Summary of selected chapters from Cory Harris's thesis on healing plants and nerve damage*

January 27, 2009

About this summary

This text is a summary of two chapters from Cory Harris's PhD thesis:

1. The background chapter, in which he reviews what other scientists have found out about the topic
2. The "Discussion" chapter, in which he reflects on what the results have taught us.

All the other chapters of the thesis have already appeared as separate articles. Most of these have been reviewed by the Iiyiyiu communities. A few chapters were based on studies that were not part of the Cree Anti-diabetic Plant Project.

Background: what other researchers have written about the topic

About trends in diabetes

Medicines like Metformin help control diabetes, but they do nothing to prevent new cases. Worldwide, the number of people with diabetes has doubled since 2003. Also, people are getting diabetes at younger ages than before. This means they live with it for many years, and have more time to develop complications. So it is becoming important to know how to reduce complications.

People have long known that controlling diet helps with diabetes. But in the 1990s, some large studies established clearly that a combination of diet, exercise, and sometimes medicines, is the best way to reduce diabetic complications.

About nerve damage and diabetes

* This is a plain-language summary of the Literature Review and General Discussion chapters from a PhD thesis by Cory Harris entitled *Anti-diabetic and neuroprotective activities of phytochemicals in traditionally used boreal plants*. (University of Ottawa, Department of Biology, 2009).

About half the people with diabetes have some degree of nerve damage. This produces effects like

- Loss of feeling in the hands and feet
- Pain
- Trouble walking
- Wounds that infect and won't heal. (In the long run, this can lead to amputation.)

Within the body, this nerve damage is caused by a whole set of inter-related processes, some of which feed off each other. We know that high blood sugar damages nerve cells directly. But it also sets off a vicious circle that indirectly causes even more damage. The cycle involves

- formation of free radicals and AGEs (harmful particles)
- inflammation
- damage to veins

The damage to the veins impedes blood flow, so the blood can't deliver the nutrients that the nerve cells need to survive.

Some of the same processes that cause nerve damage also play a part in the eye and liver problems that often go along with diabetes. So when you find a treatment that seems to reduce nerve damage, it is worth checking if it might also help with these other problems.

About diabetes in Aboriginal peoples

Before 1945, diabetes was almost unknown in most Aboriginal groups. Now it is a major problem for some peoples, with rates far above the average. No one really knows why this is so, and the reasons may be different for each Aboriginal group. Some of the possible explanations are

- Acculturation and the change to a more "western" way of life
- Differences in genetics that make some groups more prone to diabetes
- The legacy of colonialism

- Low incomes and isolation, which in turn affect people's education, way of life, and eating habits

Not only do some Aboriginal groups have high rates of diabetes, but they tend to have poor access to health care. And many people are not good at following the advice doctors give them about managing their diabetes. They may not be willing to have regular medical tests, check their blood sugars, change their diet, or take medicines. Why don't people follow medical advice? Perhaps the factors listed above—colonialism, differences in education, and so forth—play a part. Or perhaps the advice simply does not fit with the culture and accepted practices in their community. Whatever the reasons, many Aboriginal people with diabetes end up with blood sugars that are high all the time. This in turn puts them at risk for more complications, and more severe complications.

Healing plants and diabetes

Most Aboriginal groups see the world as an interconnected web of relationships between all living things and the environment. As food, shelter, symbol, or spirit, plants have a major place in this web. They provide a connection to land and to culture—a connection that people see as central to health. If people could control their diabetes using their traditional plants instead of "western" approaches, perhaps they would get better results. After all, these plants are available locally and fit in with people's beliefs and way of life. This is the thinking that underlies the Anti-diabetic Plant Project.

Within this context, Cory's thesis focused on two things:

1. Describing the ingredients in the Iiyiyiu plants
2. Looking at how the plants might protect against nerve damage caused by diabetes.

Reflections on how the results add to our knowledge

The specific results from Cory's lab tests have been presented in the articles he prepared (see the list at the end of this paper). But beyond the specific results, the study taught us some more general things.

Identifying ingredients

First, Cory and the team were able to identify many of the ingredients in the plants, especially plants in the Heath family (such as blueberries, cranberries, and Labrador tea). This allowed them to develop a "fingerprint" for each plant species, so that we can tell even similar plants apart based on their ingredients. This is a contribution to the field of plant chemistry.

Knowing the ingredients also helps us to understand *how* some of the plants work. Other scientists have already described certain ingredients that are good at fighting diabetes, controlling free radicals, and protecting nerve cells. The team found some of these ingredients in the Iiyiyiu plants. For instance, people across Canada use blueberries as a remedy for diabetes, but this is the first time anyone has been able to say which ingredients make them effective.

Characteristics of plants that protect against nerve damage

Did the research show that the most effective plants were the ones the elders and healers used the most? Only partly. It seems to depend on whether "effective" means

- that the plant protects against nerve damage;
- that it fights AGEs; or
- that it fights free radicals (particles that damage veins).

It seems that the plants that do the most to fight nerve damage or AGEs (the first two points in the list) are not necessarily the ones the healers use the most. However, this conclusion may not be fair, since all the plants had *some* effects. Maybe if the study had included some plants that have *no* effect, we would have seen a closer fit between a plant's effectiveness and how likely the healers were to use it. Also, we need to

remember that the healers told us about plants that help with many different symptoms of diabetes, not just nerve damage.

However, other people on the team have noticed that the plants the healers use the most tend to be the ones that are good at fighting free radicals (the third point in the list above). We also notice that the parts of the plants that the healers use most (e.g., needles, bark) are the parts that the lab tests suggest are most effective.

Learning about the processes that cause nerve damage

Most plants contain a class of ingredient called “phenolics.” Phenolics seem to protect against chronic conditions like heart disease, cancer, and diabetes. They do this partly because some of them are strong anti-oxidants—they protect veins against damage from free radicals and AGEs. So Cory thought that the most effective plants would probably be the ones that are high in phenolics, and the ones that are strong anti-oxidants.

It turned out that this was true only for some types of effects. The high-phenolic plants were indeed good at fighting AGEs. But they were not always the best at protecting nerve cells against damage. This tells us something about the processes in the body that cause nerve damage. It tells us that there are processes other than those associated with free radicals and AGEs that contribute to nerve damage. It also reminds us that we can’t always extend results from lab tests to living people.

Using the results from Iiyiyiu plants to inform research in related areas

As we have seen, nerve damage happens through many different processes. One such process causes nerve cells to self-destruct in response to signals from Platelet-Activating Factor (PAF). PAF damage is implicated in Alzheimer’s disease, a problem increasingly seen in people with diabetes. It makes sense that a plant ingredient that helps protect nerve cells in one way might also work in others. In a related study, Cory was testing certain phenolics to see if they would help protect nerve cells against PAF damage. Some of the phenolics he chose were ones that

showed promise in the Iiyiyiu Anti-diabetic Plant Project. In this way, the Anti-diabetic Plant Project is helping to inform other research.

List of articles based on Cory's thesis that have been reviewed and approved by the communities		
Title of the plain-language summary	**Title of the original article**	**Authors**
"Fingerprinting" different plants in the Heath family	Metabolomic Methods for the Identity and Quality Assurance of Northern Medicinal Ericaceae	Saleem, Harris, Haddad, Martineau, Cuerrier, Coonishish, and Arnason
Anti-diabetic activity of medicines made from the needle, bark and cone of minhikw: how different parts of the tree protect from too much or too little sugar	Anti-diabetic activity of extracts from needle, bark, and cone of Picea glauca: Organ-specific protection from glucose toxicity and glucose deprivation	Harris, Lambert, and others
Ingredients in pitcher plant that protect against nerve damage	Bioassay guided isolation of neuroprotective constituents of sarracenia purpurea, a Cree medicinal plant that inhibits glucotoxicity in PC12 cells	Harris, Asim, Saleem, the Elders of Eeyou Ishtchee, Martineau, Haddad, Arnason, Bennett
Reducing bad effects from diabetes: the healing plants and AGEs	Characterizing the inhibitory effects of Cree medicinal plant extracts on in vitro formation of advanced glycation endproducts	Harris, Beaulieu, Fraser, McIntyre, Martineau, Cuerrier, Johns, Haddad, Bennett, Arnason
Plant ingredients and protection of brain cells	Flavonoids as novel inhibitors of platelet activating factor-mediated neuronal death.	Harris, Ryan, Moffat, Mo, Haddad, Arnason, Bennett

Ellen Bobet
Most of the chapters in Cory’s thesis have already been reviewed as stand-alone articles. This summary covers the remaining portions – the Lit Review and General Discussion – neither of which is apt to be controversial.

Kathleen Wootton
I agree it does not seem to contain Cree TK and at least no new information about plants that is not in the public domain already.

Jill Torrie
I agree with Kathleen's assessment that these chapters do not discuss Cree TK which is not already in the public domain. Therefore, these specific chapters do not need to be reviewed by the Healers and Elders.