Tribun EU
2011

Publisher: Tribun EU s.r.o., Gorkého 41, Brno 602 00, Czech Republic
Editors: Prof. Josef Köfer, Dr. Hermann Schobesberger
Layout: AGES COM, Dr. Klaus Hasler, Sylvia Stepanek, Magdalena Zeger, Sybille Meier
First Edition, Brno 2011
Volume I

ISBN 978-80-263-0008-3
(Volume II ISBN 978-80-263-0009-0, Volume III ISBN 978-80-263-0012-0)

XV ISAH Congress 2011

Proceedings of the XVth International Congress of the
International Society for Animal Hygiene

"Animal Hygiene and Sustainable Livestock Production"

Innovations in Hygiene, Nutrition and Housing
for Healthy Food from Healthy Animals

International Society for Animal Hygiene

University of Veterinary Medicine, Vienna
Austrian Agency for Health and Food Safety
Austrian Federal Ministry of Health

Supporters of XV ISAH Congress 2011 in Vienna, Austria

In alphabetical order:

Alltech Animal Nutrition, EU
Bayer Healthcare, Animal Health, Leverkusen
BIOMIN Holding GmbH, Herzogenburg
Klifovet AG, Munich
Intervet GesmbH, Vienna
Lohmann Animal Health, Cuxhaven
Merial SAS, Vienna
Svanova Biotech AB / Adiagene France – Biomedica Group Austria

Special thanks to

The Professor Tielen Foundation

Agency for Health and Food Safety AGES, Vienna
Federal Ministry of Health, Vienna
University of Veterinary Medicine Vienna

Preface

More than 40 years after the foundation of the International Society for Animal Hygiene, ISAH, in Hungary 1970, and 31 years after the IIIrd ISAH International Congress in Vienna, 1980, it is our great honor and pleasure – and challenge – to welcome you to participate in the XVth International Congress on Animal Hygiene ISAH 2011, again in the lovely capital of Austria, Vienna. It is also our great pleasure to honour this time one of the founding members of ISAH and former congress president of III ISAH 1980, late Professor Dr. Hermann Willinger, with a special memorial lecture during the opening ceremony of this congress.

The motto of XV ISAH 2011 is "Animal Hygiene and Sustainable Livestock Production" and puts the focus of the congress right into the centre of the three principle domains of ISAH, namely preserving animal health, human health and the health of the environment. The congress therefore gives emphasis to all recent, novel and innovative research on animal hygiene, animal health and welfare and sustainable livestock production. Special focus of XV ISAH 2011 lies on the interaction of animal hygiene and veterinary public health. Particular attention will be paid to prevention strategies against the development and spread of diseases and pathogens in animals including those that pose a risk to human health (zoonoses). Other important topics of the conference are environmental implications of livestock production as well as all other related impact on natural resources, in particular water, air, and soil resources. Animal by-products and waste management and the associated issues of microbiological safety, round up the major conference themes.

The International Society for Animal Hygiene (ISAH) is an association of veterinarians and other professional scientists, practitioners and students working in the field of animal health and welfare, animal hygiene, biosecurity, safety of food of animal origin, environmental protection in relation to animal production and related areas. ISAH is a highly international organisation with members in 51 countries all over the world.

This two volume book of the XV ISAH Congress 2011 proceedings presents papers of lectures from invited speakers, oral and poster presentations held in 27 parallel sessions, 2 special sessions and a joint OIE/FAO - ISAH symposium.

The realisation of such a congress requires the help and input of many people, and we hereby would like to express our deep thanks to all who contributed to make XV ISAH 2011 a memorable event. Our most sincere gratitude goes to the XV ISAH 2011 Organising Committee, the Scientific Committee and the Executive Board of ISAH.

Our special thanks are reserved to our host, the University of Veterinary Medicine Vienna, namely Rector Dr. Sonja Hammerschmid and her fellow rectorate and the involved university services. Our gratitude also goes to Minister of Health Alois Stöger and the Austrian Ministry of Health, and to AGES Chief Executives Dr. Bernhard Url and Dr. Heinz Frühauf, and the Austrian Agency for Health and Food Safety for functioning as co-hosts and co-organisers of this congress. We also thank them and Mayor Dr. Michael Häupl and the City of Vienna, specifically its Vienna Convention Bureau, for their generous support and sponsorship. Big thanks go also to all our other supporters from industry and business and all those that opened their premises for our technical tours. An excellent job was done by Tribun EU s.r.o., Brno, again printing these proceedings in high quality.

We would also like to thank all the many helping hands, most prominently the competent experts of Austropa Interconvention, Vice-Director Alfred Kerschenbauer and PCO Claudia Stelzer and the AGES Teams AKAD around Dr. Friedrich Polesny and Mag. Christoph Unger, and COM around Dr. Klaus Hasler and Sylvia Stepanek for invaluable help and indefatigable support. Thanks also to Mag. Ulla Winkler, Dr. Sabine Wanda and Dr. Friederike Hilbert for their help on the way. Special appreciation and big thanks go also to the office of Prof. Hartung at TiHo Hannover, Ms. Petra Sommer, Ms. Ebru Jackson and Ms. Dipl. biol. Annette Clauß who contributed ideas and organisational skills.

Last not least, it is our privilege to thank all participants, contributors, chairpersons, organisational and technical assistance for their considerable efforts and inputs. Special thanks also to Prof. Martin Tielen and the Professor Tielen Foundation for their generosity enabling indigenous students from Overseas to attend this conference.

We do hope the congress will provide to you all a unique opportunity to present recent research results, to meet and get together with international experts and professionals, to discuss interesting results and ponder new problems in a stimulating intellectual atmosphere and last not least to enjoy the charms of a world famous capital and its beautiful surroundings

Prof Josef Köfer,
Dr. Hermann Schobesberger,
Organisers of XV ISAH 2011 Organising Committee

Scientific Committee	Organising Committee	ISAH Executive Board
Prof. Andres Aland	Prof. Josef Köfer	President:
Prof. Bo Algers	Dr. Hermann Schobesberger	Prof. Jörg Hartung
Prof. Thomas Banhazi	Dr. Claudia Binter	
Dr. Daniel Berckmans	DI Anka Lorencz	Vice Presidents:
Prof. Thomas Blaha	Prof. Friedrich Schmoll	Prof. Andres Aland
Dr. Christian Griot		Prof. Josef Köfer
Dr. Stephan Gunnarsson		
Prof. Jörg Hartung	Austropa:	EB Members:
Prof. Josef Köfer	Vice Dir. Alfred Kerschenbauer	Prof. Thomas Banhazi
Dr. Laszlo Könyves	PCO Ms. Claudia Stelzer	Dr. Stephan Gunnarsson
Dr. Francois Madec		Dr. Laszlo Könyves
Prof. Norbert Nowotny	AGES Akademie:	
Prof. Günther Schauberger	Dr. Friedrich Polesny	
Prof. Friedrich Schmoll	Mag. Christoph Unger	
Prof. Martin Tielen		
Prof. Josef Troxler	AGES COM:	
Dr. Jan Venglovsky	Dr. Klaus Hasler	
Prof. Martin Wagner	Ms. Sylvia Stepanek	

Contents

Volume I

Block 2 - Tuesday, July 5, 11:00 – 12:30

Wednesday, July 6

Session 5.4. Pathogens in exotic regions

Block 6 - Wednesday, July 6, 14:00 – 15:30

Session 6.1. Feed additives

Session 6.2. Ruminant Health

Session 6.3. (MR)SA

Volume II

Part IV Poster Presentations

Tuesday, July 5

Volume III

Part IV Poster Presentations

Wednesday, July 6

ANIMAL HYGIENE AND SUSTAINABLE LIVESTOCK PRODUCTION: IMPACT OF GROUND WATER CONTAMINATION WITH ARSENIC

Ranjith, L., Shukla, S. P., Vennila A., Purushothaman C. S.

Aquatic Environment and Health Management Division,
Central Institute of Fisheries Education, (ICAR), Mumbai, India

SUMMARY

There is a growing concern all over the world about contamination of ground water with Arsenic. One of the major repercussions of arsenic contamination is degradation of animal hygiene that ultimately affects sustainable livestock production. The reports suggest that concentration of Arsenic in ground water of twenty one countries is well above the guideline values. Use of such contaminated water for animal husbandry and livestock production compromises with the hygienic value of animal products. Therefore, there is an urgent need to develop low cost treatment technologies for reducing the level of arsenic in ground water to maintain the hygiene and sustainability of livestock production. Most of the traditional treatment technologies are costly and less effective in reducing arsenic concentration to safer limits. Therefore, during present study, an attempt was made to design a low-cost algal adsorbent based filtration unit consisting of polyurethane columns with entrapped algal adsorbents. The column was made of adsorbents of algal origin like agar-agar, alginic acid, calcium alginate and *Spirulina platensis* biomass entrapped in polyurethane foam matrix. The performance of the column was assessed in terms of removal efficiency and the quantity of metal sequestered in unit time interval. The results from the study the show that algal biosorbents and *S. platensis* biomass combination has a capacity to adsorbed arsenic from aqueous solution. The simple design, easy fabrication and no energy requirement for the operation of the filtration unit developed under the present study is suitable to rural areas where arsenic contamination of ground water is adversely affecting the animal hygiene and sustained livestock production.

INTRODUCTION

Environmental Protection Agency and the World Health Organization listed arsenic is a metalloid and ranks 20th in natural abundance, comprising about 0.00005% of the earth's crust, 14th in the seawater and 12th in the human body (Mandal and Suzuki, 2002). High arsenic concentrations have been reported recently from 21 countries including USA, China, Chile, Bangladesh, Taiwan, Mexico, Argentina, Poland, Canada, Hungary, Japan and India (Mohan and Pittman, 2007). An arsenic concentration of 10 µg/l has been recommended by World Health Organization (2008) as a guideline value for drinking water.

Ground water is one of the most important sources of drinking water and contamination of ground water with arsenic is one of the serious problems encountered in India. Arsenite and arsenate compounds are highly toxic to human beings as well as animals (Singh *et al*., 2005). Chronic exposure to arsenic concentrations above 100 µg/l can cause vascular disorders, such as abnormality in dermal pigments (Blackfoot disease) and skin, liver and lung cancer in human beings (Wang *et al*., 2001).
The tolerance level of arsenic varies from animal from animals in age, sex, physiological status, nutritional status, route of exposure and biological availability (Sarder, 2004) The arsenic concentrations in the water could affect human health through milk intake, since the allowable limit for water used to feed cattle is 0.05 mg/ L (USEPA, 1973).
It is clear that arsenic pollution is creating havoc to animal hygiene and sustainable livestock production. There is an emergent need for the removal of arsenic from groundwater and domestic wastewater containing arsenic which has been directly or indirectly used for the sustainable livestock production and their products. Adsorbents of algal origin consist of metals/metalloids binding groups like amino, carboxyl, sulfhydryl etc., which can adsorb the metals/metalloids from aqueous solution. Therefore, the present study aims to develop a low cost and feasible technology for the removal of arsenic using polyurethane blocks loaded with adsorbents of algal origin like agar-agar, alginic acid, calcium alginate, and *S. platensis* dry biomass. Use of these adsorbents in column mode can provide a cost-effective technology for remediation of metals/metalloids including arsenic which is used for animal hygiene and sustainable livestock production.

MATERIALS AND METHODS

Unialgal culture of cyanobacterium, *Spirulina platensis* was obtained from Algal culture laboratory of Central Institute of Fisheries Education (CIFE), Mumbai. The pure culture was sub-cultured in Zarrouk's medium (Zarrouk, 1966) under photoautotrophic conditions. The outdoor mass cultivation was done under natural conditions when solar

radiation reaching the surface of culture was between 2160 and 8450 lux, and temperature ranged from 27 to 34 °C to generate sufficient biomass for the experiment. Designing and preparation of fixed-bed column filtration unit explained in detail in the paper Ranjith *et al*., 2011. The column-bed adsorption study was carried out for 25, 50, 75 and 100 µg/L initial concentrations for an hour. Water samples were digested using a microwave-based closed vessel (Anton Parr, USA) and analyzed by FI-HG-AAS, flow injection-hydride generation atomic absorption spectrometry (AAnalyst 800, Perkin Elmer, USA). The removal efficiency at 30-minute and 60-minute intervals of different column-beds was calculated using Amin *et al*., 2006 equation. The biosorption capacity of the biomass combinations was calculated by using Zhang and Banks, 2006 equation.

RESULT

The observations recorded during the study show that the removal efficiency of Arsenic after 60 minutes treatment time varied from 0.7% to 45% for 25 to 100 µg/l initial concentrations in a cycle of operation with the flow rate of four litres per hour. The best removal efficiency of Arsenic was exhibited by a combination of agar-agar and *S. platensis* biomass which is 27% higher than the agar-agar alone at 25 µg/l initial concentration. The biosorption capacity of Arsenic varied from 108 to 694 µg/g adsorbent for 25 to 100 µg/l initial concentrations and the highest value (694 µg/g) was recorded for agar-agar and *S. platensis* biomass combination.

DISCUSSION

Polyurethane was selected for the present study on the basis of its characteristics like low cost, easy availability of the material in the local market, possibility of up-scaling of the volume of water to be treated, long shelf-life, resistant to heat sterilization, suitable for the entrapment of the algal biomass and its chemical stability in water.

The selection of algal compounds for present study was based upon the earlier reports (Awasthi and Rai, 2006; Bajpai *et al*., 2006). However, in contrast to calcium alginate which is the most commonly used algal compound for immobilization of algae, the reports on the use of alginic acid and agar-agar are very few. Therefore, an attempt was made in this study to assess the biosorption capacities of these compounds along with dehydrated biomass of *S. platensis.*

The alga *S. platensis* used in present study was selected based on the characteristics like fast growing capacity, availability of sufficient base line information about the cultivation techniques and the supply of biomass in required quantity for the column bed preparation and treatment of water will be ensured.

The column bed reactor designed was constructed by low cost materials like polyurethane, PVC pipes, nylon cloth and the average cost of a unit (unit of capacity of 4 liter/hour flow rate.) was calculated to be approximately US $ 11 to 13. The unit can be easily fabricated using household tools and require little technical skills; however the entrapment of the algal compounds and biomass of *S. platensis* requires a small setup with weighing and drying facilities. Thus, it is suggested that PU loaded with appropriate quantity of algal compounds and *S. platensis* biomass can be produced in a separate unit and supplied in the market at reasonable price. The dried *S. platensis* powder is available at a price of US $ 9 to 11 per kg can be used for the column preparation as the cultivation of *S. platensis* is a cumbersome process. Though, this will enhance the cost of construction of the filtration unit but considering the small quantity of the algal compounds and *S. platensis* biomass required for column bed preparation, the overall cost will not vary to a great extent.

CONCLUSION

Few studies have been accomplished on biosorption of arsenic using immobilized algal biomass. Therefore, present work will provide baseline information about the potentialities of algal adsorbents, *S. platensis* biomass immobilized on the PUF matrix at different environmental conditions. So, considering the growing menace of arsenic pollution in various parts of the country the proposed filtration unit would help to reduce arsenic in the water discharged from household after its use in various domestic purposes which adversely affecting the animal hygiene and sustained livestock production.

REFERENCES

1. **AWASTHI, M.; RAI, L.C. (2006):** Interactions between zinc and cadmium uptake by free and immobilized cells of *Scenedesmus quadricauda* (Turp.) *Breb.* Acta. Hydrochim. Hydrobiol. **34**, 20–26.
2. **BAJPAI, J.; SHRIVASTAVA, R.; BAJPAI, A. K. (2004):** Dynamic and equilibrium studies on adsorption of Cr (VI) ions onto binary biopolymeric beads of cross-linked alginate and gelatin. Colloid Surf. A: Physicochem. Eng. Aspects, **236**., 83-92.
3. **MANDAL,B.K.; SUZUKI, K.T. (2002):** Arsenic round the world: a review, Talanta., **58**, 201–235.
4. **MOHAN, D. B.; PITTMAN C. U. (2007):** Arsenic removal from water/waste water using adsorbents-A critical review. J. Hazard. Mater., **142**, (1-2), 1-53.
5. **RANJITH, L. (2009):** A study on biosorption of arsenic and copper on physically entrapped biomass of *Spirulina platensis.*, A M.F.Sc. Dissertation submitted to Central Institute of Fisheries Education, Indian Council of Agricultural Research, Mumbai.
6. **RANJITH, L.; SHUKLA, S. P.; VENNILA, A.; PURUSHOTHAMAN, C. S.; LAKSHMI, M. S.; ARUNA, S.; PADMANABHAN, A. K. (2011).** An assessment on *Spirulina platensis* as a biosorbent for Arsenic removal. *Water Science and Technology: Water Supply.* **11** (doi:10.2166/ws.2011.020)
7. **SARDER, P. (2004):** Chronic arsenicosis in chicken and common carp (*Cyprinus carpio* L.) and its remedial measures through nutritional manipulation. A PhD thesis submitted to West Bengal University of Animal & Fishery Sciences, West Bengal.
8. **SINGH, R.B.; SAHA, R.C.; MISHRA, R.K. (2005):** Arsenic profile of livestock livestock feedsand livestock products in West Bengal. A report of National Dairy Research Institute, Kalyani, Nadia, West Bengal, India.
9. **USEPA (1973):** Water Quality Criteria, Ecological Research Series, Washington, D.C.
10. **WANG, W.; YANG, L.; HOU, S.; TAN, J.; LI, H. (2001):** Prevention of endemic arsenism with selenium. Curr. Sci., 18:1215-1218.
11. **WORLD HEALTH ORGANIZATION (2008):** Guidelines for drinking-water quality- incorporating first and second addenda, Recommendations, 3rd ed., World Health Organization, Geneva., **1**, 194 & 306.
12. **ZARROUK, C. (1966):** Contribution a lÕ.tude du cyanophyc.e. Influence dev divers facteurs physiques et chimiques sur la croissance et la photosynth se de *Spirulina maxima* (Setch et Gardner) Geitl., PhD Thesis, Paris.