Advances in Understanding the Potential Health Benefits of Maple Syrup: The Path Forward

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Studies to evaluate the potential health benefits of maple syrup are scarce. To date, there are a handful of published in vivo studies (in animal models) and several in vitro studies (in cell and laboratory based assays) that support the positive biological effects of maple syrup. However, there are no published human studies to validate these (preliminary) findings. This is unfortunate considering that over the past two decades, various other food commodity groups (e.g., oats and other whole grains, nuts, berries, fruits, several vegetables, olive oil, fish oil, many spices, dairy products, dark chocolate, and certain beverages including green tea, coffee, red wine, etc.) have invested considerable resources to fund scientific research to elucidate and substantiate the human health benefits of their products. Obviously, this has given a competitive marketing advantage to these foods since modern-day consumers want so called ‘functional foods’ or foods which impart health benefits that go beyond basic nutrition.

Over the past six years, my laboratory, and others, have been conducting research focused on identifying bioactive plant compounds (known as phytochemicals or phytonutrients) and evaluating the biological effects of maple syrup, maple water (i.e. maple sap), and maple plant parts and their derived extracts. These studies were funded, in large part, by the Federation of Maple Syrup Producers of Quebec (FPAQ) with the support of government institutions in Canada (AAFC-Agriculture and Agri-Food Canada) and in Quebec (MAPAQ - Ministry of Agriculture, Fisheries and Food of Quebec). In fact, the vast majority of the currently available published animal and laboratory-based studies on maple have been supported by FPAQ through these agencies.

These works have led to several peer-reviewed publications and presentations at international scientific conferences which have in turn garnered considerable attention from the public and scientific community (Figure 1). Although maple syrup is a newcomer to this target area, these research and public relation efforts have catapulted the natural sweetener into the functional foods category. However, unlike the other aforementioned plant foods, maple syrup faces additional challenges given the negative connotations associated with added sugars and excessive sugar consumption. Therefore, rigorous study designs, and careful and responsible dissemination of research findings will be necessary to position and keep maple syrup in the functional foods category so it can carve its own niche among other sweeteners and healthy plant foods.

Maple syrup is a unique natural sweetener. It contains over 100 different substances including mono-and disaccharides (primarily as sucrose), complex sugars (i.e. oligosaccharides),

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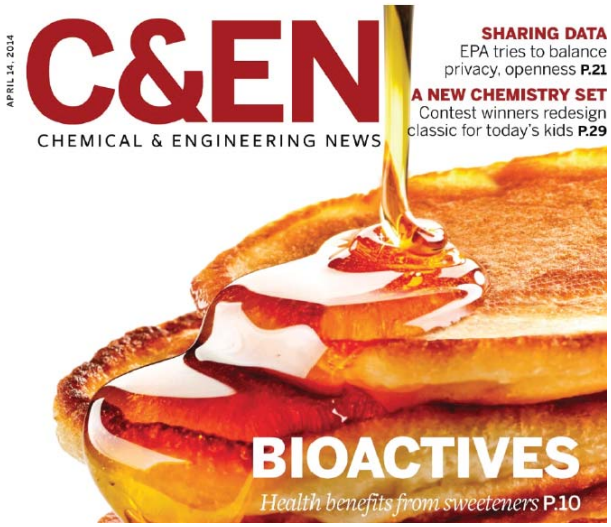
minerals, amino acids, organic acids, phytohormones, vitamins, and phytochemicals. It the phytochemicals that have been the research focus of my laboratory, and toward this end, we have isolated and identified a wide diversity of phytochemicals in maple syrup. Interestingly, maple syrup contains a diverse cocktail of different chemical sub-classes of plant compounds (known as polyphenols or phenolics) which are also found in several other healthy plant foods including flax, tea, berries, and red wine. Obviously these molecules are all found in one 'sweet' package and it is remarkable that many compounds which naturally occur in maple sap survive the concentration process to persist in maple syrup and co-exist along with others which are formed during processing.



Maple syrup contains more than 63 bioactive phenolic compounds counted to date, several of which are new molecules including the process-derived compound named Quebecol (see Figure 1). Apart from these compounds, it should also be emphasized that maple syrup also contains several other health beneficial constituents including vitamins, minerals, amino acids, organic acids and phytohormones. Using in vitro (cell and laboratory-based) assays, my group has demonstrated that maple syrup extracts have anti-diabetic and anti-inflammatory effects in vitro but this work is yet to be substantiated by in vivo studies (in animals and humans). However, as mentioned before, thus far, there are a handful (five) published animal studies on maple syrup: one from the research group of Dr. Andre Marette (Laval University, Quebec, Canada) and two from the research group of Dr. Keiko Abe (University of Tokyo, Tokyo, Japan) all which have been supported by FPAQ. The other two animal studies were published by a group from Kinki University in Osaka, Japan. All of these animal studies support a potential role for maple syrup in glucose regulation and liver protection.

Given this momentum, there is urgent need to continue on this trajectory of maple syrup health benefits research. This calls for a 'visionary think-tank' group to establish strategies to collaboratively combine resources to fund maple syrup health benefits based research. This is especially critical given the high costs of research studies and a rapid decline in funding available from federal, state and provincial agencies in the United States and Canada, the only two commercial producing maple syrup countries in the world.

In summary, the "triple whammy" of unique chemical composition of macronutrients, micronutrients, and phytochemicals in maple syrup (Figure 1), in combination with their promising biological activities, supports its functional food applications. However, further in vivo studies are warranted to advance current scientific knowledge of the potential health benefits of maple syrup.