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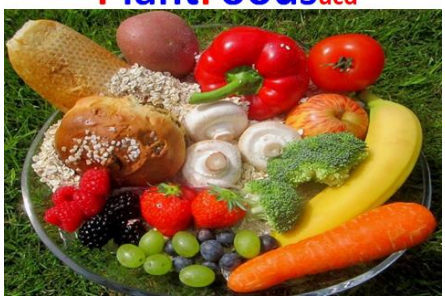

Issue 4: September, 2019: This e-bulletin is aimed at health professionals, consumers, growers, farmers, packers, processors, distributors, retailers, and others in the plant foods area.

Glucose control potential of AIS from berries and mushrooms

A study in 1982 (Mayne *et al*.) showed that alcohol-insoluble-solids (AIS) separated from apples helped control type-2 diabetes in a clinical trial with 12 patients. This prompted the current UCD study that separated AIS from strawberries, raspberries, blackberries, blueberries, apples, and from mushroom buttons, flats and stipes. The effect of the AIS on cell proliferation and insulin secretion in/by rat BRINBD11 pancreatic β-cell lines was studied as an indicator of the glucose control potential of the AIS materials. The study was conducted by Emma Clarke (4th year food science research project) in cooperation with Dr Heleena Moni Bottu, Professor Lorraine Brennan and Professor Ronan Gormley of the UCD Institute of Food and Health, University College Dublin.

What are alcohol insoluble solids (AIS)?

AIS are the fraction of finely blended (pureed) fruit or vegetables (250g lots) insoluble in boiling 80% aqueous ethanol with the 20% water coming from the fruit or vegetable. This necessitates measuring the moisture content of the fruit or vegetables in advance. After coming to the boil the mixture is left at room temperature overnight and the AIS collected by filtration under vacuum and dried in an oven at 100ºC for 1h. Sugars and other soluble compounds dissolve in the aqueous ethanol and are contained in the filtrate. In commercial practice the alcohol in the filtrate would be recovered and re-used. AIS are largely dietary fibre with some protein, minerals and insoluble carbohydrate, e.g. certain starches, glycogen and chitin. Most of the dietary fibre is cell wall material which is largely composed of pectin. Percentage yield of AIS from the different samples was raspberries (6.0), mushroom stipes (5.9), blackberries (5.2), mushroom flats (4.2), button mushrooms (4.1), blueberries (3.4), apples (2.9) and strawberries (2.1). Ranges for the carbohydrate, protein and ash contents of the fruit AIS samples were 75-80, 10-13 and 2-6% respectively. Corresponding ranges for mushroom AIS samples were 50-60, 28-33 and 6-9%.

Effect of AIS samples on rat pancreatic beta cell viability and insulin secretion

All the AIS samples had a positive effect on rat pancreatic cell proliferation/growth with mushrooms and blackberries being particularly good. Proliferation/growth figures were button mushrooms (183), mushroom flats (179), blackberries (139), mushroom stipes (136), blueberries (125), apples (115), strawberries (107) and raspberries (106) compared against a proliferation/growth baseline scale of 100%.

Insulin secretion potential of the AIS materials was tested using BRINBD11 rat pancreatic β-cell lines (procedure of Drummond *et al*., (2018). The cells were stimulated with 1ml of Kreb's Ringer Bicarbonate buffer followed by addition of 16.7mM glucose plus 1mg/mL of AIS material. Controls of 16.7mM glucose and 10mM alanine (well-known insulin stimulator) solutions were used and insulin secretion was determined using a Rat Insulin ELISA kit. All AIS samples outperformed the control glucose solution in terms of insulin release and mushroom buttons, mushroom flats and strawberry AIS also outperformed the alanine solution. Insulin secretion values (ng/µg protein in 20min) in descending order for AIS samples were: 109 (mushroom buttons), 100 (mushroom flats), 82 (strawberries), 68 (mushroom stipes), 66 (apples), 57 (blueberries), 52 (blackberries) and 40 (raspberries). Values for the alanine and glucose solutions were 41 and 23 respectively.

Conclusions

(i) Results from this UCD study show that AIS from berries and mushrooms may have potential for aiding glucose control through stimulation of insulin secretion. However, further studies are now needed to examine the potential *in-vivo*.

(ii) Research will continue in 2019/2020 on AIS prepared from selected vegetables and algae and also on identifying the compounds in the various AIS samples that are responsible for insulin secretion in the cell lines.

Previous issues of PlantFoods-ucd can be viewed at:
https://www.ucd.ie/foodandhealth/newsandevents/plantfo

References

- Drummond, E. & 15 co-authors. 2018. Casein hydrolysate with glycemic control properties: Evidence from cells, animal models & humans. *J. Agriculture & Food Chem.*, 66, 4352-4363.
- Mayne, P.D. & 5 co-authors. 1982. The effect of apple fibre on diabetic control & plasma lipids. *Irish Journal of Medical Science*, 151, 36-41.

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