Bill 46: Save Lake Winnipeg Act, Presentation to Legislative Committee
Dr. Eva Pip, June 13, 2011

I would like this evening, Mr. Chairperson and ladies and gentlemen, to speak on the nitrogen and phosphorus as it relates to the waste-water treatment plant, and, as a background, we know that eutrophication of Lake Winnipeg and our other lakes has drastically accelerated in the last few years. I personally have been working in this area now for about 45 years, and so in that span I have seen the tremendous changes that have happened, especially on Lake Winnipeg. I remember, in the 1950s, that water was crystal clear and those pebbles on the bottom, they were like jewels, and now everything is covered in that horrible crud, that periphyton, and the lake is overrun with algae, and we now have this discussion where phosphorus is deemed to be the primary culprit and we seem to be backing away on nitrogen removal.

And so, today, I would like to speak a little bit about how both of these nutrients are important but in different ways, because I think that the phosphorus steamroller has minimized the impact that nitrogen has. There is a very large body of evidence globally that illustrates how important the nitrogen and phosphorus are, not just the phosphorus. And, specifically, the phosphorus, it does address the cyanobacterial problem, primarily, and that is a huge problem currently in Lake Winnipeg. But we have to remember that Lake Winnipeg is not just algae. In order to have a healthy lake, we have to have a healthy entire aquatic ecosystem, and that means all of the other components of the system, not just the algae. And so it so happens that, for the other components, the animals, nitrogen is very important because it can be a toxic material for them.

Now, we know that in Lake Winnipeg we have already lost a very, very significant amount of biodiversity, some of which we will never be able to replace now, some of those species that have disappeared. As an illustration, for the freshwater mussels, just for example, the freshwater mussels in North America are the single most endangered group of animals in North America, and about 85 per cent of the freshwater mussel species in North America are extinct just within the last two decades.

In Lake Winnipeg, we used to have, I remember, 11 species of freshwater mussels. Now we only have five remaining, and, of those five species, two species, the roughest, toughest ones, now constitute 98 per cent of the freshwater communities; the other three are now almost gone as well.

And so I come here having worked with this nitrogen and phosphorus issue, specifically as it relates to cyanobacteria. Over the past five years, we have studied how the soluble nitrate and the soluble phosphate relates to not just the algal blooms as a whole in the south basin of the lake but also to the toxicity of the algae, because the toxicity, as you know, is a very significant public health problem.

And so skipping ahead here, I've given you in my written presentation the more details when you want. But what we found was, first of all, when you talk about the algal blooms as a whole, we have to remember that algal blooms are composed not just of

cyanobacteria, which are the blue-green algae, but there are also eukaryotic algae that do not have the ability to extract atmospheric nitrogen. They are dependent on soluble nitrogen for their nutrition.

And we also have to remember that there are many cyanobacteria that also do not have the capacity to obtain atmospheric nitrogen. And so for them, the soluble nitrogen is important, and if you increase the amount of the nitrates, and well–and ammonia and nitrite, they will be able to assimilate this and grow. And so what we found was, taken as a whole, as represented by chlorophyll a concentrations and that summarizes the entire algal population. We found that both organic–I'm sorry, well, organic matter but also the phosphate and the nitrate, they were significantly correlated with chlorophyll a, which meant the blooms as a whole.

We also found that the ratio of nitrate nitrogen to orthophosphate phosphorus had no impact on the chlorophyll a, because if you remove the phosphorus, yes, you are impacting those cyanobacteria that have the ability to extract atmospheric nitrogen. But at the same time, you are creating an advantage for all the other kinds of algae that can step in now and they can utilize that nitrate that is dissolved. And the only impact that we did find for phosphorus was, of course, aside from reducing those cyanobacteria that can–that have the nitrogen to extract atmospheric–that also the reduction in phosphorus levels did have an impact on reducing microcystin, which is a primary toxin. But aside from that, though, if you're talking about blooms as a whole, if you do not remove the nitrate, you will still have algal blooms.

And the bottom line is that the blooms will simply be–they'll have a different species composition. They will have a higher proportion of those other algae that are not the nitrogen fixers. So it is important for us to remove both the nitrate and the–as well as the phosphorus.

And another issue here, of course, is even though we are removing ammonia, that is not good enough. Because once the nitrate gets into the lake, we know that with these high algal blooms, that we're going to have anyway and that high biomass, when that decays and decomposes, it depletes the oxygen and under those oxygen depletion conditions, the–you have de-nitrification, microbial de-nitrification, that will convert the nitrate to ammonia in the lake. And this is why removing it only at the treatment plant is not good enough.

And so my very strong opinion is that, you know, it's a comparatively minor additional cost for us to be able to do it. Why, in heaven's name, are we not doing it when we will have to do it eventually anyway? At that time, it's going to be even more expensive for us to do it, and so why don't we get with the program and seriously address what is wrong with Lake Winnipeg instead of only going half way?

And so I will leave it there. Thank you.