

Saskatchewan: The pharmaceutical potential of tree bark

For 15-year-old Xingju Zhao, winning the Saskatchewan regional competition of this year's Sanofi-Aventis Biotech Challenge was a case of one thing leading to another.

It started in 2006 when she undertook her first SABC project – an investigation into the health benefits of proanthocyanidin, a flavonol found in many plants including pine bark. During her research, she encountered several articles about antioxidants found in tree bark and decided to investigate that area for her 2007 SABC project.

Starting with crude extracts from the bark of four common trees, she measured total polyphenol amounts and antioxidizing activities of the extracts and tested their anti-microbial and anti-mutagenic effects. This preliminary research convinced Xingju that she was barking up the right tree.

"I continued my project this year because of the very promising results I obtained last year and because there was so much more detailed work to be done," said Xingju, a Grade 10 student at Walter Murray Collegiate in Saskatoon. To start this year's project, she made 70% methanol extracts from jack pine, paper birch, white spruce and trembling aspen bark samples collected in Prince Albert National Park.

These extracts were then fractionated – into ethyl acetate, butanol and water fractions – and Xingju conducted assays to determine the total amount of polyphenols and measure the antioxidizing activity for all fractions of the bark extracts. Bacterial susceptibility tests were performed on six clinically important bacteria and the anticancer effects of the fractions were evaluated against three common human cancer cell lines and one normal human cell line.

The results showed a positive correlation between the amount of polyphenol and antioxidizing activity, with white spruce bark exhibiting the greatest total polyphenol content and antioxidant properties and jack pine bark the lowest. Most of the bark extracts/fractions inhibited bacterial growth, the strongest being the ethyl acetate and butanol fractions.

In the test for anti-cancer properties, trembling aspen was the only extract that failed to inhibit the proliferation of the cancer cell lines. The white spruce and paper birch extracts were particularly effective. Importantly, it was noted that the extracts affected normal cells less than cancer cells.

While pleased with the results of her latest research project, Xingju is already considering the next step in her investigation into the pharmaceutical potential of tree bark – more tests on the most promising fractions to isolate the actual chemicals responsible for inhibiting the growth of cancer cells.