

# **History of the International Society for Research in Human Milk and Lactation**

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## **Abstract**

The goal of this report is to recount the history of the International Society for Research in Human Milk and Lactation and how its members contributed to the science of human milk and lactation. The International Society for Research in Human Milk and Lactation was formed in 1988 by a group of young scientists who were intrigued with the mysteries of human milk and lactation and the effects of human milk upon recipient human infants. The inception of the International Society for Research in Human Milk and Lactation by those scientists with many different types of interests and expertise led over the next three decades to a wealth of new information concerning the biology of the mammary gland and the exceptionally complex composition of human milk. Those findings helped to explain why human milk is by far the superior nutrition for human infants.

## **The Beginnings**

Breastfeeding was accepted as the best nutrition for human infants in the 19<sup>th</sup> century.

However, as the industrial revolution progressed the notion that man could improve upon nature became widespread (1). That idea led to the development of processed bovine milk for feeding human infants. The abrupt upturn toward artificial feedings coincided with an upsurge of women entering the workforce (2). Infant feeding thus became a major focus of the medical profession. Consequently, the control over the choice of infant feeding shifted from mothers to physicians.

Research in the early 20<sup>th</sup> century regarding mammalian milks dealt primarily with major nutrients in cow milk. Most nutritionists and physicians believed that cow milk used for infant feeding and human milk were equivalent. There were, however, some disquieting notes. Quantities of caseins, beta-lactoglobulin, and saturated fats were higher in cow milk, whereas concentrations of carbohydrates and whey proteins were greater in human milk. Moreover, certain epidemiological studies indicated that breastfed infants were less prone to certain illnesses. By the mid-20<sup>th</sup> century, many new research technologies were being developed. Thus, the time was ripe for a new look at the components of human milk, how they were produced, and how they affected human infants.

As the 1970s dawned, a group of scientists with quite different types of expertise became interested in the largely neglected field of research into human milk and lactation. They were interesting, in that they had not trained with mentors who were interested in the field. In different ways, each became attracted to this area of science although funding for studies from resources was hard to obtain because of the lack of enthusiasm for this area of science among study sections of the National Institutes of Health of the United States or their counterparts in other countries.

Two other features were their appreciations of many scientific disciplines and their abilities to work with others in the nascent field. In the latter part of the 1970s, the interests of those scientists in the United States began to coalesce. The upshot was an initiative generated by Thorsten A. Fjellstedt, an administrative scientist at the National Institute of Child Health and Human Development. Fjellstedt was a visionary in many ways. His original training was in microbiology, but his bent was to reach out to many aspects of child health and aid in the development of outstanding science that would benefit infants and children. Fjellstedt recognized through his review of research grants that there was a growing interest in human milk and lactation. But the problem was how to channel support toward scientists who might conduct excellent studies in that field. Fjellstedt convinced his co-workers to encourage research proposals concerning human milk and lactation. The call for these proposals consolidated the interest in the field and attracted graduate students and postdoctoral fellows to join the research.

### **Pioneers of the Society**

As research in human milk began to increase, it was recognized that a meeting of these pioneers in the field was needed. Fjellstedt played a pivotal role in organizing the agenda and selecting participants for such a conference. The first conference held in Elk Ridge, Maryland in 1982 (Table 1) examined methodologies in human milk banking. At that meeting, it was recognized that many aspects of methods used to analyze human milk required further study and new methods were needed to address many key issues in the field.

A committee on methods chaired by Robert G. Jensen from the University of Connecticut was formed. The other members included Stephanie Atkinson from McMaster University in Canada, Cutberto Garza from Baylor College of Medicine, Bo Lönnerdal from the University of California at Davis, Margaret C. Neville from the University of Colorado, and Mary Francis

Picciano from the University of Illinois. Afterwards, Margit Hamosh from Georgetown University and Armond S. Goldman from the University of Texas Medical Branch in Galveston were added to that group.

Plans were laid for a second conference held under the auspices of the National Institute of Child Health and Human Development focused upon laboratory research methodologies. Robert G. Jensen was the principal organizer. Margaret C. Neville also played a major role in organizing the scientific program. An isolated, pastoral site in Winter Park, Colorado was chosen for the site. About 50 scientists, many of whom became the core of a new research organization in the field of human milk and lactation, gathered for the event in August 1984 (Table 1).

It became clear at that conference that methodologies originally designed to measure the components of other biological systems were not necessarily ideal for investigating human milk and lactation. The presentations from the meeting were published in 1985 (3). The publication heightened the interest in human milk and lactation.

The workshop atmosphere of the conference engendered a spirit of intellectual challenge and camaraderie that paved the way for a succession of research conferences devoted to human milk and lactation. Also, it appeared that a critical mass of investigators could be mobilized to warrant the creation of a new research society devoted to human milk and lactation. In fact, many of the attendants at that conference played important roles in the development of that research organization.

### **Momentum Occurs**

A steering committee was created that recommended that the next conference be devoted to the effect of environmental and maternal factors upon human lactation. Margit Hamosh was

asked to form the conference. She requested Armond S. Goldman to help organize it. Salvador Villalpando and Samuel-Flores Huerta from the *Unidad de Investigacion Biomedica* in Mexico City graciously arranged for the meeting to be held in the picturesque, Spanish Colonial setting of Oaxaca, Mexico, where the ancient Mitex and Zapotec civilizations had been.

The conference was held in January 1986 (Table 1). As with the Winter Park Conference, there were vigorous presentations and discussions. The main areas of interest were the ethnic-cultural determinants of lactation, lactation performance, effects of nutrition upon human lactation, drugs and toxins in human milk, and host defense factors in human milk (4). The conference also attracted many colleagues from Hispanic America and some from Europe. As with the preceding conference, the publication of the proceedings attracted great interest and encouraged the creation of an international society devoted to research in human milk and lactation.

Armond S. Goldman was asked to organize the third conference. He in turn asked Stephanie Atkinson from McMaster University in Canada and Lars Å. Hanson from Göteborg, Sweden to help design a conference that focused on the effects of human milk upon the recipient infant. A European site for the conference was chosen to attract Europeans into the new research society and to encourage collaboration between groups from both sides of the Atlantic. Fortunately, Dr. Gerd Harzer, a German scientist who was studying certain components in human milk, learned about the idea and volunteered to arrange for the meeting to be held in Konstanz, West Germany in September 1986 (Table 1).

At the conference in Konstanz, over 60 scientists addressed the nutritional, epidemiological, metabolic, hormonal, immunological, and toxicological aspects of the issues. The site in Western Europe was ideal from many points of view. As with the Oaxaca conference, the cultural setting

facilitated an exchange of ideas and permitted vigorous but friendly debate that became a hallmark of the soon to be formed research society. Questions pinpointed at that meeting still resonate. Will investigations of the physicochemical structures of components in human milk lead to a discovery of new functions of the components? How do the components interact? What animal models are suitable to test the effects of human milk upon the recipient human infant? How do the components interact with the mucosa of the recipient infant? Are there systemic effects of human milk? If so, what bioactive factors in human milk are responsible for those effects? The publication of the conference (5) generated more interest among members of the research community.

### **Formation of the International Society for Research in Human Milk and Lactation**

Final plans were made to form the International Society for Research in Human Milk and Lactation (ISRHML). All participants in the first three conferences were invited to join the new society. Elections for officers were held. In 1988, Margit Hamosh became the first President (Table 2), Leif Hambreaus (Sweden) the first President-Elect, and Kathryn Dewey (University of California at Davis) the first Secretary/Treasurer. Members of the first Executive Committee were Lindsey H. Allen (University of California, Davis), Stephanie Atkinson, Armond S. Goldman, Lars Å. Hansen, Ruth Lawrence (University of Rochester), Bo Lönnerdal, Audrey Naylor (University of California, San Diego), Mary Frances Picciano, Guy Putet (Hopital Edouardo Herroit in Lyons, France), and Richard J. Schanler (Baylor College of Medicine, Houston).

The Laws and By-Laws of the Society were formulated principally by Margaret C. Neville with some assistance from Margit Hamosh and Armond S. Goldman. The document provided the framework for the subsequent operation and development of the Society. The goals were to

formulate excellent science in the field of human milk and lactation, bring together investigators in all aspects of the field, and aid in the development of young researchers to carry the endeavors into the future. Indeed, the intertwining of renewal and continuity ran through the document and through the minds of those who founded the Society. It was understood at the beginning that the Society would be composed of individuals who were devoted to research into the subject and were poised to make future contributions.

### **Steady Progress**

Over the next decade, international conferences were held in Costa Rica (1988), Asilomar, California (1990), Stockholm, Sweden (1992), Tlaxcala, Mexico (1995), Plymouth, Massachusetts (1997), and Irsee, Germany (1999) (Table 1). In addition, annual symposia were held in conjunction with the Experimental Biology meetings in the United States. The Society also helped to spawn the Milk Club, a group of academic pediatricians who met annually at the conjoined meetings of the American Pediatric Society and the Society for Pediatric Research.

The Society was well served by a succession of excellent officers and members of the Executive Committee. During the first 12 years of the Society, the Presidents following Margit Hamosh were Leif Hambræus (Uppsala University in Sweden), Cutberto Garza (Cornell University), Mary Frances Picciano (Pennsylvania State University), Armond S. Goldman, Salvador Villalpando, and Richard J. Schanler (Table 2). The Secretary/Treasurers following Kathryn G. Dewey were Nancy Butte (Baylor College of Medicine, Houston), Armond S. Goldman, Ruth Lawrence, and Frank Greer (University of Wisconsin, Madison). These officers along with the members of the Executive Committee provided the leadership for the International Society and in doing so ensured that the members of the Society would be able to participate and have opportunities to become leaders in their own right.



The members of the Society recognized in 1994 that it was essential to establish an ethical code for the operation of the International Society. The ethical code was prepared principally by Jean-Pierre Habicht (Cornell University) and was accepted by the Society after a thorough review. The guidelines were established to design the meetings of the Society and deal with donors and their donations.

The Society decided in 1994 to create an award to recognize senior scientists who had made outstanding contributions to the field of human milk and lactation. The award was named in honor of Icie Gertrude Macy Hoobler from the University of California, Berkeley for her pioneering studies in lactation performance and Paul Györgi from Philadelphia General Hospital for his research concerning host resistance factors in human milk. The first Macy-Györgi Award for Research in Human Milk and Lactation was given to Robert G. Jensen from the University of Connecticut, a founder of the Society, for his many discoveries concerning lipids in human milk (Table 3). The second awardee, Dr. Stuart Patton from the University of San Diego, was recognized for his many salient studies including the structure and components of milk fat globules. The third awardee was Dr. Margit Hamosh from Georgetown. Hamosh, one of the founders and the first President of the Society, was recognized for her excellent research into lipids, enzymes, and immune factors in human milk and the way that the recipient infant deals with and is affected by those agents. The award was bestowed upon Armond S. Goldman in 2000 for his investigations of the immune system in human milk, Bo Lönnerdal in 2002 for his studies in the nutrients in human milk, Lars Å. Hansen in 2004 for his pioneering studies of the immune components of human milk, Peter Hartmann in 2006 for his investigations of the production of human milk and its components, W. Allan Walker in 2008 for his findings concerning the immune protection by human milk, Mary Frances Picciano in 2010 for her studies of maternal

nutritional requirements, Kathryn Dewey in 2012 for her investigations of the effects of nutrient supplementations upon human milk, Margaret C. Neville in 2014 for her investigations of the molecular mechanisms responsible for the functions of the mammary gland, Kathleen M. Rasmussen in 2016 for demonstrating that improving maternal nutrition enhances the volume and composition of human milk, and Ann Prentice in 2018 for her investigations of nutrient requirements in lactating women and nutrients in human milk (Table 3).

The Society from its inception encouraged the development of young investigators. The Early Career Award was established in 1995. In 1999, the Award was named after Paul Ehrlich, who first discovered that the mammary gland was an immunological organ, and Otakar Koldovsky from the University of Arizona, who conducted pioneering studies on hormones and growth factors in human milk and their fate in and effects on the recipient infant. The recipients of the Ehrlich- Koldovsky Award were Sharon M. Donovan (1995), Ardythe L. Morrow (1997), Rafael Perez-Escamilla (1999), Bohuslav Dvorak and Cheryl Lovelady (2000), Johanna Hawkes and Michelle (Shelley) McGuire (2002), Shannon Kelleher (2006), Mark Cregan and Donna Geddes (2008), Stefano Bembich (2010), Lars Bode (2012), Foteini Kakulas (2014), Katie Hinde (2016), and Meghan Azad (2018) (Table 3).

Since the Society was established in 1988, the membership grew steadily and involved scientists from many different disciplines including anthropology, biochemistry, epidemiology, genetics, human evolution, immunology, lactation biology, maternal and child health, metabolism, microbiology, molecular biology, nutrition, physiology, toxicology and related areas. The group remained highly interactive. New scientists were attracted to the field and became dedicated to the promulgation of excellent science in human milk and lactation.

Biannual meetings of the International Society for Research in Human Milk and Lactation continued to be held (Table 1). They were in San Jose, Costa Rica in 1988 (organizers: Stephanie Atkinson, Lars Å. Hansen, and Ranjit K. Chandra); Asilomar, California in 1990 (organizers: Mary Frances Picciano and Bo Lönnerdal); Stockholm, Sweden/Helsinki, Finland in 1992 (organizers: Leif Hambræus, Bo Lönnerdal, Janet King and Lindsey Allen); Tlaxcala, Mexico in 1995 (organizers: Cutberto Garza, Kathy Rasmussen, and Salvador Villalpando); Plymouth, Massachusetts in 1997 (organizer: David Newburg); Irsee, Germany in 1999 (organizers: Berthold Koletzko, Olle Hernell, and Kim Michaelsen); Tucson, Arizona in 2000 (organizers: Margarette Davis, Charles Isaacs, Lars Å. Hansen, and Anne Wright); Mexico City, Mexico in 2002 (organizers: Larry Pickering, Ardythe Morrow, Richard Schanler, and Guillermo Ruiz-Palacios); Queens College, UK in 2004 (organizers: Gail Goldberg, Andrew Prentice, Ann Prentice, Suzanne Filteau, and Kirsten Somondon); Niagara-on-the-Lake, Canada in 2006 (organizers: Olle Hernell, Bo Lönnerdal, Stephanie Atkinson, Debbie O'Connor, Daniel Sellen, and Ruth Lawrence); Perth, Australia in 2008 (organizers: Ardythe Morrow, Peter Hartmann, Mark Cregan, and Donna Geddes); Lima, Peru in 2010 (organizers: Rafael Perez-Escamilla, Mary Penny, Theresa Ochoa, and Rossina Pareja); Trieste, Italy in 2012 (organizers: Paula Meier, Riccardo Davanzo, Peter Hartmann, Shelley McGuire, Mark McGuire, and Theresa Ochoa); Kiawah, South Carolina in 2014 (organizers: Rafael Perez-Escamilla, and Carol Wagner); Stellenbosch, South Africa in 2016 (organizers: Lars Bode, Evette van Niekerk, and Lisanne du Plessis); and Kanagawa, Japan in 2018 (organizers: Sharon Donovan and Katsumi Mizuno). The 2021 conference organized by Berthold Koletzko and Magnus Domellöf will be held in Stockholm, Sweden.

A Trainee Interest Group and a Trainee Expansion Program were urged by Sara Moukarzel from the University of British Columbia in Canada when she received an International Society for Research in Human Milk and Lactation trainee travel award for the Experimental Biology meeting in San Diego in 2014. Consequently, the Laws and Bylaws of the International Society for Research in Human Milk and Lactation were changed to include a Trainee Interest Group.

The idea for a Trainee Expansion Program was developed by the International Society for Research in Human Milk and Lactation President-Elect Lars Bode and by Janet Prince, who then was the only employee of the newly formed Family Larsson-Rosenquist Foundation. The concept was further developed when Dr. Katharina Lichtner became the Managing Director of the Family Larsson-Rosenquist Foundation. The program was launched at the ISRHML conference in South Africa 2016 (Table 1). The Family Larsson-Rosenquist Foundation committed the first one million dollars to support the Trainee Expansion Program (~\$200,000 per year for 5 years).

The Family Larsson-Rosenquist Foundation funds for the Trainee Expansion Program and expenses related to it (providing awards of \$10,000 and \$100,000 to different universities and institutions around the world) exceeded the roles of the Secretary/Treasurer of the ISRHML. Consequently, the ISRHML President Lars Bode initiated the move from a member-volunteer management to a professional association management. That was officially instituted in 2018.

A salient outcome of the creation of the International Society for Research in Human milk and Lactation was the development of more collaborations between scientists who were investigating human milk and lactation. In addition, the new knowledge in the field significantly influenced pediatricians, obstetricians, other physicians, nurses, other health care professionals, and the general public that human milk was the ideal nutrition for human infants. Consequently,

the frequency of breastfeeding in industrialized countries gradually rose from a nadir of 5 to 10 percent in the 1970s to about 80 percent (6,7). The rates of exclusive breastfeeding correspondingly increased particularly in mothers with high educational levels in European countries such as Denmark, the Netherlands, and Germany (8).

Many health benefits occurred because of the increased breastfeeding. Some examples are as follows. The incidence and intensity of many infectious diseases in human infants fell (9). The incidence of necrotizing enterocolitis was lessened in preterm infants fed human milk (10). Breastfed children were protected against certain inflammatory diseases long after weaning (9). Many positive psychological effects of breastfeeding on the mother and the child were discovered (11). Furthermore, breastfeeding was found to lessen the risks of obesity in young children (12).

As the International Society for Research in Human milk and Lactation entered the 21st century, there was a spirit of optimism among its members because of many new opportunities to explore the mysteries of the human mammary gland, human milk, and the interrelationships between the secretions of the mammary gland and the biology of the recipient infant. Therefore, researchers in the field of human milk and lactation look forward to further accomplishments in research in human milk and lactation. More will be forthcoming. Thus, in a few decades, the history of the International Society for Research in Human milk and Lactation will have to be recounted again.

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Table 1. International Society for Research in Human Milk and Lactation (ISRHML) Conferences

Year	Organizers	Topics & Publications	Locations
1982	Thorstein Fjellstedt	Human Milk Banking Methods	Elk Ridge, Maryland
1984	Robert Jensen, Margaret C. Neville	1st International Conference. Human Lactation: Milk Components and Methodologies. Plenum Press, NY, 1985.	Winter Park, Colorado
1986	Margit Hamosh & Armond S. Goldman	2nd International Conference. Human Lactation: Maternal and Environmental Factors. Plenum Press, NY, 1986	Oaxaca, Mex
1986	Armond S. Goldman, Stephanie Atkinson, Lars Å. Hanson	3rd International Conference. Human Lactation: The Effects of Human Milk on the Recipient Infant. Plenum Press, NY, 1987	Konstanz, Germany
1988	Stephanie Atkinson, Lars Å. Hanson, R. K. Chandra	4th International Conference. Breastfeeding, Nutrition, Infection and Infant Growth in Developed and Emerging Countries. Arts Biomedical Publishers and Distributors, St John's, Newfoundland, Canada 1990	San Jose, Costa Rica
1990	Mary Frances Picciano, Bo Lönnerdal	5th International Conference. Mechanisms Regulating Lactation and Infant Nutrient Utilization. Wiley-Liss, Inc., New York, 1992	Asilomar, California
1992	Lindsay H. Allen, Janet C. King, Bo Lönnerdal	6th International Conference. Nutrient Regulation during Pregnancy, Lactation, and Infant Growth. Adv Exp Med and Biol 1994; 352	Stockholm, Sweden
1995	Cutberto Garza, Kathy M. Rasmussen, Sal Villapando	7th International Conference ISRHML	Tlaxcala, Mexico
1997	David Newburg	8th International Conference. Bioactive Components of Human Milk. Adv Exp Med and Biol 2001; 501	Plymouth, Massachusetts
1999	Berthold V. Koletzko, Olle Hernell, Kim F. Michaelsen	9th International Conference. Short & Long-Term Effects of Breastfeeding on Child Health. Adv Exp Med Biol 2000; 478	Irsee, Germany
2000	Margarette Davis, Charles Isaacs, Lars Å. Hansen, Anne Wright	10th International Conference L. Adv Exp Med and Biol 2002; 503	Tucson, Arizona
2002	Larry Pickering, Ardythe Morrow, Richard Schanler, Guillermo Ruiz-Palacios	11 <sup>th</sup> International Conference: Protecting Infants Through Human Milk. Adv Exp Med and Biol 2004; 554:522	Mexico City, Mexico
2004	Gail Goldberg, Andrew Prentice, Ann Prentice, Suzanne Filteau, Kirsten Somondon	12th International Conference Breast-Feeding: Early Influences on Later Health. Adv Exp Med and Biol 2004; 639	Queens College, UK
2006	Olle Hernell, Bo Lönnerdal, Stephanie Atkinson, Debbie O'Connor, Daniel Sellen, Ruth Lawrence	13th International Conference of ISRHML. Abstracts. J Human Lactation 2007; 234:72-109	Niagara-on-the-Lake, Ontario, Canada
2008	Ardythe Morrow, Peter Hartmann, Mark Cregan, Donna Geddes	14th International Conference of ISRHML	Perth, Australia
2010	Rafael Perez-Escamilla, Mary Penny, Theresa Ochoa, Rossina Pareja	15th International Conference of ISRHML. Abstracts. J Human Lactation 2010; 26:419-445	Lima, Peru
2012	Paula Meier, Riccardo Davanzo, Peter Hartmann, Shelley McGuire, Mark McGuire, Theresa Ochoa	16th International Conference: Abstracts: Breast-Feeding: Breastfeeding and the Use of Human Milk: Science and Practice. Breastfeeding Medicine 2012; 7:556-577	Trieste, Italy
2014	Rafael Perez-Escamilla, Carol Wagner	17th ISRHML Conference: Abstracts. J Human Lactation 2015; 31:530-551	Kiawah Island, South Carolina
2016	Lars Bode, Evette van Niekerk, Lisanne du Plessis	18th ISRHML Conference Abstracts: Breastfeeding Medicine 2016; 11: A3-79.	Stellenbosch, South Africa
2018	Sharon Donovan, Katsumi Mizuno	19th ISRHML Conference. Abstracts. Breastfeeding Medicine 2018; 13: A1-68	Kanagawa, Japan



Table 2. Presidents of the International Society for Research in Human Milk and Lactation

Years Served	Presidents
1988-1989	Margit Hamosh
1990-1991	Leif Hambreaus
1992-1993	Cutberto Garza
1994-1995	Mary Frances Picciano
1996-1997	Armond S. Goldman
1998-1999	Salvador Villalpando
2000-2001	Richard J. Schanler
2002-2003	Kathleen M. Rasmussen
2004-2005	Kim F. Michaelsen
2006-2007	Kathryn G. Dewey
2008-2009	Peter E. Hartmann
2010-2011	Ardythe L. Morrow
2012-2013	Paula P. Meier
2014-2015	Rafael Perez-Escamilla
2016-2017	Lars Bode
2018-2019	Sharon M. Donovan
2020-2021	Berthold V. Koletzko

Table 3. Recipients of the Macy-György and Ehrlich-Koldovsky Awards Concerning Human Milk (HM), Lactation (LT), and Breastfeeding (BF)

Macy-György Awardees	Ehrlich-Koldovsky Awardees
1994: Robert G. Jensen: HM nutrition	1995: Sharon Donovan: HM components
1996: Stuart Patton: HM fat globules	1997: Ardythe Morrow: Support of BF
1998: Margit Hamosh: HM enzymes	1999: Rafael Perez-Escamilla: Epidemiology & BF
2000: Armond S. Goldman: HM immunology	2000: Bohuslav Dvorak: HM growth factors; Cheryl Lovelady: LT
2002: Bo Lönnerdal: HM components	2002: Johanna Hawkes: Cytokines & HM cells
2004: Lars Å. Hansen: HM immunology	2004: Michelle McGuire: Prebiotics, probiotics HM
2006: Peter E. Hartmann: HM bioactive agents	2006: Shannon Kelleher: HM zinc
2008: W. Allan Walker: HM immunology	2008: Mark Cregan: HM stem cells; Donna Geddes: LT
2010: Mary Frances Picciano: HM agents	2010: Stefano Bembich: BF & brain activation
2012: Kathryn G. Dewey: HM nutrition	2012: Lars Bode: HM oligosaccharides
2014: Margaret C. Neville: Human lactation	2014: Foteini Kakulas: HM epithelial cells
2016: Kathleen M. Rasmussen: HM nutrition	2016: Katie Hinde: Evolution & BF
2018: Ann Prentice: HM composition	2018: Meghan Azad: Maternal nutrition & HM