

# Toxicology in Asia—Past, present, and future

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## Abstract

The Asian Society of Toxicology (ASIATOX), which consists of the seven national toxicology member societies of Japan, Korea, China, Taiwan, Thailand, Singapore, and Iran, now boasts of more than 3,000 members from a variety of industries, academia, and regulatory organizations. ASIATOX congresses are spaced three years apart and rotated among the member societies. In 1995, ASIATOX joined the International Union of Toxicology (IUTOX) as a regional society, and now serves as the scientific voice of toxicology in Asia under the IUTOX umbrella. Since its inauguration, the society has worked diligently to handle matters deemed essential to promoting the vision set forth by its founders. Future perspectives of ASIATOX include the establishment of education and training programs, and the certification and accreditation of toxicologists. As the leading voice of toxicology in Asia, the society seeks to extend knowledge of toxicological issues to developing nations in Asia based on the following missions and goals: (1) to provide leadership as a worldwide scientific organization that objectively addresses global issues involving the toxicological sciences, (2) to broaden the geographical base of toxicology as a discipline and profession to all countries of the world, and (3) to pursue capacity building in toxicology, particularly in developing countries, while utilizing its global perspective and network to contribute to the enhancement of toxicology education and the career development of young toxicologists.

## Keywords

ASIATOX, toxicology, certification, ASIA, regional society

## Introduction

For more than 20 years, toxicology development has proceeded at a rapid pace throughout Asia. Advances focusing on the genomic basis of the field, in particular, have had enormous consequences, and growth is likely to accelerate in the future. As a consequence of the previous developments, the professional activities of toxicologists have been generally categorized into three primary fields: descriptive, mechanistic, and regulatory. Yet in all three areas, toxicologists need outstanding education and training to stay at the forefront of their specializations.

Toxicology was first recognized as a scientific discipline in Asia with the formation of the Japanese Society of Toxicological Sciences (JSTS, later renamed the Japanese Society of Toxicology (JSOT)] in 1981, which is a society that promotes knowledge utilization and exchange of information among toxicologists around the world. Following the JSOT, other toxicology societies at the national level were formed in Asia.

Later, the Asian Society of Toxicology (ASIATOX) was founded to promote the acquisition and exchange of knowledge in Asia. ASIATOX is one of several regional member societies of the International Union of Toxicology (IUTOX), which also includes the Federation of European Toxicologists and European Societies of Toxicology (EUROTOX), and the Latin American Society of Toxicology. The history and current conditions of toxicology in Asia are described below.

## The Asian Society of Toxicology

ASIATOX was founded on June 8, 1994, and joined IUTOX in 1995.

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### Origin

The roots of ASIATOX extend back to a Japan–Korea Joint Symposium on Toxicology organized by JSOT and the Korean Society of Toxicology (KSOT). This event was held three times between 1987 and 1993 (Seoul, 1987; Nagoya, 1990; and Seoul, 1993).

### Preliminary meeting of the formation of ASIATOX

In 1992, representatives of the JSOT and KSOT met to discuss the formation of ASIATOX at the 6th International Congress of Toxicology (ICT-VI) in Rome, Italy. After long discussions, it was concluded that the formation of ASIATOX was necessary to promote toxicological research and to nurture the education of toxicology specialists in Asia.

### Preparatory meeting for the formation of ASIATOX

The ASIATOX preparatory meeting was held in conjunction with the 3rd Japan–Korea joint symposium on November 27, 1993, at the Cultural Center of Seoul National University, Seoul, Korea. A total of 15 toxicologists, including six from Korea, seven from Japan, and one each from Taiwan and Singapore, attended the event.

### Foundation of the ASIATOX

On June 8, 1994, the founding meeting and the first council meeting of ASIATOX was held in Hokkaido University, Sapporo, Japan. Participants from each member society totaled 16, including eight from Japan, three from Korea, two each from China and Taiwan, and one from Thailand.

### Member societies

In addition to JSOT and KSOT, other founding member societies include the Chinese Society of Toxicology (CSOT), the Thai Society of Toxicology (TST) (formerly Toxicological Society of Thailand), and the Toxicology Society of Taiwan (TSTA). ASIATOX founding members were joined by the Iranian Society of Toxicology (2012) and the Toxicology Society (Singapore) (TSS; 2013). As of January 20, 2015, ASIATOX boasted more than 3000 members from a variety of industry, academia, and regulatory organizations.

### The founding ASIATOX executive committee members (1994–1997)

- President: Tomoji Yanagita (Japan)
- 1st Vice President: Sang Dai Park (Korea)
- 2nd Vice President: Jion Lin Zhou (China)
- Secretary General: Tetsuo Satoh (Japan)
- Treasurer: Kyu-Hwan Yang (Korea)
- Auditors: Jen-kun Lin (Taiwan) and Songsak Srianjata (Thailand)

### General objectives

Recognizing the value of a multinational organization, ASIATOX will work toward the following objectives:

1. Serve as the scientific voice of toxicology in Asia under the IUTOX umbrella.
2. Provide leadership and a forum for promoting scientific cooperation and information exchange related to toxicology in Asia.
3. Organize triennial international congresses of ASIATOX with the member societies in order to facilitate and encourage scientific exchange and leadership.
4. Enhance opportunities for educational development in toxicology.
5. Facilitate platforms for discussion among regulators, academics, stakeholders, the private sector, and the public at large regarding toxicological issues.
6. Encourage diversity within the toxicological disciplines, and increase the number of member societies within the region.
7. Improve dialogue with member societies and other toxicology societies worldwide.
8. Address leadership as a scientific organization based on a state-of-the-art knowledge in toxicological sciences.
9. Pursue capacity building in toxicology in Asia to contribute to the enhancement of toxicology education and the career development of young toxicologists.

### Application of ASIATOX for IUTOX membership

ASIATOX submitted their application for IUTOX Membership on October 7, 1994, which was unanimously accepted at the IUTOX Executive Committee meeting held on July 2, 1995.

**Table 1.** ASIATOX congresses (1997–2015).

Number	Date	Year	City	Country	President
ASIATOX-I	Jun 29–Jul 02	1997	Yokohama	Japan	T Yanagita
ASIATOX-II	Aug 23–25	2000	Jeju	Korea	I-M Chang
ASIATOX-III	Feb 01–06	2004	Bangkok and Chiang Mai	Thailand	S Srianujata
ASIATOX-IV	Jun 18–21	2006	Zhuhai	China	JS Chen
ASIATOX-V	Sep 10–13	2009	Taipei	Taiwan	J-F Deng
ASIATOX-VI	Jul 17–20	2012	Sendai	Japan	A Naganuma
ASIATOX-VII	Jun 23–26	2015	Jeju	Korea	M-H. Cho

ASIATOX: the Asian Society of Toxicology.

### The ASIATOX congresses

ASIATOX congresses have been hosted by member societies on a rotating basis every 3 years. (See Table 1 for details)

### Future perspectives

ASIATOX works to handle matters deemed essential to promoting the vision proposed by its founders. Future perspectives of the ASIATOX include:

1. recruitment of new member societies
2. establishment of education and training programs
3. certification and accreditation of toxicologists
4. newsletter publication

## Toxicological activities of the ASIATOX member societies

### Japanese Society of Toxicology

**Foundation of the JSOT.** The JSTS was founded in 1981 to promote the acquisition and utilization of knowledge in toxicology as well as to facilitate the exchange of information among toxicologists around the world. JSTS was renamed JSOT in 1997.

**Mission.** In support of the JSOT mission for advancing health through furthering understanding of, and research in, toxicology, the society promotes the following activities:

1. Convening the annual meeting.
2. Publishing the official journal
3. Educating and certifying toxicologists
4. Conducting scientific and publicity related activities for members and the public.
5. Engaging in other programs/projects deemed necessary to support the JSOT mission.

**Members.** JSOT membership, which was 1083 at the society's founding in March 1982, had blossomed to 2648 as of December 2014, making it the second largest toxicology society in the world. Among its current members are 40 associates from around the world including 15 from Korea, 11 from the United States, 9 from the United Kingdom, 3 from Canada, and 1 each from China and Denmark. Member affiliations are diverse including industry and contract research organizations (70%), academia (22%), government agencies (6%), and others (2%).

**National and international meetings.** The JSOT scientific meeting is held annually. In 1986, the Society hosted the 4th International Congress of Toxicology (ICT-IV) in Tokyo, Japan, which was attended by 1,104 participants from 39 different countries.

Contrastingly, ASIATOX congresses are spaced 3 years apart, with the first (ASIATOX-I) hosted by JSOT in Yokohama in 1997. This event was attended by 474 participants from 13 countries. In 2012, JSOT hosted ASIATOX-VI in Sendai. This event attracted 522 participants from 17 countries including 327 from Japan, 73 from Korea, 44 from China, 42 from Taiwan, and 4 each from Thailand and Singapore.

**Publication of the society journals.** The official journal *Journal of Toxicological Sciences (JTS; J. Toxicol. Sci.)* was launched in 1981 to provide a dedicated forum for invited review articles and peer reviewed original papers. In 2014, a second journal, "*Fundamental Toxicological Sciences (Fund. Tox. Sci.)*" was launched, and the editorial committee has put in place a highly efficient Web-based manuscript submission and peer review system.

**Accreditation and professional certification program.** A JSOT certification program for toxicologists, based

on annual closed book examinations, was launched in 1997, with the content and level of examination questions selected to be comparable with those provided by the American Board of Toxicology. At the first certification examination for Diplomat of the Japanese Society of Toxicology in 1999, 148 toxicologists were certified. As of June 2014, 454 toxicologists have been formally approved. Approximately 80% of the society's diplomats are from industry, 12% from academia, and 8% from other fields. Diplomats may be recertified every 5 years provided they remain in active toxicology practice and maintain an expert level of knowledge in general toxicology.

**Conclusion and future perspectives.** Over the years, JSOT has achieved exceptional success with its meetings, publications, member services, and outreach activities. The society's two ongoing missions are maintaining the high-quality certification program for toxicologists and considering ways to improve the society journals.

Concerning certification, the number of JSOT-certified toxicologists has increased every year since its inauguration, and the certification program is now well recognized worldwide. Another goal of the program is to expand it to toxicologists in other countries. As for the journal, the *JTS* editorial team envisions building a publication with increased visibility, and which enhances the scientific edge in the field of toxicology.

Ultimately, the mission of JSOT is to develop an implementation plan that ensures a systematic and efficient expenditure of energies and resources, and that is most closely aligned with a carefully considered strategy for accomplishing its long-range plans.

### **Korean Society of Toxicology**

KSOT and the Korea Environmental Mutagen Society are academic societies in the field of toxicology that were established to more efficiently meet social needs regarding these areas. KSOT, which was founded in 1985, has grown to a membership of 1400 as of March 2015. The aims of the society are to promote the academic development of toxicology and relevant disciplines and to contribute to the further advancement of toxicology by enhancing academic ties at home and abroad. To facilitate this, the society engages in the activities discussed below.

**Publication.** KSOT's official journal, the *Korean Journal of Toxicology* was launched in 1985, and then renamed *Toxicological Research (ToxRes)* in 1997. Articles published in this journal are indexed in Scopus of Elsevier and PubMed Central, as well as other major scientific databases including Google Scholar. *ToxRes* is published quarterly.

**Scientific conferences.** The KSOT has organized scientific meeting annually to promote academic exchanges with relevant national and international societies and organizations. Each year, the society sponsors and conducts a variety of education and training programs aimed at nurturing young toxicologists.

**Certification of toxicologists through training and tests.** The KSOT diplomat system, which was established in 1999, conducts yearly certification examinations every October. As of March 2015, the society was represented by 70 diplomats, 47 in industry and 23 in academia.

**Chinese Society of Toxicology.** Founded in December 1993, the CSOT is a registered Science and Technology Association dedicated to toxicology and its related fields. CSOT is a member society of the China Association for Science and Technology, IUTOX, and ASIATOX. The Society is committed to improving human health and environmental safety by hosting scientific conferences and information exchanges, promoting continuing education and professional training, facilitating international collaboration, and providing advisory services to governmental agencies and society. Currently, the CSOT has developed into a large professional society with 24 specialty sections, provincial chapters, and several thousand members. The Society organizes its National Congress of Toxicology every 2 years, and numerous conferences and workshops are conducted yearly in China by the various sections and chapters. Each year, CSOT delegations are sent to attend Society of Toxicology, EUROTOX, ASIATOX, IUTOX, and other international conferences.

The CSOT established its Toxicologist Certification program in 2009 after several years' preparation and commenced recertifications in 2013. The program includes prequalification on education and professional experience for eligibility, and a written examination on general toxicology. As of March 2015, the CSOT had certified 167 members as

diplomat toxicologists (DCST), 62 of whom have been recertified in the last 2 years.

### *Thai Society of Toxicology*

The TST was founded in 1983 by a group of toxicologists and related scientists. The Society elected Dr Sompoon Kritalak its first president in 1984, and five other individuals have held office up to the present day. The current president is Dr. Songsak Srianujata, who has been reelected three times and has now served a total of 11 years. Presidential elections are held every 2 years.

Dr Malyn Chulsiri is TST Vice President. Dr Chaniphun Butryee serves as the Secretary General, and Dr Anong Bintaviahok is the treasurer.

The present (2014–2016) TST Executive Committee consists of 18 members. The society is a founding member of the Council of Science and Technology Associations of Thailand (COSTAT) and ASIATOX as well as being a long-standing member of IUTOX. Dr Songsak also served as president of COSTAT for 8 years (four terms in office) and as ASIATOX president for 3 years.

Major activities of the TST are discussed subsequently.

*National and international meetings.* Organizing the annual National Conference of Toxicology (NCT).

Hosting the international conferences, such as the 3rd ASIATOX and the 8th International Conference of Toxicology in Developing Countries (CTDC8) under the auspices of IUTOX.

*Participation in governmental activities and public.* Participating in national government committees and subcommittees concerning the management of the safety of chemicals, hazardous substances, food, and drug control.

Participating in study projects on environmental safety and public health issues.

*Education and training program.* Organizing periodic training programs aimed at spreading knowledge and understanding about toxicology matters among society members, specific groups, and the general public.

### *Toxicology Society of Taiwan*

The TSTA, which was founded in 1985 by a group of toxicologists led by Dr Chen-Yuan Lee, registered

with the nation's Ministry of the Interior on June 20, 1987. Dr. Lee became the first president of TSTA and was succeeded by Dr Jen-Kun Lin, Dr Jou-Fang Deng, Dr Tzue-Huei Ueng, Dr Tsung-Yun Liu, Dr Huei Lee, and Dr Min-Liang Kuo. The current president is Dr. Jaw-Jou Kang.

TSTA became a member of ASIATOX in 1997 and has been actively participating in various related activities since then, including serving as the host organization of the 5th International Congress of ASIATOX at the Taipei Veterans General Hospital in September 2009. In addition to ASIATOX, TSTA joined IUTOX in 1987 and has regularly hosted the biennial cross-strait meetings between TSTA and CSOT.

To comply with the international harmonization of the certification/registration of toxicologists worldwide, an effort led by IUTOX, TSTA has recently established a board certification program for Diplomat of Certified Toxicologist (DTSTA). The first board certification exam was held at Kaohsiung Medical University on June 28, 2014. Among the 10 examinees, Dr Hsio-Mei Chiang, Dr Pinpin Lin, and Dr Hwei-Hsien Chen successfully passed and were awarded the title of DTSTA. The 2nd exam is scheduled to be held at Kaohsiung Medical University on July 4, 2015, and it is expected that more toxicologists in Taiwan will become DTSTAs.

### *Toxicology Society (Singapore)*

The TSS, was founded in February 2011 by a diverse group of toxicologists from various backgrounds. Since then, more toxicologists, especially those engaged in regulatory and experimental toxicology have joined the Society. TSS, which is the first society of its kind in Singapore, is comprised of members from multidisciplinary backgrounds including physicians, pharmacists, scientists, and academics with an interest in developing and advancing toxicology. These numerous specialists have consolidated their resources and experience in the society in order to help elevate the status of this neglected but crucial discipline, with the overall aim of contributing to chemical safety in Singapore.

### *Iranian Society of Toxicology*

The Iranian Society of Toxicology (IranTox) was established in 1990 by a group of pioneer Iranian toxicologists. The Society's first president was

Professor Mahdi Balali-Mood. He was succeeded by the late Professor Mahshid Afshar, Professor Abdolkarim Pajoumand, Professor Mohammad Abdollahi, and the Society's current president is Professor Omid Sabzevari.

IranTox became an IUTOX member in 2001 and joined ASIATOX in 2011. The Society is actively involved in various activities including the organization of national and international Congresses, advancement of toxicology, and poisoning-related studies, investigations into the health impacts of poisons and chemicals, and providing advice to authorities at the national and international levels. The *Iranian Journal of Toxicology*, which is the official journal of the society, was launched in 2008 and is published quarterly.

Courses in basic and clinical toxicology in the nation's major universities and the National Board of Toxicology were founded and administered by the IranTox members. This includes the toxicology PhD program that was founded in 1989 and the fellowship in clinical toxicology founded in 2008. Since the establishment of these courses, more than 100 diplomats have been certified. Examinations are held every year. Currently, IranTox consists of about 150 certified toxicologists in academia and industries.

### Conclusions and future perspectives

As the voice of toxicology in Asia, ASIATOX seeks to extend knowledge of toxicological issues to

developing societies and nations in Asia based on the following mission and goals;

- to provide leadership as a worldwide scientific organization that objectively addresses global issues involving the toxicological sciences;
- to broaden the geographical base of toxicology as a discipline and a profession to all countries of the world; and
- to pursue capacity building in toxicology, particularly in developing countries, and to utilize its global perspective and network to contribute to the enhancement of toxicology education and the career development of young toxicologists.

### Acknowledgment

The author gratefully acknowledge the presidents of the ASIATOX member societies for providing their valuable information of the society.

### Conflict of interest

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author received no financial support for the research, authorship, and/or publication of this article.