal Unit, Royal Maternity Hospital and
Department of Child Health, Queens University of Belfast
Belfast BT12 6BB (Northern Ireland)

demonstrated for the first time that early replacement of surfactant could prevent or modify lung injury and overcome surfactant inactivation. This became a major research interest of Bengt and it still occupies some of his current research time. This all happened about 30 years ago when the scene was being set for Tetsuro Fujiwara and his colleagues in Japan to undertake the first successful clinical trial with a bovine surfactant in 1980 [13].

Meanwhile, Bengt and Tore Curstedt, a clinical chemist also working at the Karolinska Institute, developed a porcine surfactant that was later named Curosurf after the first 2 letters of their respective surnames. This was undoubtedly a major discovery and it led to an effective treatment that has saved the lives of many preterm babies. The key to the superior effects of Curosurf is the extra step of liquid-gel chromatography in preparation which leaves a surfactant with 99% polar lipids in addition to 1% SP-B and SP-C [14]. It is a very concentrated surfactant (80 mg/ml) which means that only very small volumes are needed to deliver adequate amounts of surfactant to the lungs of very preterm babies.

From 1984 onwards there have been a large number of randomised clinical trials of Curosurf which have established its effectiveness in neonatal RDS, the number of doses required, the benefits of prophylaxis for very preterm infants, the usefulness of Curosurf compared to other surfactant preparations and its combination with nasal CPAP [15]. Bengt's drive and support ensured that more than 4000 infants have been treated in randomised trials

of Curosurf. The clinical collaborations that have developed as a result in Italy, France, Germany, UK, Spain, Brazil, China, Sweden, Netherlands, Norway, Poland, Finland, Denmark, Hungary, Portugal, Greece, Israel, Slovenia, Czech Republic and more recently the USA have largely been a result of Bengt Robertson's endeavours. Most recently, he and his collaborators were able to demonstrate that surfactant may also be beneficial in pulmonary diseases of the newborn which are characterized by inactivation of the surfactant system such as meconium aspiration syndrome and neonatal pneumonia.

His talents have been recognised far outside the laboratory and clinical research teams that he led. In 1996 Bengt was awarded the King Faisal International Prize for Medicine (jointly with Tetsuro Fujiwara) for his contributions to care of the premature newborn. In 1998 he was awarded the Hilda and Alfred Eriksson's Prize by the Royal Swedish Academy of Sciences and in 2002 the Maternite Prize of the European Association of Perinatal Medicine.

Bengt Robertson, an outstanding and brilliant personality, has been one of the pioneers of surfactant research and his scientific contributions to both laboratory and clinical study of surfactant over the last 30 years or more have been immense and too numerous to mention properly in this extended abstract. We salute you as a great man. Have a happy retirement Bengt, from all your friends, fellows and colleagues worldwide; ad multos annos.

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