CV

Dr. Minashree Kumari

Environmental researcher seeking opportunities in research and academic sector.

Carrier objectives:

Ambitious and hardworking environmental professional. To pursue a challenging career and be part of a progressive organization that gives scope to enhance my knowledge, skills and to reach the pinnacle in the teaching and research field with sheer determination, dedication, and hard work.

Research interests:

I have an interdisciplinary background comprising of Life sciences, Biotechnology and, Environmental Sciences. My area of expertise is drinking water treatment, wastewater treatment, disinfection by-products (trihalomethanes), emerging contaminants, risk assessment, and predictive modeling. My specific interest lies in water and wastewater treatment, fate and transport of pollutants, emerging contaminants (detection, treatment, environmental and human health effects), nanomaterials, environmental chemistry, and environmental biotechnology.

❖ Educational Qualifications

Ph.D.:	**Environmental Sciences from** Indian Institute of Technology (Indian School of Mines) Dhanbad, Jharkhand, India on the topic entitled **"Risk assessment, modeling and control of trihalomethanes (THMs) from drinking water" (July 2013-March 2017),** date of award: 31.03.2017
Post-Graduation:	**M.Sc. (Biotechnology) [2006-2008],** Vinoba Bhave University, Hazaribag, Jharkhand, INDIA, Percentage-73.17%, date received: 13.08.2008
Graduation:	**B.Sc. (Zoology) Hons [2001-04],** Vinoba Bhave University, Hazaribag, Jharkhand, INDIA, Percentage: 73.875 %, date received: 31.06.2004
XIIth	**C.B.S.E Board [2000],** Kendriya Vidyalaya Dhanbad, Jharkhand, INDIA, Percentage: 67.5 %, date received: 31.05.2000
Xth	**C.B.S.E Board [1998]**, Kendriya Vidyalaya Dhanbad, Jharkhand, INDIA, Percentage: 66.6%, date received: 15.06.1998

❖ Publications

➢ Book

Minashree Kumari. 2016. Transfer and expression of plasmids from antibiotic resistance bacteria. Lambert Academic Publishing, Germany, 978-3-659-92928-1.

➢ Book Chapter

- **Kumari, Minashree,** Gupta, S.K. (2016). "Multi-pathway risk assessment of trihalomethanes exposure in drinking water supplies" In: *Recent Trends in Asian Water Environment and Technology, Ed. AL. Ramanathan, Absar Kazimi, Futoshi Kurisu and Manish Kumar*. Springer Publication, ISBN: 978-93-81891-28-5. [Citation: 1], https://www.springer.com/gp/book/9783319392578.
- Gupta, S.K., **Kumari, Minashree.** (2013). Factors influencing the formation of trihalomethanes in drinking water supplies. Strategic Technologies of Complex Environmental issues: A Sustainable Approach. ISBN: 978-93-83083-85-5, p225-231.www.krishisanskriti.org/vol_image/10Sep201512095436.pdf [Citation: 1]
- **Kumari, Minashree,** Gupta, S.K. "Trihalomethanes (THMs) in Wastewater: Causes and Concerns", In Cost-efficient Wastewater Treatment Technologies**, Accepted, Springer Publications**

➢ Articles Papers in Peer reviewed International Refereed Journals, SCI listed (Published), Total Citations: 149; h-index: 7 (as per google scholar) [Total Impact Factor: 49.74] *Corresponding author

1. **Kumari, Minashree***., Kumar, A. (2021). Can pharmaceutical drugs used to treat Covid-19 infection leads to human health risk? A hypothetical study to identify potential risk. Science of the Total Environment, 778, 146303 **(IF 6.55).**
2. Anchal, P., **Kumari**, **Minashree***., Gupta, S.K. (2020). Human health risk estimation and predictive modeling of halogenated disinfection by- products (chloroform) in swimming pool waters: A case study of Dhanbad, Jharkhand, India. Journal of Environmental Health Science & Engineering, **18**, 1595-1605 **(IF 2.179).** DOI: 10.1007/s40201-020-00578-6. ISSN 2052-336X.
3. **Kumari, Minashree***., Kumar, A. (2020). Identification of component-based approach for prediction of joint chemical mixture toxicity risk assessment with respect to human health: A critical review. Food and Chemical Toxicology, 143, 111458. (**IF 4.679)** ISSN: 0278-6915 [Citation: 4]
4. **Kumari, Minashree***., Gupta, S.K. (2020). Water quality assessment, Statistical analysis and kinetics of trihalomethanes (THMs) formation in drinking water supplies - A complete batch study. *Environmental Engineering and Management Journal*, Vol. 19 Issue 3, 427-438. 12p. **(IF 1.18)** ISSN: 1582-9596 [Citation: 1]
5. **Kumari, Minashree***., Kumar, A. (2020). Human Health risk assessment of antibiotics in binary mixtures for finished drinking water. *Chemosphere*, 240, 124864. ISSN: 0045-6535 **(IF 5.778)** [Citation: 14]
6. **Kumari, Minashree***., Gupta, S.K. (2020). A novel process of adsorption cum

enhanced coagulation flocculation spiked with magnetic nanoadsorbents for the removal of aromatic and hydrophobic fraction of NOM along with turbidity from drinking water. *Journal of Cleaner Production*, 244, 118899, ISSN: 0959-6526. DOI: 10.1016/j.jclepro.2019.118899 (**IF 7.246)** [Citation: 15]

7. **Kumari, Minashree***., Gupta, S.K. (2019). Response surface methodological (RSM) approach for optimizing the removal of trihalomethanes (THMs) and its precursor's by surfactant modified magnetic nanoadsorbents (sMNP) - An endeavor to diminish probable cancer risk. *Scientific Reports (Nature journal)*, 9, 18339 (**IF 3.99)** ISSN 2045-2322 [Citation: 8]
8. **Kumari, Minashree*** & Gupta, S.K. (2018). Removal of aromatic and hydrophobic fractions of natural organic matter (NOM) by surfactant modified magnetic nanoadsorbents (MNPs). *Environmental Science and Pollution Research*, 25(25):25565-25579. DOI: 10.1007/s11356-018-2611-0 (**IF 3.056**). ISSN 0944-1344 [Citation: 10]
9. **Kumari, Minashree*** & Gupta, S.K. (2018). Age dependent adjustment factor (ADAF) for the estimation of cancer risk through trihalomethanes (THMs) for different age groups- A innovative approach. *Ecotoxicology and Environmental Safety*, 148, 960-968. Elsevier, (**IF 4.872**). ISSN: 0147-6513 [Citation: 6]
10. Ali. S., **Kumari, Minashree**., Gupta, S.K., Sinha, A., Mishra, B. K. (2017). Investigation and mapping of fluoride endemic areas and associated health risk - A case study of Agra, Uttar Pradesh, India. Human and Ecological Health Risk Assessment, 23 (3), 590-604. http://dx.doi.org/10.1080/10807039.2016.1255139. ISSN: 1080-7039 **(IF 2.3).** [Citation: 9]
11. **Kumari, Minashree**., Gupta, S.K., & Mishra, B.K. (2015). Multi-exposure cancer and non-cancer risk assessment of trihalomethanes in drinking water supplies – A case study of Eastern region of India. *Ecotoxicology and Environmental Safety*, 113, 433–438. ISSN: 0147-6513. Elsevier (**IF 4.872**). [Citation: 50]
12. **Kumari, Minashree** & Gupta, S.K. (2015). Modelling of trihalomethanes in drinking water supplies – A case study of Eastern region of India. *Environmental Science and Pollution Research*, 22:12615-12623. ISSN: 0944-1344. Springer (**IF 3.056**). [Citation: 32]

- **Papers in Non-Refereed Journals (Published)**

(a) International

i. **Kumari Minashree,** Kumar Arun (2020). Human health risk due to exposure of ciprofloxacin in drinking water samples of Yamuna River, India. International Research Journal of Pharmacy and Pharmacology, 8(2), Presented at the 7th World congress and Exhibition on Antibiotics and Antibiotics Resistance, London, UK, March 2020 [Virtual presentation]

ii. **Kumari, Minashree** & Gupta, S.K. (2015). Speciation and kinetics of trihalomethanes formation in drinking water. International conference on Geo-Engineering and climate change technologies for sustainable environmental management, MNNIT Allahabad, October 9-11, 2015. Science &Technology, 1(4), 157-163. ISSN 2394-3750.

(b) National

Gupta, S.K., **Kumari, Minashree**. (2013). Factors influencing the formation of trihalomethanes in water treatment plants in Eastern India. MINENVIS, ISSN: 0972-4648, 78, p1-6.

➢ Papers in Conference Proceedings (International/National)

1. **Kumari, Minashree** and Gupta, S.K. (2016). Adsorption of NOM by iron oxide magnetic nanoparticles: Synthesis, kinetics and isotherms. 10th World Aqua Congress, November 24-25, 2016, New Delhi, India. Proceeding, p267-280.
2. **Kumari, Minashree**., Gupta, S.K. (2015). Modelling of trihalomethanes drinking water supplies-a case study of eastern region of India. Annual conference and exposition, American Water Works Association (AWWA), Anaheim, California, United States of America, June 7-10, 2015, *Proceedings.*
3. **Kumari, Minashree**., Gupta, S.K. (2015). Use of nanoparticles for the removal of trihalomethanes in drinking water supplies-a review. National workshop on challenges and opportunities for management of water supplies in rural areas, Department of Environmental Science & Engineering, January 23-24, 2015, IIT (ISM) Dhanbad, *Proceedings*, p164-169.
4. **Kumari, Minashree**., Gupta, S.K. (2015). Seasonal variation and correlations of trihalomethanes in drinking water supplies. 102nd Indian science Congress, University of Mumbai, January 3-7, 2015, *Proceedings*, p196-197.
5. **Kumari, Minashree**., Gupta, S.K. (2013). Multipathway risk assessment of trihalomethnaes in drinking water supplies. 1st International Forum on Asian water technology, JNU Convention Centre, December 18-20, 2013, *Proceedings*, p64-65.
6. **Kumari, Minashree**., Gupta, S.K., & Mishra, B.K. (2012). Chlorination by- products formation and their removals from drinking water. National conference on sustainable development of ground water resources in industrial region (SDGRIR 2012), Department of Environmental Science & Engineering, IIT (ISM) Dhanbad, March 22-23, 2012, *Proceedings*, p120-129.

➢ Papers presented in Conferences/Seminars/ Workshops but not published

1. **Kumari, Minashree**., Kumar, A. "Health risk assessment of drugs used for the treatment of novel coronavirus, COVID-19: Lopinavir, ritonavir, and azithromycin". Society for Risk Analysis (SRA), Texas, USA, December 13-17, 2020.
2. **Kumari, Minashree**., Gupta, S.K. (2014). Factors influencing the formation of disinfection by-products in Eastern part of India. International conference on Energy Technology, Power Engineering and Environmental Sustainability (ETPEES-2014), JNU New Delhi, June 21-22, 2014. *Souvenir & Abstracts*, p16.
3. **Kumari, Minashree**., Gupta, S.K. (2014). Concentration and correlations of trihalomethanes in drinking water systems from an exposure assessment perspective. National conference on Harmony with Nature in context of environmental issues and challenges of 21st century (HARMONY 2014), Department of Environmental Sciences,

Faculty of Earth Sciences, Mohan Lal Sukhadia University, Udaipur, Rajasthan, November 28-30, 2014, *Souvenir & Abstracts*, p59.

4. **Kumari, Minashree**., Gupta, S.K. (2012). Disinfection by-products formation and their removals from drinking water- A review. UGC sponsored National seminar on Biodiversity: Its conservation and sustainable development for human welfare, Department of Zoology, VBU Hazaribag, April 7-9, 2012, *Souvenir & Abstracts*, p74.
5. **Kumari, Minashree**., Gupta, S. K. (2012). Chlorination by-products formation and their removals from drinking water-a review. National conference on environmental problems and their remedial measures (EPRM-2012), Department of Environmental Science, Ch. Charan Singh University, Meerut, March 24-26, 2012, *Souvenir & Abstracts*, p27.
6. **Kumari, Minashree**., Gupta, S.K. (2012). Factors influencing the formation of disinfection by-products in Eastern part of India. International conference on Anthropogenic Impact on Environment and Conservation Strategy, Department of Zoology, Ranchi University, November 2-4, 2012. *Souvenir & Abstracts*, p16.

➢ Papers submitted/under review in Peer Reviewed International Journals

1. **Kumari**, **Minashree***., Gupta, S.K. Trihalomethanes in drinking water: factors, risk and associated guidelines-A systematic review. Science of The Total Environment. Under review *(Corresponding author)*.
2. **Kumari, M*., Kumar. A.** Antibiotic nanoparticle risk paper, Environmental Research, Submitted.
3. **Kumar, A., Mahato, J.D., Kumari, M*.,** Gupta, S.K. Feasibility analysis of newly developed fly-ash coagulant for the removal of natural organic matter from drinking water. Separation and Purification Technology, *Under Review*.
4. **Kumari, M*., Kumar. A.** Ecological-human health risk assessment of pharmaceutical in water. Under preparation

➢ Courses taught

✓ Biotechnology

1. Immunology (M.Sc. Theory paper)
2. Molecular Biology (M.Sc. and B.Sc. Theory paper)
3. Instrumentation (X-ray diffraction, Chromatography, Centrifugation, NMR, etc.) (M.Sc. Theory paper)
4. Microbiology (B.Sc. Theory paper)

✓ Environmental Sciences/Engineering

1. Municipal wastewater Treatment (B. Tech, Lab course)
2. Water supply Treatment and Wastewater Engineering (M. Tech, Lab course)
3. Ecology and Environmental Biotechnology (B. Tech, Lab course)
4. Physiochemical Process (M. Tech, Lab course)
5. Environmental Chemistry and Microbiology (M. Tech, Lab course)
6. Environmental Engineering (B. Tech, Theory paper

➢ Courses I Can Teach

1. Water treatment
2. Industrial wastewater treatment
3. Environmental chemistry
4. Environmental microbiology and Biotechnology
5. Physio-chemical Processes

➢ Students Guided

1. Puja Anchal (M. Tech Thesis) IIT ISM Dhanbad- Trihalomethanes in swimming pool water, 2016
2. Shreya Guha (M. Sc. Thesis) TERI University- Wastewater reuse, 2019
3. Nikhil (B. Tech, 3rd Year) IIT Delhi- Disinfection, 2019
4. Rohit (B. Tech, 3rd Year) IIT Delhi-Nullah sampling and physicochemical properties, 2019
5. Adane Woldemedhin, Ph.D. Exchange Student, IIT Delhi- Fluoride removal, 2019

❖ Work experiences

- **Post-Doctoral Fellow** at the Department of Civil Engineering, Indian Institute of Technology Delhi, New Delhi (Dec 2018-Dec 2020) - Worked on emerging contaminants (pharmaceutical drugs) in water and wastewater, mixture toxicity risk assessment, model approaches, and nanoparticles.
- Environmental Researcher-Freelancer, IIT (ISM) Dhanbad, Control of trihalomethanes in drinking water (April 2017-Dec 2018)/NCL Pune (Feb 2018-Dec 2018), Women scientist proposal, DST-WoSA.
- As a **Junior Research Fellow (JRF)** at Indian School of Mines (ISM), Dhanbad in a project funded by the **Ministry of Drinking Water and Sanitation (DW&S), Govt. of India**, New Delhi in a project entitled **"Disinfection by-products formation and their management in drinking water supplies in India"** from Sep 2011 to June 2013. The project mainly emphasized on monitoring and establishing the concentration range of THMs in drinking water supplies.
- As a **Lecturer** in Marwari College, Ranchi, Jharkhand. The work profile included lectures for B.Sc. and M.Sc. Biotechnology along with their practical classes, invigilation duties (IIT_JEE Exam; Bank PO Exam; Semester Exams) (Feb 2011-Sep 2011).
- As a **Lecture**r in P. K. Roy College, Dhanbad, Jharkhand. The work profile included lectures for B.Sc. Biotechnology along with their practical classes (Aug 2010 - Dec 2010).
- As a **BCIL Trainee** in the R&D, Molecular Biology lab. at SPAN Diagnostics, Surat, Gujarat. This was under BITP (Biotech Industrial Training Programme), by the Department of Biotechnology (DBT) Govt. of India. Worked on the project entitled **"RNA isolation and purification from bacterial different sources".** Apart from this, also learned DOT BLOT, Reverse hybridization, ELISA, Multiplex PCR, AFB Staining, Sputum processing and suspension preparation from M. tuberculosis, Denaturing agarose

gel protocol optimization (Nov 2009 - May 2010)

- As a Part-time **Lecture**r (B.Sc. Zoology) in SSLNT College, Dhanbad, Jharkhand (July 2008 - Oct 2009).
- M.Sc. Dissertation Trainee at Subhashree Biotech Kolkata, February 2008-April 2008.

Total-experience: 10.92 Yrs. (8.8 Yrs. of research experience including PhD and more than 4 Yrs. of teaching experience)

❖ Awards and achievements

1. Peer reviewer of SCI International Journals (Reviewed 20+ manuscripts):
   - Arabian Journal for Science and Engineering, 2021 (Springer)
   - Environmental Processes, 2021 (Springer)
   - Biotechnology Reports, 2020 (Elsevier)
   - RSC Advances 2020 (Royal Society of Chemistry)
   - Water and Environment Journal 2019 (Wiley Online Library)
   - Environment Monitoring and Assessment 2019, 2020 (Springer)
   - Environmental Science & Pollution Research 2019 (Springer)
   - Water Research 2016 (Elsevier)
2. **Best Science story award, AWSAR DST 2020** (PDF Category). Prize money includes a cash prize of ₹10000 and a certificate of appreciation.
3. **Reviewer book:** Natural Organic Matter in Water: 2nd edition Proposal, Elsevier, 2020 (Received a remuneration fee of $100)
4. **Editorial Board Member**, Environmental Management Journal, Springer, 2019.
5. Awarded **CSIR** International travel grant for attending the 7th World congress and Exhibition on Antibiotics and Antibiotics Resistance, London, UK, March 2020.
6. Awarded International travel grant from **Science and Engineering Research Board**, **Department of Science and Technology, GoI, New Delhi** for presenting my paper at the 134th Annual conference and exposition organized by the American Water Works Association (AWWA), Anaheim, California, USA, June' 2015.
7. Awarded MHRD, GoI, New Delhi Junior Research Fellowship for Ph.D. July' 2013
8. Awarded fellowship from the **Department of Biotechnology, GoI** under the Biotech Consortium India Limited Training Programme, Nov' 2009.
9. **JRF representative,** Department of Environmental Science and Engineering, IIT(ISM) Dhanbad, 2015-2016.
10. Topped the class among research scholars and M. Tech students in **"Wastewater Engineering" and "Water Supply and Treatment"** subjects during my Ph.D. Course work, 2013-2014.
11. 1st prize in **quiz competition** at National Environmental Engineers Meet (NEEM-2015), organized by Department of Environmental Science and Engineering, IIT(ISM) Dhanbad.

12. 1st prize in **online case study** at National Environmental Engineers Meet (NEEM-2015), organized by Department of Environmental Science and Engineering, IIT(ISM) Dhanbad.
13. 2nd prize in the online **essay writing** competition on International Yoga day 2016 at IIT(ISM) Dhanbad.
14. **Secured 5th position the university in my master's degree** (M.Sc. Biotechnology, Vinoba Bhave University), 2008
15. **Topped my college and secured 2nd in the whole university** in B.Sc. (Zoology Hons.), Vinoba Bhave University, 2004
16. Selected as an Assistant Professor, Department of Environmental Science, M.S Baroda University, Vadodara, Gujarat. August 2017.
17. Proposal selected for Women Scientist A scheme, Department of Science and Technology, GoI, Delhi, September 2019.

❖ In Print Media and News

- ✓ My research work on the analysis of trihalomethanes in five different water treatment plants of the Eastern Region in India was covered and published as front-page news by the leading English and Hindi newspaper daily **"The Telegraph"** and **"Dainik Jagran"** on the occasion of world water day, 2015. Articles on my research were also published by **"Hindustan",** a leading Hindi newspaper in India.
- ✓ **Kashish News channel** aired a half-hour program on the identification and the harmful adverse effects of trihalomethanes in their prime slot in March 2015.

❖ Laboratory Set-up, Training programs and workshops organized

- Established Instrumentation lab and Wastewater Engineering Lab-2 in the Department of Environmental Science and Engineering, IIT (ISM) Dhanbad.
- Organized one National workshop on **"Challenges and opportunities for management of water supplies in rural areas"**, Department of Environmental Science & Engineering, January 23-24, 2015, IIT (ISM) Dhanbad (Total Strength: 150).
- Two workshops for water resource professionals of the Government of Jharkhand under the **Key Resource Centre (KRC) scheme** at Centre of Mining Environment, Department of Environmental Science & Engineering, IIT (ISM) Dhanbad (Total Strength: 30).

❖ Instruments and software handled

- Hands-on experience on instruments such as Gas Chromatography (ECD, TCD and FID), Total Organic Carbon (TOC) analyzer, Atomic Absorption Spectroscopy (AAS), Flame Photometer, Particle Size Analyzer, CHNS analyzer, High Performance Liquid Chromatography (HPLC), Bomb calorimeter, Double beam UV-Vis spectrophotometer, ICP-MS, UASB reactors, etc.

- **Software handled**: MS office 2010 (Word, PowerPoint, Excel), SPSS 21.0, Statese: Design Expert, @Risk: Risk Analysis software (Monte Carlo Simulation in Excel), Origin, Sigma Plot, ChemDraw, Edraw.

❖ Membership of professional bodies

- American Water Works Association (AWWA), California, USA and AWWA India (**ID: 02905411)**
- **Member** India-UK Water Centre

❖ Certificate courses

- MHRD- GIAN course on **"Nanomaterials for biomedical applications",** organized by Centre for Biomedical Engineering, IIT Delhi, 12th-16th March 2019.
- **"MATLAB Programming and its applications"** organized by Computer Centre, IIT (ISM) Dhanbad, 07th -11th April 2014
- Fundamentals of Life-Cycle Assessment, www.udemy.com (Feb 2021)

❖ Current Projects

- Revisiting water reuse criteria with regards to emerging contaminants
- Sensor project at IIT Delhi funded by DST and Intel
- nanoSAICM
- Control of trihalomethanes in drinking water, IIT (ISM) Dhanbad

❖ Personal details

- Date of Birth: 25/01/1983
- Marital Status: Married
- Nationality: Indian
- Hobbies: Reading, Travelling, Drawing
- Contact No: +91 8102805359, 7066544200
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- Current Address 2nd Floor, 2919A, Block-C, Sushant Lok Phase-I, Gurgaon - 122002, Haryana, India.
- Permanent Address Aashirwaad, Near Hanuman Mandir, Mahavir Nagar (Bhuda), Dhanbad-826001, Jharkhand, India

❖ References

1) Prof. S. K. Gupta, PhD Supervisor
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I hereby declare that all the information given above is true to the best of my knowledge.

(Minashree Kumari)

Journal of Environmental Health Science and Engineering
https://doi.org/10.1007/s40201-020-00578-6

RESEARCH ARTICLE

Human health risk estimation and predictive modeling of halogenated disinfection by- products (chloroform) in swimming pool waters: a case study of Dhanbad, Jharkhand, India

Puja Anchal[1] · Minashree Kumari[1] · Sunil Kumar Gupta[1]

Received: 6 April 2020 / Accepted: 20 October 2020

Abstract

Disinfection is an important process to make the water free from harmful pathogenic substances, but sometimes it results in the formation of harmful by-products. Development of predictive models is required to define the concentration of THMs in pool water. Majority of studies reported inhalation to be the most significant THMs exposure route which is more likely to be dependent upon the concentration of THMs in pool water and in air. THMs concentration in the analyzed pool water samples and in air was found to be 197.18 ± 16.31 μg L^{-1} and 0.033 μg m^{3-1}, respectively. Statistical parameters such as high correlation coefficients, high R^2 values, low standard error, and low mean square error of prediction indicated the validity of MLR based linear model over non-linear model. Therefore, linear model can be most suitably used to pre-assess and predict the THMs levels in swimming pool water. Risk estimation studies was conducted by using the united states environmental protection agency (USEPA) Swimmer Exposure Assessment Model (SWIMODEL). The lifetime time cancer risk values related to chloroform exceeded 10^{-6} for both the sub-population. Inhalation exposure leads to maximum risk and contributed up to 99% to total cancer risk. Risk due to other exposure pathways like accidental ingestion and skin contact was found to be negligible and insignificant. Monte Carlo simulation results revealed that the simulated THMs risk values for the studied exposure pathways lies within ±3.1% of the average risk values obtained using SWIMODEL. Hence, the risk estimates obtained using SWIMODEL seemed to be appropriate in determining the potential risk exposure of THMs on human health. Variation in input parameters like body weight (BW) and skin surface area (SA) leads to difference in risk estimates for the studied population. Non cancer risk was found to be insignificant as represented by low hazard quotient (HQ < 1) values. Through monitoring and regulations on control of THMs in swimming pool water is required to minimize the risk associated.

Keywords Swimming pool · Chloroform · Predictive models · Risk exposure · Hazard quotient

Introduction

Disinfection of swimming pool water is essential to maintain hygienic conditions and to avoid the outbreak of waterborne diseases like typhoid and cholera [41]. Several types of disinfectants like chlorine, bleaching powder, chlorine dioxide etc., have been used of which chlorine is the most widely used in swimming pool due to its efficacy, low cost and retentive power [6, 25]. However, during the course of disinfection, chlorinated compound reacts with natural organic matter (NOM) substances of swimmer's origin (sunscreen, mucus, urine, skin particles and hairs), and results in the formation of undesirable harmful halogenated by-products known as disinfection byproducts (DBPs) [38]. Swimming pool water serves as water matrices with high concentrations of DBPs due to constant chlorination and the persistent organic load of swimmer's origin. The occurrence and quantity of DBPs in swimming pools is governed by several factors such as the mode of disinfection, the type and concentration of disinfectant used, the NOM content, the physicochemical characteristics of treated waters etc. [11, 22, 47, 48]. Erratic addition of substances from swimmers, inconsistent interactions of different precursors (natural and swimmers

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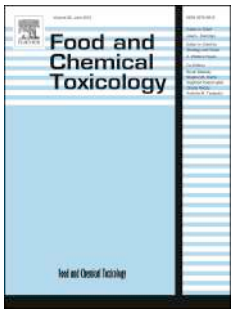
01.12.2020



Identification of component-based approach for prediction of joint chemical mixture toxicity risk assessment with respect to human health: A critical review

Minashree Kumari, Arun Kumar

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Identification of component-based approach for prediction of joint chemical mixture toxicity risk assessment with respect to human health: A critical review

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http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

WATER QUALITY ASSESSMENT, STATISTICAL ANALYSIS AND KINETICS OF TRIHALOMETHANES FORMATION IN DRINKING WATER SUPPLIES - A COMPLETE BATCH STUDY

Minashree Kumari[1]*, Sunil Kumar Gupta[2]

[1]Department of Environmental Science and Engineering, Indian Institute of Technology (ISM) Dhanbad-826004, Jharkhand, India
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Abstract

The study attempted to identify the best suited models to determine the kinetics of chlorine decay and trihalomethanes (THMs) formation in drinking water supplies. Batch experiments were conducted on synthetic water samples to simulate the characteristics of raw water collected from Maithon water treatment plant (MWTP), Dhanbad, Jharkhand, India. Influence of various parameters like total organic carbon (TOC), reaction time, pH and chlorine dose on the rate of THMs formation were analysed. The studies revealed that above 50% of THMs were formed within the first 83.65 min. Later on the reaction rate decreases and it takes 7.32-9.26 hours for 99% formation of total THMs. Pearson correlation matrix dictated strong correlation of reaction time followed by pH, dose and TOC with THMs formation. Principal component analysis (PCA) demonstrated that dissolved organic carbon (DOC) is the most influencing parameter for THMs formation. Chlorine decay kinetics followed second order reaction and the rate constant was found to be 0.0131 L/mg.min^{-1}. THMs formation kinetics was analysed by Clark and Kavanaugh model. Validation results indicated lower error of prediction (< 6%) for Clark's model than Kavanaugh model (< 20%). Thus, it was observed that Clark's model more suitably predict the formation of THMs in Indian drinking water supplies.

Key words: chlorine decay, drinking water, kinetics, model, trihalomethanes, validation

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Response surface methodological (RSM) approach for optimizing the removal of trihalomethanes (THMs) and its precursor's by surfactant modified magnetic nanoadsorbents (sMNP) - An endeavor to diminish probable cancer risk

Minashree Kumari* & Sunil Kumar Gupta

Response surface methodology (RSM) approach was used for optimization of the process parameters and identifying the optimal conditions for the removal of both trihalomethanes (THMs) and natural organic matter (NOM) in drinking water supplies. Co-precipitation process was employed for the synthesis of magnetic nano-adsorbent (sMNP), and were characterized by field emission scanning electron microscopy (SEM), trans-emission electron microscopy (TEM), BET (Brunauer-Emmett-Teller), energy dispersive X-ray (EDX) and zeta potential. Box-Behnken experimental design combined with response surface and optimization was used to predict THM and NOM in drinking water supplies. Variables were concentration of sMNP (0.1 g to 5 g), pH (4–10) and reaction time (5 min to 90 min). Statistical analysis of variance (ANOVA) was carried out to identify the adequacy of the developed model, and revealed good agreement between the experimental data and proposed model. The experimentally derived RSM model was validated using *t-test* and a range of statistical parameters. The observed R^2 value, adj. R^2, pred. R^2 and "F-values" indicates that the developed THM and NOM models are significant. Risk analysis study revealed that under the RSM optimized conditions, a marked reduction in the cancer risk of THMs was observed for both the groups studied. Therefore, the study observed that the developed process and models can be efficiently applied for the removal of both THM and NOM from drinking water supplies.

Long-term exposure of disinfection by-product (DBPs) especially trihalomethanes (THMs) in drinking water is potentially harmful and is a cause of major health concern. Since 20th century, chlorination has been widely used as a disinfectant to protect water against microbial growth during water treatment process[1]. Over the years, increasing attention has been paid on human health risks of THMs in drinking water supplies. THMs consists of four compounds i.e. chloroform ($CHCl_3$), bromodichloromethane ($CHBrCl_2$), dibromochloromethane ($CHBr_2Cl$) and bromoform ($CHBr_3$). The sum of four THMs is referred to as total THMs (TTHMs). Literature studies revealed that prolonged exposure of THMs leads to increased risk of different types of cancer such as bladder, colon, rectum, blood, stomach and rectal[2–4]. Toxicological and epidemiological studies have reported a direct link between THMs and cancer risk[3,4].

Dissolved organic matter (DOM), mainly humic acids (HAs) and fulvic acids (FAs) are the major precursors for the formation of THMs in drinking water. A number of water quality operational parameters like pH, temperature, residual chlorine concentration, natural organic matter (NOM) etc., influences the formation of THMs.

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A novel process of adsorption cum enhanced coagulation-flocculation spiked with magnetic nanoadsorbents for the removal of aromatic and hydrophobic fraction of natural organic matter along with turbidity from drinking water

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ABSTRACT

The present study developed a novel conjugate process for the removal of aromatic, hydrophobic fraction of natural organic matter and turbidity from drinking water supplies. Magnetic nanoadsorbents were synthesized under laboratory conditions and their surface properties were enhanced by surface modifiers followed by their characterization. The synthesized magnetic nanoadsorbents was then used in combination with conventional aluminum and iron coagulants for the removal of both natural organic matter and turbidity from drinking water. Adsorption cum enhanced coagulation-flocculation study was conducted in two different stages i.e. adsorption of natural organic matter by magnetic nanoadsorbents (stage 1) followed by coagulation-flocculation experiments using conventional coagulants like alum and ferric chloride (stage 2). Study indicated that magnetic nanoadsorbents-alum conjugate process is efficient in removing trihalomethane precursors. Significant removal of dissolved organic matter (98.7%), ultra violet absorbance at 254 nm (99.7%) and trihalomethane formation potential (91%) was achieved. The overall study showed that the developed magnetic nanoadsorbents-alum conjugate process is highly efficient in removing the trihalomethane precursors with a marked reduction in the overall cost for its large scale application.

1. Introduction

Availability of potable water is a major issue all across the globe. In order to make the water drinkable, it must be free from natural organic substances and turbidity. Presence of natural organic matter (NOM) due to surface discharge, agricultural runoffs, vegetation decay and release of domestic waste distresses the performance of unit operations of water treatment plants (WTPs) and affects water quality (Golfinopoulos, 2013). These substances interfere with the biological stability of water triggering color, taste and odor problems and also acts as a substrate for bacterial growth in the water distribution system. NOM in aquatic environment can be derived from both the external sources (allochthonous) and internal sources (autochthonous) (Kosobucki and Buszewski, 2014). NOM is chiefly a heterogeneous mixture of hydrophobic and hydrophilic fraction of organic material and are major precursors of disinfection by-product (DBPs) formed during the disinfection of water (Chaukura et al., 2018). Fractionation studies revealed that hydrophobic portion of NOM primarily leads to the formation of carcinogenic DBPs i.e trihalomethanes (THMs) in chlorinated drinking water (Wang et al., 2013; Matilainen and Sillanpaa, 2010). Variation in NOM concentration is associated with changes in biogeochemical cycles of particular environment (Kumari and Gupta, 2015).

Due to their adverse effects on human health, several treatment technologies/methodologies such as coagulation-flocculation (Bongiovani et al., 2016; Mao et al., 2013), enhanced coagulation (Uyak et al., 2007; Yigit et al., 2009), adsorption (Esmaeili et al., 2012) ozonation (Garcia, 2011; Molnar et al., 2012), ion exchange membranes (Vaudevire et al., 2019), ultra/nano filtration (Ma et al., 2014), and advanced oxidation processes (Matilainen and Sillanpaa, 2010; Nie et al., 2010) have been developed. Some of these technologies are not techno-economically feasible due to high cost, membrane fouling and regeneration, sludge generation and

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Human health risk assessment of antibiotics in binary mixtures for finished drinking water

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HIGHLIGHTS

- First study on antibiotics risk in binary mixture by UESPA weight of evidence.
- Use of pharmacological data for risk assessment of antibiotics in binary mixture.
- Binary mixture of antibiotics under the studied condition do not possess any risk.
- USEPA weight of evidence method can be used for risk assessment of antibiotics.
- Concentration of antibiotic was major contributor to overall variance in risk estimate.

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ABSTRACT

The present study developed a new step-wise approach to estimate the potential human health risk of antibiotics in binary mixture for drinking water samples for two different sub-populations. Monte Carlo simulation based uncertainty analysis was performed to reduce uncertainty in risk assessment. Human health risk assessment studies were carried out using the acceptable daily intake (ADIs) for exposures of individual antibiotics considering point of departure (POD) and uncertainty factors (UFs). The estimated ADI values were used to estimate the predicted no effect concentrations (PNECs), at or below which no adverse human health effects are anticipated. Hazard quotient (HQ) in risk assessment was calculated as a ratio of environmental concentrations (ECs) and PNECs (EC/PNEC). The study showed that the average HQs values of individual antibiotics in adult and children were found below the acceptable limit, demonstrating no possible human health risk for both the subgroups. $HI_{interaction}$ values of antibiotics in binary mixture was calculated using HQ values of antibiotics. The study observed that the estimated $HI_{interaction}$ values of antibiotics in binary mixture was found to be less than 1 for both the sub populations, indicating no potential adverse effects on human health. Concentration of antibiotics was the primary contributor (>65%) to the overall variance in the uncertainty estimates for HQs of individual antibiotics in drinking water for adult and children. The co-occurrence of antibiotics in binary mixture for drinking water samples doesn't possess any possible risk on human health for the studied population.

1. Introduction

Safe and clean drinking water is the basic necessity for mankind and plays a vital role in health safety. Contamination of water resources possess a serious threat to the global water environment due to the presence of several environmental contaminants, including endocrine disrupters compounds (EDCs), pharmaceuticals and personal care products (PPCP) and other substances, in the water sources that may be used by a water treatment plant (WTP) for the production of water for human consumption (Jones et al., 2001). Antibiotics are the most frequently used drugs by human beings and have been detected in the aquatic environment since the 1970s and in the last twenty years, in all types of surface water, groundwater and the oceanic environment (Klosterhaus et al., 2013; Luo et al., 2014; Veach and Bernot., 2011). In recent decades, antibiotics have emerged as potential environmental contaminants due to their toxicity to non-target organisms and their omnipresent occurrence in the environment due to widespread and incessant release from sources like

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