Assessment of natural organic matter and ptaquiloside in Irish drinking water

'Special Edition—Irish NOM 2016'

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Issue 4

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Sector Representation at Irish NOM 2016:

Summary

Ireland's first 'Natural Organic Matter (NOM) & Trihalomethanes (THMs)' workshop took place in Galway City on the 16th & 17th of June 2016. The event was attended by 145 representatives from all sectors relating to the drinking water industry in Ireland.

The workshop had 3 main aims:

1. To showcase *some* of the national and international work available on NOM and THMs.
2. To provide a platform for networking.
3. To establish a NOM network.

Day 1 of the workshop, chaired by Dorothy Stewart, EPA, was described as 'ground-breaking' and entailed a series of seventeen 20-minute talks from leading experts in the field. The late afternoon breakout session, chaired by Bruce Misstear, TCD, gave delegates an opportunity to discuss and debate some of the day-to-day issues and challenges that they face in their own professional roles. The day concluded with a summary given by Liwen Xiao, TCD.

On Day 2, delegates met at Hotel Meyrick and were transported by bus to Luimnagh Water Treatment Plant. John McMyler, Galway CoCo delivered a highly informative talk on his experiences at Luimnagh WTP. The day was described as 'enjoyable and worthwhile' and was attended by 45 delegates.

Irish NOM 2016 has defined a 'network' of people working in roles connected to NOM and THMs in Ireland. Feedback from the event has been incredibly positive with delegates acknowledging the event as 'necessary' for developing the knowledge base. With some tweaks in response to the follow-up survey we anticipate that Irish NOM 2018 will be even better.

Connie O'Driscoll

NUI Galway OÉ Gaillimh

CIWEM Chartered Institution of Water and Environmental Management

Engineers Ireland cpd Approved Event

Trinity College Dublin Coláiste na Tríonóide, Baile Átha Cliath The University of Dublin

Speakers

Niall Dunne (EPA):

Gave an overview of trihalomethanes in Ireland and mentioned how Ireland has a higher percentage exceedance compared to the UK and that 8.6% exceedance equates to a population of approximately 440,000. 76% of the affected population should be resolved by 2018.

Michael Joyce (Ryan Hanley):

Discussed the 2012 National Trihalomethanes Project from which the Drinking Water Advice Note 4 were derived. Michael mentioned factors such as higher chlorine dose, higher pH, increased temperature, extended contact time and presence of sediments in distribution networks result in higher THM formation potential.

Victor van der Walt (Irish Water): Spoke about industry requirements from NOM research drawing attention to some of the challenges, i.e. error in historical THM lab analysis, suitability of THM monitoring surrogate, highly variable raw water quality. Victor envisages to lower the total THM parametric leaving the treatment plant.

Brian MacDomhnaill (NFGWS):

Gave an overview of THMs issues in private group water schemes. Brian identified surface water and groundwater supplies influenced by surface water as the main concerns and proposes that an evidence-based approach be adopted to determine risk.

Peter Jarvis (Cranfield University):

Spoke on the impact of changing water quality such as increasing pesticides in raw water, on treatment of NOM laden water sources. Peter discussed unregulated disinfection by-products and how different NOM has different formation potential.

Peter Fiske (Pax Water):

Discussed post-treatment aeration to remove THMs. By exposing water to air, volatile chemicals in the water evaporate into the air. In-tank aeration can lower treatment plant operating costs.

Speakers

Steve Ward-Smith (Malvern):

Discussed a successful case study of using zeta potential measurements for coagulation control at Severn Trent Water in the UK. The benefits of zeta potential measurements are it reduces risk and generates efficiencies.

Adam Gilmore (HORIBA):

Demonstrated the Aqualog, simultaneous absorbance and fluorescence measurements. Adam discussed the benefits of the Aqualog for industrial monitoring of NOM, referring to DBP formation, membrane fouling and algae contamination.

Peter Croot (NUI, Galway):

Discussed the role of freshwater NOM in the marine environment and how organic matter of terrestrial origin can be distinguished from that of marine origin by examining spectral slopes. Peter's research group examine the influx of organic matter from the Corrib to Galway Bay.

Alec Rolston (Dundalk IT):

Spoke about novel approaches to connect science, policy, managers and local communities for the benefit of integrated management of Ireland's water resources. Alec emphasized the role of local communities in improving water quality.

Chris Evans (CEH, UK):

Discussed the dynamics of NOM in natural waters, increasing trends in large parts of Northern Europe and Northern America. Analysis has shown the primary driver of these increasing trends has been recovery from the effects of Sulphur deposition.

Heleen de Wit (NIVA, Norway):

Gave an overview of trends in DOC in boreal and temperate water bodies - from headwaters to large rivers. A tripling of colour has been observed since 1980. Trends are uniform across catchment size, and browning of surface water continues.

Julian Aherne (Trent, Canada):

Discussed atmospheric deposition with specific emphasis on acidification and its role in NOM. Julian gave an overview of

DOC concentrations in Irish surface waters and looked to soil carbon concentrations as most likely sources and posed the questions 'does sea salt deposition drive inter-annual variability in water chemistry?'

Florence Renou-Wilson (UCD):

Spoke of the carbon balance in Ireland, highlighting that large variability exists in waterborne carbon losses from managed organic soils with great significance from a climate perspective.

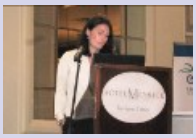
Eleanor Jennings (Dundalk IT):

Described modelling DOC export from a humic catchment and discussed increasing DOC trends with regard to climate and drought. Eleanor spoke of projected DOC increases with climate change using the DOC-GWLF model.

Chris Barry (AFBI, UK):

Discussed the NOM dynamics in the Northern Irish aquatic environment giving a breakdown of land use and soil types. Greatest export of DOC was observed coming from humic, 55%, peat, 45% coniferous forestry, 47% and pastures soils, 34%.

Connie O'Driscoll (NUIG & TCD):



Gave an overview of the current EPA funded NOM Project. Slope (<5), rainfall (>1400 mm), peat presence and groundwater vulnerability were used to determine high risk catchments for NOM. THMs are likely to increase with increasing peat % where there is an absence of treatment to remove NOM. Where inadequate treatment is present the interaction of peat and pastures has been shown to be more important.

Breakout Discussion Groups

1: Catchment NOM: important factors such as soil type, rainfall, slope, chloride (coastal areas) and soil moisture deficit were considered. Land use factors such as forestry, pasture, peat extraction and the practices associated with these were mentioned. It was recommended by this group that turf cutting be stopped peat bogs be rewetted, buffer zones implemented and control of felling.

2. Treatment of NOM

Some of the barriers and challenges in treating NOM were discussed, i.e. the cost of monitoring (especially for private group water schemes). Approval on the frequency of monitoring. The cost of alternative treatment options and with limiting the levels of THMs leaving the treatment plant and ongoing browning of waters there were concerns for the potential cost of plant upgrades for this. Access to knowledge was a further barrier especially around catchment knowledge and insights into the drivers of browning. Legacy 'network' issues were also discussed as a major issue.

3: Methods for quantifying/ qualifying NOM

Delegates were most familiar with traditional methods of colour and UV_{254} for quantifying NOM. SUVA was mentioned for determining the character of NOM but there was some uncertainty about its accuracy and the level of information that could be obtained. Delegates felt that there was potential for more *novel* methods.

4: Disinfection by-products

The Group felt that there is a need for wider examination of unregulated DBPs. The group felt that alternative forms of disinfection such as chloramination give rise to unregulated DBPs and would not serve to benefit Irish drinking water. The group were very positive towards and confident in the idea of in-tank aeration to reduce THMs but stressed that use of this system should be carried out in conjunction with optimisation of any existing process and existing disinfection system. The group felt there was room for increased public awareness around the issue of THMs and the associated health risks.

Luimnagh, Co. Galway - Technical Tour

John McMyler, Senior Engineer with Galway Co. Co. gave a presentation to delegates in the board room of Luimnagh WTP. John gave a run down of the Local Authority role in drinking water production for Public Water Supplies in Co. Galway. Luimnagh is capable of producing 48,000 m^3 (45% of the total drinking water production for public water schemes in Co. Galway) per day. John gave an account of the events of the 2007 boil water notice issued at Luimnagh WTP and of lessons learned.

Delegates were taken on a tour of the plant from the intake at Lough Corrib, through to the Raw Water Screen House, the Raw Water Pump House, the main process area, the pH adjustment and addition of aluminium sulphate area, through to where the polyelectrolyte is added. From there delegates were brought to the clarifiers, the gravity sand filters and the U.V. reactors.





Exhibitors

Complete Laboratory Solutions
TOBIN Consulting Engineers
PAX WATER TECHNOLOGIES™
els
HORIBA Scientific
Malvern

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