Selenium Research

International Society for Selenium Research Issue 6, Fall 2019

President's Remarks

Gary S. Bañuelos, President, ISSR

Dear ISSR Members and Friends:

Welcome to quickly passing 2019! The great memories of selenium's 200th birthday celebration in Stockholm, Sweden seems not so long ago, and it is soon time to create new memories from our upcoming 2019 Selenium Conference in Xi'an, China. With our hectic and busy schedules, there are always papers to write, proposals to submit, classes to teach, presentations to deliver, experiments to conduct, countries to visit, and plans to make for attending the 6th International Conference on Selenium in the Environment and Human Health in Xi'an/Yangling on 27-30 October 2019. The conference organizers Professor Dongli Liang of Northwest A&F University, Professor Zhi-qing Lin of Southern Illinois University-Edwardsville and myself have been busily preparing for the upcoming conference to be held in Xi'an/Yangling, the ancient capital of China. Based upon the multi-faceted expertise's represented by the high quality of both keynote and invited speakers representing more than 19 different countries, this conference will be destined to be extremely informative and selenium rich for the international selenium research community. Please go to the conference website (icshh2019.csp.escience.cn) to view the latest conference program and other important information related to the conference.

As mentioned in our last newsletter, we will be holding an election for the office positions of the International Society for Selenium Research Society. The election will be done via online voting after the conference. According to the bylaws, I can serve as President only for two terms. In this regard, it is important to take note that only paid members will be eligible to participate in the election. Thus, if you want to be involved in the Society election, please consider becoming an active member. You can go to the Society website and follow directions on how to easily become a member. You may pay $50 for a regular member for two years, $20 for a student member for two years, or $300 for a lifelong membership. The election guidelines have been reviewed and approved by the Council on October 15, 2019, and that has also been included in this newsletter.

Lastly, we are considering a one-time changing of the two-year cycle for holding our next selenium conference. We will hold our next selenium conference in 2022. Thereafter, the Se conference would then take place every 2 years. This modification will eliminate the overlapping or future time conflicts with the Selenium in Medicine and Biology Conference that takes place every 4 years or is currently scheduled for 2021. The Se 2022 conference will be hosted by Professor Lutz Schomburg in Berlin, Germany and co-hosted by Professor Lenny Winkel, Zurich, Switzerland. A short introduction article for the 2022 Se conference has also been included in this newsletter for your interest.

In this newsletter we have also highlighted some selenium research activities conducted jointly by an international research group or some society members on Natural Biofortification Program (NBP) in Se-rich Enshi, China.

I hope to see many of you in Xi'an/Yangling at the 2019 Selenium Conference, and I especially look forward to your contributions representing the many faces of selenium research. You are the ones who create a successful and meaningful conference. Research activities revealed at this Se conferences are key for contributing to and for understanding the famous quote by "Selena" (selenium goddess) - *"Long live selenium and live long with selenium"*

Parlier, California

The Chronicle
OF SELENIUM RESEARCH

AN AGENDA FOR SELENIUM RESEARCH - FROM YESTERDAY TO TOMORROW

Gerald F. Combs, Jr., Ph.D., Senior Scientist, Jean Mayer USDA Human Nutrition Research Center on Aging, Tufts University, Boston, MA; and Professor of Nutrition Emeritus, Division of Nutritional Sciences, Cornell University, Ithaca, NY.

I was introduced to selenium (Se) by Milt Scott and have thought about it for the better part of five decades. In the late 1950's, Milt collaborated with Klaus Schwarz at National Institutes of Health and found Se to "spare" vitamin E in livestock and experimental animals. As Milt's graduate student in 1971, I was interested in the metabolic basis of that effect and wanted to know whether Se was a nutrient *per se* or simply an effector of vitamin E function. This question was clarified in 1972 when John Rotruck (in Bill Hoekstra's lab at the University of Wisconsin) found Se to be an essential constituent of the antioxidant enzyme glutathione peroxidase. That finding led to the mushrooming of research in this field. Within the next two decades other selenoenzymes were identified[1]; each was found to contain Se in a previously unidentified amino acid, selenocysteine, which was found to be incorporated *via* a novel co-translational mechanism; and dietary levels of ca. 0.1-0.3 mg/kg were found to be required for maximal expression of the major selenoenzymes.

At the same time, others found that Se reduced tumorigenesis in virtually all animal and cell models studied. Those studies showed both organic and inorganic forms of Se effective at non-toxic intakes greater than those needed to prevent vitamin E deficiency signs or maximize selenoenzyme expression. In the 1960's through 1990's, results from epidemiological studies suggested that cancer risk may be inversely related to Se status. Yet, only a few randomized controlled trials were conducted. The Nutritional Prevention of Cancer (NPC) Trial, which Larry Clark, Bruce Turnbull and I conducted, found a two-third reduction in prostate and colorectal cancer risks with a daily 200 µg Se supplement (as Se-enriched yeast) in a cohort of some 1300 Se-adequate Americans, with no protection among subjects with baseline plasma Se levels <121 ng/ml. The much larger Selenium and Vitamin E Cancer Prevention Trial (SELECT) found no such effects of a similar Se supplement (as selenomethionine) in cohort of Americans most of whom had baseline plasma Se levels >121 ng/ml. These results were consistent with a U-shaped relationship of Se intake and cancer risk.

By the 1980's, it had become clear that Se was an essential nutrient, at least for animals, with the property of also being antitumorigenic at supranutritional exposures. The question arose: "Is Se essential for humans?" This question would be answered by researchers in China.

In the spring of 1978, I received a manuscript from an individual whom I didn't know at the Institute of Food Hygiene in Beijing. It purported to show that a heart disease occurred in children with levels of plasma Se of only 10-20 ng/ml[2]. Several months later, I received a call from the same individual, Dr. Chen Junshi, asking to spend a year in my lab at Cornell. I arranged for him to work with me and a colleague, Colin Campbell. In a productive year, the three of us learned a lot from each other and became good friends. This led to Colin and me being invited in 1980 to go to China with two European scientists to conduct a "selenium" seminar at Chen's Institute[3,4]. From Beijing we traveled by overnight train to Xichang City, an area of endemic Se deficiency in southwest Sichuan Province. There we met with 'barefoot' doctors and their pediatric patients with the multifocal myocarditis called Keshan Disease. Chen's colleagues and researchers in Xi'an had found in large-scale trials that Keshan Disease was preventable (but not treatable) with supplemental Se (sodium selenite, 0.5-1 mg Se/child/wk; or selenite-fortified table salt containing 10-15 µg Se/g). Subsequent research raised questions as to whether Se deficiency was a direct cause of Keshan Disease, which may also involve cardiotrophic RNA viruses. Indeed, severe Se deficiency is now seen as, at least, a major predisposing factor.

On my return to Beijing, I had dinner with Dr. Liu Jinxu, of the Chinese Academy of Agricultural Sciences and a 1952 Cornell Ph.D. in Animal Nutrition. He described the rebuilding of his Institute after the Cultural Revolution, and I asked what I could do to help. Dr. Liu responded: "*We are going to get foreign experts here to talk. But our young people need to learn how foreign scientists think about science – scientific reasoning!"* Within the year, Dr. Liu had arranged support from the Ministry of Agriculture for me to spend 13 weeks working in the Institute of Animal Science in Beijing. Over the next several years I made four such visits[5], and brought Chinese colleagues to spend comparable

[1] Ultimately, some 25 selenocysteine-containing proteins would be identified.
[2] This compares to plasma Se levels of 80-200 ng/ml in the US and 35-100 ng/ml in Europe.
[3] This meeting was made possible by the efforts of Dr. Curtis Hames, Claxton, GA.
[4] The Institute staff included Dr. Chen Chungming, who would be influential in Chinese national public health programming, and Dr. Jin Daxun, who to everyone's surprise, had been a fellow graduate student with my father at Cornell in the late 1940s.
[5] And my taking a Cornell summer total immersion course in Mandarin.

times in my lab at Cornell[6]. In 1984, I chaired the first international scientific meeting held in modern China – the Third International Symposium on Selenium in Biology and Medicine[7]. This attracted some 250 participants, half being Chinese scientists.[8] We used the two-volume proceedings[9] to get Chinese Se research into the English language literature. By the 1990's, Se was established as an essential nutrient for humans, and a Recommended Daily Allowance (RDA) was established. It was based on a single study from China that had found a daily intake of 41 µg Se supported the maximal expression of plasma glutathione peroxidase (GPX3) in a small group of Se-deficient Chinese men. The RDA was revised in 2000 to reflect the amount of Se necessary to prevent both Keshan Disease and support maximal expression of two selenoenzymes (GPX3 and selenoprotein P [SePP1]). Various national advisory panels subsequently produced a range of recommended reference intakes (25-125 µg/d). When I compared the reported Se contents of different national food supplies, I found that sub-clinical Se deficiency (Se intakes <50 µg/d) likely affected 10-50% of residents in most countries for which data were available - only Canada, Japan, Norway, and the US appeared not to show prevalent low Se status.

Thus, over five decades I have seen Se added to the Nutrition agenda as an essential nutrient with potential to reduce cancer risk. I have also noted that consequences of Se deprivation can be sub-clinical in nature, requiring other precipitating factors (e.g. vitamin E deficiency, viruses, carcinogens, iodine deficiency, protein insufficiency) to reveal manifestations of sub-optimal expression of selenoenzymes and/or insufficient amounts of active Se-metabolites. It has also become clear that Se can have both healthful and adverse effects at supranutritional intakes, raising questions about its window of safety. This has left me with three questions which I consider pressing:

1. *Can Se be part of a useful practical strategy for reducing cancer risk in humans?*

The clinical significance of Se in cancer prevention remains a subject of debate. The (only) nine randomized clinical trials conducted to date have yielded inconsistent results. Systematic reviews have found that Se may be effective in preventing cancer in individuals of low to adequate, but not high Se status, and a U-shaped dose-response relationship has been proposed. Yet, these conclusions are weakened by the fact that several trials have not followed robust protocols, and none has been conducted in recent years or in cohorts with individuals of both marginal and adequate Se status.

2. *Is Se safe?*

Excess type 2 diabetes (T2D) was noted among subjects in the upper quintile of plasma Se in two US NHANES (National Health and Nutrition Examination Survey) cohorts, as well as among Se-supplemented subjects in the NPC trial who achieved plasma Se levels averaging ca. 190 ng/ml. Other trials have not found excess T2D, and studies in animal models have revealed no negative effects of Se on glycemic control. Resolving the question of whether supranutritional intakes of Se can increase T2D risk will demand well controlled trials with subjects randomized by T2D risk factors (high BMI, elevated fasting glucose) and followed with unequivocal diagnostic indicators (fasting glucose, HbA1c, oral glucose tolerance). Until then, there would appear to be no justification for any healthy adult, regardless of his/her baseline Se status, to consume more than 100 µg Se/day.[10]

3. *Who can benefit from Se?*

This may be the ultimate question about the health value of Se. Se-supplementation of adults with Se intakes <50 µg/d will increase selenoenzyme expression; those increases will depend on the extent to which baseline plasma Se levels were below approximately 90 ng/ml. Whether individuals with plasma Se levels >90 ng/ml may also benefit from increased Se intakes is suggested from results of the NPC Trial in which supplemental Se reduced cancer risk among adults with plasma Se levels in the range of 80-121 ng/ml, a range that includes some 10% of Americans. Thus, individuals with plasma Se levels >90 ng/ml may benefit from cancer protection unrelated to selenoenzyme expression[11]. If this can be confirmed, it would mean that large numbers of adults are likely to benefit from increased Se intakes - some to reduce cancer risks, others also to maximize selenoprotein expression.

Today's Selenium Research Agenda must address these key questions with robust research that produces unequivocal and, thus, useful results. Pursuing this agenda is the challenge for those who will be thinking about Se over the *next* decades.

[Citation: Combs, G.F., Jr. 2019. An Agenda for Selenium Research - from Yesterday to Tomorrow. XV-XVII. In: G. Bañuelos, Z.-Q. Lin, D. Liang, and X.-B. Yin (eds.), *Selenium Research for Environment and Human Health: Perspectives, Technologies and Advancements*. CRC Press, Boca Raton, FL.]

[6] Their visits were facilitated through generous support from American agribusinesses.

[7] This would not have been possible without the help of Julan Spallholz and S.P. Yang, Texas Tech Univ.; Jin Daxun and Niu Shiru, China Nat. Center for Prev. Med.; Orville Levander, USDA; and Jim Oldfield, Oregon State Univ.

[8] To everyone's surprise and delight, I opened the symposium in Mandarin.

[9] Combs, G.F., Jr., J.E. Spallholz, O.A. Levender and J.E. Oldfield (eds). 1987. *Proceedings of the Third International Symposium on Selenium in Biology and Medicine.* AVI Publishing, Westport, CT, Vol. A & B, 1138 pp.

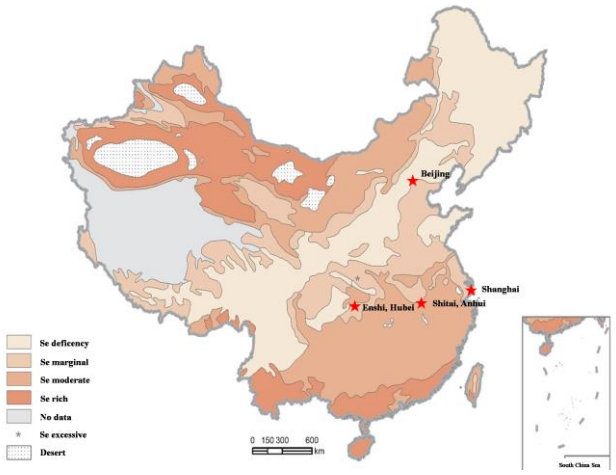
[10] The toxicity of high doses of Se has been described in case reports of accidental exposures to various seleniferous products, and from naturally occurring chronic selenosis in Enshi County, Hubei Province, China. The latter involved very high Se levels in soils, water and throughout the local food system, with some residents consuming >1.5 mg Se/p/day (almost 4 times the UL set by WHO and IOM) showing hair, nail and skin lesions.

[11] It should be remembered that *all* individuals, regardless of Se status, will show increases in plasma total Se when supplemented with the dominant food form, SeMet. In fact, that response will be nearly linearly over the entire range of practical doses, reflecting to increases in Se nonspecifically bound in albumin and other plasma proteins.

RESEARCH HIGHLIGHTS

The Natural Selenium Biofortification Program (NBP) is an international collaborative research effort. The program was initiated in 2014 and coordinated by Dr. Gary Banuelos at USDA-ARS, USA and Dr. Linxi Yuan at Jiangsu Bio-Engineering Research Centre of Selenium, China. The research team includes: Joel Caton at North Dakota State University, USA, Graham Lyons at University of Adelaide, Australia, Lutz Schomburg at Charité - Medical University Berlin, Germany, Jean Hall at Oregon State University, and Gijs Du Liang at Ghent University, Belgium.

The goal of the program is to establish the relationship between selenium status and human longevity in selected Se-enriched communities in China. The research activities include the analyses of selenium (Se) contents, Se speciation, selenium interaction with heavy metals and their bioavailability, and bioaccessibility of Se through the soil-crops-human-animal system.



The research sites include Shitai in Anhui and Enshi in Hubei. Shitai (E 117°12´-117°59´, N 29°59´-30°24´) is located in southern Anhui Province. Shitai has 82% forest coverage under subtropical humid climate having four distinct seasons. Dashan is known as a longevity village where the elder population (> 80-year old) accounts for about 12% of the local population, according to the census report in 2015 (http://www.ahshitai.gov.cn/DocHtml/1/15/12/00008831.html), while at the same, the elder population (> 80 years old) in China and Anhui Province was 1.6% and 1.8%, respectively, according to the Census Report published by Statistical Bureau of China (2010). During 2014-2017 period the research team has visited Shitai over 10 times, and have collected about 1,000 samples, including soils, water, crops, meat, eggs, human hairs and human blood for selenium analyses.

Enshi (E 108˚23'12"-110˚38'08", N 29˚07'10"-31°24'13") is located in Northwestern Hubei Province, China. In early years (1930 to 1960), residents of Yutangba, Huabei, and Shadi villages have experienced loss of hair and nails, showing the typical symptoms of Se toxicity. For instance, 19 of 23 local inhabitants in Yutangba showed some visible Se poisoning symptoms, and all livestock in the village died in 1963. Subsequently, villagers were evacuated from their homes in Yutangba. After the occurrence of Se poisoning incident, selenosis has become a matter of concern for local governments, scientists, and Se endemic disease investigators. Among the studies carried out in Enshi, the discovery of Se minerals in Yutangba village was most significant. The mineral has a high Se content of 8,500 mg/kg. The Se mine was formed in Maokou or during the late Permian period with a thickness of 13 m. During 2011-2018, the research team members have visited Enshi more than 10 times and collected about 2,000 samples, including soils, water, plants, crops, meat, eggs, human hairs and blood.

The questionnaire on food intake, job, health status, etc. has also been distributed along with human specimen collection. This study showed high Se concentrations of Se in human hair and plasma in residents of Sancha and Yutangba, which was related with high abnormal ratios of blood fat and blood pressure.

The research findings from this program will provide scientific data to evaluate the safe range on daily Se intake for humans through natural Se-rich foods, and further develop management guidance on utilization of natural Se sources in China.

(Linxi Yuan & Gary Banuelos)

Society News

2019 COUNCIL ELECTIONS

ISSR Society Election Guidelines (2019)

(Approved by the Council on October 15, 2019)

1. Relevant content for election in the Bylaws

"*Officers are elected for a two-year term, and can be re-elected to the same position twice before needing to step down from that position for at least two years. All officers shall be nominated by the Election Committee and elected by the members. All members who have paid their biannual membership dues for the current calendar years are eligible to be nominated for the officer positions and also eligible to vote. The election will be organized by the election committee using electronic ballots."* **(4. Election)**
The Bylaws of International Society for Selenium Research can be found at:
http://www.seleniumresearch.org/index.php?option=com_content&view=article&id=15&Itemid=24

2. Election time

According to Bylaws, the society election shall be conducted every two years. Due to various limitations, the society election was delayed for four years after the establishment of the Society in 2013. The 2019 election will be conducted out in two weeks after the council has approved the election guidelines.

3. Election procedure

The society election will be conducted via an online election procedure using electronic ballots. All members who have paid their membership before November 10, 2019 (or the deadline of nomination) will be eligible for nominations and participation in the election. These members have the right to be nominated as candidates and have the right to vote for candidates. The electronic ballots will be cast anonymously. The election website administrators include Gary Banuelos, ZQ Lin and Xuebin Yin. The online election website is:
https://www.surveymonkey.com/.

4. Nomination procedure

Elected positions include President, two Vice-Presidents, Secretary, Treasurer, and five council members (see Society Bylaws). The members can self-nominate or nominate other person(s) for the available positions. The nomination needs to be forwarded via email to the Nominating Committee or Gary Banuelos (gary.banuelos@usda.gov), ZQ Lin (zhlin@siue.edu) and Xuebin Yin (xbyin@ustc.edu.cn) no later than November 10, 2019. The nominating committee will contact each nominee for his/her candidate consent.

5. Voting procedure

For each open position all nominated candidates will be included on the ballot. The online voting website will be open for 10 calendar days. For each nominated candidate an internet link to his/her personal website or a short biography (<300 words) will be sent to all voting members prior to the election.

6. Election result announcement

The election results or newly elected officers will be announced to all members and will also be posted on the Society's webpage.

7. List of ISSR members and Diversity Need

Current regular and student members can be found at:
http://www.seleniumresearch.org/index.php?option=com_content&view=article&id=17&Itemid=25. This list will be updated constantly with new members.

International Society for Selenium Research includes members in different disciplines of selenium research. The Society greatly values interdisciplinary selenium research among members and their presentation in the council. Thus, the Society encourages members to nominate and elect candidates in diverse fields of selenium research.

MEMBERSHIP

How to Become a Member?

Membership is open to all who are interested in fostering the expansion of communication and scientific exchange of new and emerging concepts centered within the multi-disciplines associated with current and future worldwide selenium research efforts. The membership will include regular, student and honorary members. A regular member has the right to elect, or to be elected, as an officer of the ISSR. To join the ISSR, individuals will need to complete the membership application form. The membership due for a regular member is $50 (USD) for a two-year membership, and $20 (USD) for a student member. For a lifelong membership the membership due is $300 (USD).

How to Pay Your Membership Fee?

The membership due of $50 (for a regular member for two years), $20 (for a student member for two years), or $300 (for lifelong membership) can be paid via the following

approaches: (1) The payment can be made in cash at the selenium conference; (2) The fund can be transferred through Western Union or other companies with money transfer service; (3) Remitting the payment in the form of a cashier's check, certified check, or money order payable to *International Society for Selenium Research*. A personal check in US currency will also be acceptable.

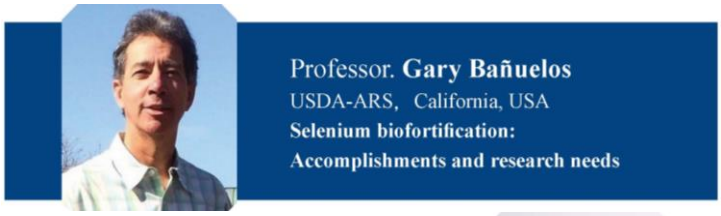
Please send your check or fund transfer notice to: Dr. Zhi-Qing Lin, Department of Environmental Sciences, 2165 Science West, Southern Illinois University, Edwardsville, Illinois 62026-1099, USA; Tel.: 1-618-650-2650; Email: zhlin@siue.edu

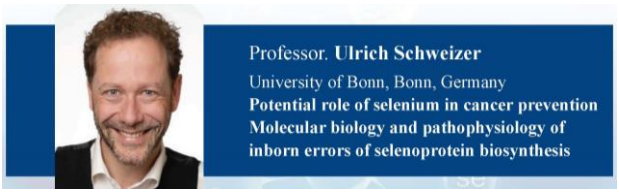
Scientific Program

6th International Conference on Selenium in the Environment and Human Health

October 27-30, 2019, Northwest A&F University, Yangling/Xian, China

Keynote Speakers





Day 1 (October 27, 2019) **Location: Yangling International Convention and Exhibition Center Hotel (YICECH)**		
13:00-22:00	Conference Registration	Location: Lobby
16:00-18:00	Welcome Reception (Appetizers will be provided); Introduction to International Society for Selenium Research (ISSR) Chair: Professor. Gary Bañuelos Professor. Zhi-Qing Lin	Location: Yangling International Convention and Exhibition Center Hotel, Meeting Room 2
18:00-19:00	Dinner, people stay in the University Guest Hotel will take bus at 19:00	Yangling International Convention and Exhibition Center Hotel
Day 2 (October 28, 2019) **Location: Northwest A&F University Conference Hall (Room 207)**		
Time	Presenter	Topic
8:15-9:15	Conference Chair: Dongli Liang Northwest A&F University, China Vice President of Northwest A&F University Vice mayor of Ankang City, Shaanxi President of ISSR: Gary Bañuelos USDA-ARS, USA	Opening Ceremony: Welcome Remarks Group Photo
Session 1 **Chair: Professor Joel Caton, USA**		
9:15-9:55	Gary Bañuelos USDA-ARS	Keynote: Selenium Biofortification: Accomplishments and Research Needs
9:55-10:15	Gijs Du Laing Ghent University, Belgium	Impact of Dietary Diversity on Se Intake Adequacy in Kenya
10:15-10:30	Coffee/Tea Break	

Session 2 **Chair: Associate Professor Xuebin Yin, China**		
10:30-10:50	Wenliang Wu China Agriculture University, China	Smart Technology Drives for Se-Agriculture
10:50-10:30	Li Li USDA-ARS, USA	Effects of Selenium Treatment on Sulfur Nutrition and Metabolism
11:10-11:30	Luiz Roberto Guimaraes Guilherme Universidade Federal de Lavras, Lavras, Brazil	Selenium Biofortification in Grain Crops in Brazil
11:30-11:50	Dongli Liang Northwest A&F University, China	Selenium Bioavailability in Soil-Plant System and Influential Factors
11:50-12:10	Milton Ferreira de Moraes Federal University of Mato Grosso, Brazil	Accumulation and Distribution of Se in Brazil Nut Tree
12:10-13:00	Lunch	Northwest A&F University Dining Room
13:00-13:30	Poster Presentations (Student poster presentations will be evaluated for the Best Student Poster Presentation Award)	
Location: Northwest A&F University Conference Hall (Room 208)		
Session 3 **Chair: Professor Zhengyu Bao,China**		
13:30-13:50	Nicholas Ralston University of North Dakota, USA (Zoom)	In a World Contaminated with Cd, Hg, and Other Electrophiles, We Need Dietary Se to Protect Us
13:50-14:10	Lenny Winkel Swiss Federal Institute of Aquatic Science & Technology; Swiss Federal Institute of Technology, Switzerland	Marine Biogenic Emissions as a Source of Terrestrial Selenium
14:10-14:30	Haibo Qin Chinese Academy of Sciences, China	Selenium Distribution and Speciation in Seleniferous Soils and Controlling Factors: Insights from Molecular Geochemistry
14:30-14:50	Rochana Tangkoonboribun Thailand Institute of Scientific and technological Research, Thailand	Selenium Distribution in Paddy and Banana Soils in Thailand
14:50-15:10	Kunli Luo Chinese Academy of Sciences, China	Distribution and Enrichment Patterns of Se during Geological Period in South China-Soil Se Distribution Characteristics and Geological Influential Factors
15:10-15:25	Coffee/Tea Break	

Session 4 **Chair: Professor Graham Lyons, Australia**		
15:25-15:45	Tao Yu China University of Geosciences, China	Safe Utilization and Zoning on Selenium-Enriched Land Resources: A Case Study
15:45-16:05	Julie Tolu Swiss Federal Institute of Aquatic Science & Technology; Swiss Federal Institute of Technology, Switzerland	Selenium Accumulation and Speciation in Soils along a Climate Gradient
16:05-16:25	Linxi Yuan Xi'an Jiaotong-Liverpool University, China	Effective and Safe Utilization on Natural Selenium Resources in China
16:25-16:45	Zhangmin Wang University of Science & Technology of China, China	Function Agriculture in China, the Present and the Future
16:45-17:05	Lianhe Zhang Henan University of Science & Technology, China	Physiological Characteristics of Selenite Uptake by Soybean
17:05-18:00	Happy Hour (Open Bar with Snacks)	University Dining Room, Yuanzhongyuan Restaurant
18:00-19:00	Dinner	Northwest A&F University Dining Room
19:00-21:40	Special Evening Session 12 Graduate Student Oral Presentations Presentations will be evaluated for the Best Student Oral Presentation Award Chair: Associate Professor Linxi Yuan, China	University Conference Hall (Room 208)
Day 3 (October 29, 2019) **Location: Northwest A&F University Conference Hall (Room 208)**		
Session 5 **Chair: Professor Lutz Schomburg, Germany**		
8:30-9:10	Ulrich Schweizer University of Bonn, Germany	Keynote: Molecular Biology and Pathophysiology of Inborn Errors of Selenoprotein Biosynthesis
9:10-9:30	Elias Arnér Karolinska Institute, Sweden	New Developments in Recombinant Selenoprotein Production
9:30-9:50	Zhen Huang Georgia State University, USA	Selenium Nucleic Acids for Biotechnology and Biomedicine
9:50-10:10	Peter Hoffmann University of Hawaii, Manoa, USA	The Role of Selenium and Selenoproteins in Immunity

10:10-10:25	Coffee/Tea Break	
Session 6 **Chair: Professor Elias Arnér, Sweden**		
10:25-10:45	Xingen Lei Cornell University, USA	Dual Roles of Se and Selenoproteins: Implications in Nutrition and Health
10:45-11:05	Lutz Schomburg Charité-Medical University Berlin, Germany	Biomarkers of Se Status
11:05-11:25	Roger A. Sunde University of Wisconsin-Madison, USA	Impact of High Dietary Se on the Selenoprotein Transcriptome, Selenoproteome, and Selenometabolites in Animals
11:25-11:45	Graham Lyons University of Adelaide, Australia	The Potential of Se-Biofortified Herbs as Antiviral Agents
11:45-12:05	Donglin Huang Northwest A&F University, China	Agronomic Se Biofortfication Increases Dietary Intake of Residents in Keshan Disease Area on Loess Plateau
12:05-13:00	Lunch	University Dining Room, Yuanzhongyuan Restaurant
13:00-13:30	Poster Presentations	(Student poster presentations will be evaluated for the Best Student Poster Presentation Award)
Session 7 **Chair: Professor Wenliang Wu, China**		
13:30-13:50	Marc Berntssen Institute of Marine Research, Norway (Zoom)	Se Supplementation to Salmon Feeds: Speciation, Toxic Mode of Action and Safe Limits
13:50-14:10	Joerg Feldmann University of Aberdeen, UK	Selenium Speciation Analysis Must Cover Also Nanoparticles in Biological Samples: from Fungi to Pilot Whales
14:10-14:30	Zhengyu Bao Zhejiang Institute, China University of Geosciences, China	Reference Materials of Selenium-Rich Rocks and Soils
14:30-14:50	Zhi-Qing Lin Southern Illinois University – Edwardsville, USA	Biotransformation and Volatilization of Nanoscale Elemental Selenium
14:50-15:10	Philip White James Hutton Institute, UK	The Genetics of Selenium Accumulation by Plants
15:10-15:25	Coffee/Tea Break	
Session 8 **Chair: Professor Peter Hoffmann, USA**		
15:25-15:45	Michela Schiavon University of Padova, Italy	Unravelling the Complex Trait of Plant Selenium Hyperaccumulation: Advances in Research on Potential Candidate Genes Involved
15:45-16:05	Andre de Reis São Paula State University, Brazil	Impact of Se Application on Se and Phytic Acid
16:05-16:25	Huafen Li China Agriculture University, China	Effect of Se on the Uptake and Translocation of Heavy Metals in Plants
16:25-16:45	Shuxin Tu Huazhong Agriculture University, China	The Role and Mechanisms of Selenium in Plant Heavy Metal Detoxification
16:45-17:05	Xiaohu Zhao Huazhong Agriculture University, China	Selenium Protects Oilseed Rape against Sclerotinia Sclerotiorum Attack
17:30-20:00	Banquet	Buses transport guests to Exhibition Center
Day 4 (October 30, 2019) **Location: Northwest A&F University Conference Hall (Room 208)**		
Session 9 **Chair: Professor Xingen Lei, USA**		
8:30-9:10	David Hughes University of Dublin, Ireland	Keynote: Potential Role of Selenium in Cancer Prevention
9:10-9:30	Peko Tsuji Towson University, USA	Selenium-Mediated Epigenetic Regulation in Colon Cancer
9:30-9:50	David J. Waters Purdue University, USA	How U-Shaped Thinking Informs Future Research on Selenium and Cancer Prevention
9:50-10:10	Zhi Huang Jinan University, China	Poria cocos Polysaccharide Decorated Selenium Nanoparticles Attenuate Colitis by Suppressing Hyper Inflammation
10:10-10:25	Coffee/Tea Break	
Session 10 **Chair: Professor Gijs Du Laing, Belgium**		
10:25-10:45	Qian Sun Charté-Medical University, Berlin	Autoimminity to Selenoprotein P in Thyroid
10:45-11:05	Yongmin Xiong Xi'an Jiaotong University, China	Study on the Mechanism of Selenium and Selenoproteins in Kaschin-Beck Disease

11:05-11:25	Joel Caton North Dakota State University, USA	Maternal Dietary Selenium Supply and Off Spring Developmental Outcomes
11:25-11:45	Jean Hall Oregon State University, USA	Selenium Supplementation Strategies for Livestock, with Focus on Agronomic Biofortification
11:45-12:05	Gary Bañuelos USDA-ARS, USA	Closing Words Student Presentation Awards Professor Lutz Schomburg: 2022 Berlin Conference Presentation
12:05-12:40	Lunch	Northwest A&F University Dining Room
13:00-14:00	Natural Biofortification Program (NBP) Discussion (Open to All)	Northwest A&F University Conference Hall (Room 208)
14:10-18:30	The 1st International Intelligent Agricultural Technology Innovation Summit of Ecology and Nutrient Intensification	Northwest A&F University Conference Hall (Room 207) (Invited Attendees Only)
14:30-17:00	City Tour (Yangling)	
17:00-18:00	Happy Hour (Open Bar with Snacks)	Northwest A&F University Dining Room
18:00-19:00	Dinner	Northwest A&F University Dining Room
Special Session: Student Oral Presentations **Day 2 (October 28, 2019)** **Chair: Associate Professor Linxi Yuan, China**		
Time	Presenter	Topic
19:00-19:12	Aryeh Feinberg ETH Zürich, Switzerland	Modelling Atmospheric Selenium Transport and Deposition on a Global Scale
19:12-19:24	Hongyu Zhang China University of Geosciences	Effects of Humic Acid on Selenium and Cadmium Uptake in Rice Seedlings
19:24-19:36	Jun Li Gent University, Beligum	Exploration of Selenium-Rich Bioproducts Generated from (Waste) Water as Micronutrient Fertilizers
19:36-19:48	Raza FAROOQ University of Science and Technology of China	Topsoil Selenium Distribution in Dry Arable Land of Zhongwei, Ningxia, China
19:48-20:00	Fei Zhou Northwest A&F University, China	Speciation and in Vitro Bioaccessibility of Selenium in Se-enriched Mushroom
20:00-20:12	Lenardo Lima Colorado State University, USA	Mechanisms of Selenium Hyperaccumulation in *Stanleya pinnata*: Exploring the Roles of SpSultr1;2 and SpAPS2
20:12-20:24	Coffee/Tea/Snack Break	
20:24-20:36	Saeed Ahmad University of Nottingham, UK	Selenium Biofortification of a Wheat Crop in North-east Pakistan Using ^{77}Se as a Trace
20:36-20:48	Chandnee Ramkissoon The University of Nottingham, UK	Effect of Soil Properties and Contact Time on Selenium Transfer to Wheat
20:48-21:00	Shizhong Yue China Agriculture University, China	Selenium Enriched Earthworm: A Potential Selenium Supplement for Animals or Humans
21:00-21:12	Xueyun Mao Yangzhou Univeristy, China	Selenium Negatively Regulates the Growth of Fusarium graminearum and Mycotoxin Production
21:12-21:24	Julian Hackler Charite - Berlin, Institute für Experimentelle Endokrinologie, Germany	Commonly Used Drugs Affect Hepatic Selenium Metabolism
21:24-21:36	Baorong Li Xi'an Jiaotong University, China	Study on the Mechanism of GPX3 and Selenium in Kashin-Beck Disease