Decaffeination - An interesting history

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Our society seems to run on caffeine. Many among us cannot function until that first hit in the morning. Those of us who are not coffee aficionados rely on tea or other beverages to get our “jolts”.

After a day of caffeine, it may be difficult to sleep or to wind down, since caffeine is a stimulant. This is where decaffeinated coffee and tea become important.

Chemical processes intrigue me as do their origins. Who came up with the idea of doing something in a particular way and what prompted these discoveries? Of course some could have happened totally by chance and an enterprising person might have been able to make a commercial success of them. This was apparently the case with the decaffeination of tea.

There is a story that long ago, several chests of tea were swept overboard from a ship during a severe storm at sea. The tea chests were later discovered washed ashore. After rinsing away the salt water and re-drying the leaves, those drinking the tea noticed that they did not get the usual buzz from the tea. Basically what had happened was that the salt water had removed the caffeine from the tea leaves. Thus began the process for salt water extraction of caffeine.

As happens in many cases, there is more than one way to approach a problem. Some imaginative and creative souls found that a harsh chemical treatment of green coffee beans could remove their caffeine. A formulation of methylene chloride was used to solubilize the caffeine and thereby decaffeinate the coffee. Many of you may have encountered methylene chloride in another application. If you read the label on a can of paint remover, the main ingredient is - you guessed it - methylene chloride. Residual levels of this solvent are extremely low or non-existent, and are highly regulated to ensure the safety of consumers, so it should not be a major worry to you. However, drinking a beverage decaffeinated with methylene chloride may not be everyone’s cup of tea.

Fortunately, modern science has developed an incredibly elegant decaffeination process. It is simple, completely safe, and involves no harmful chemicals - not even salt water.

Supercritical fluid extraction uses liquid carbon dioxide. The coffee or tea to be decaffeinated is placed in a large column which can withstand relatively high pressures. Once sealed, liquid carbon dioxide is pumped into the column where it solubilizes the caffeine. After the extraction process has been completed, the liquid carbon dioxide is

pumped to a second column. When the pressure is released in this column, the liquid carbon dioxide vaporizes to form a gas. The gaseous carbon dioxide is then re-compressed to go back into its liquid form and is used to decaffeinate a fresh batch of coffee or tea.

Meanwhile, the caffeine extracted from the coffee or tea is recovered and used as an ingredient in many pharmaceutical preparations. The decaffeinated coffee or tea can be packaged and sold with no risk of any harmful chemical residues remaining from the extraction process.

Carbon dioxide makes up about one percent of the air around us and is exhaled when we breathe as a product of our respiration process. As soon as the decaffeinated coffee or tea is exposed to the air outside of the extraction column, the carbon dioxide is dissipated, so there is absolutely no worry to the consumer.

Supercritical fluid extraction has other interesting uses as well. As an example, essential oils from mint leaves and other similar plants can be extracted using liquid carbon dioxide. The extracted oils have a wonderfully fresh aroma and are of extremely high quality.

This is just one example of how modern science is contributing to the safety and quality of the food we enjoy.

A hot cup of coffee in my favourite mug