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**Background/Aims:** Diabetes Mellitus (DM) affects 9.8% of Australian women. Breakfast cereal consumption has been linked with better health outcomes, including for DM. This study investigated the effect of breakfast cereal consumption on the risk of developing DM among the Australian Longitudinal Study of Women's Health (ALSWH), over 12 years.

**Methods:** Data from Survey 3 (S3) to Survey 7 (S7) inclusive, from the 1946–51 ALSWH cohort were analysed. Dietary data (DQESv2 FFQ) were available at S3 and S7, DM at S4–S7. Women were excluded if: dietary data were incomplete; they reported existing diabetes or IGT at S3; or if total energy intake was < 4,500 or > 20,000 kJ. Logistic regression models investigated the association between breakfast cereal intake (yes or no) and incident DM. Models were adjusted for: BMI, smoking, marital status, income, physical activity, and dietary intakes.

**Results:** There were 538 (8.1%) incident cases of DM. Total breakfast cereal intake was not associated with incident DM (OR: 1.08; 95%CI: 0.76, 1.55;  $p = 0.655$ ). There were no significant associations with most individual breakfast cereal types, however women who consumed muesli had a strong and significant decrease in the odds of developing DM (OR: 0.73; 95%CI: 0.59, 0.90;  $p = 0.003$ ).

**Conclusions:** Among mid-age Australian women muesli consumption, but no other breakfast cereals, was associated with a reduction in DM. This effect may be due to a particular profile of muesli eaters that we have not been able to fully adjust for, but the relationship warrants further investigation.

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## P21

### THE EFFECTS OF BOYSENBERRIES ON CHOLESTEROL METABOLISM TO PREVENT ATHEROSCLEROSIS

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**Background/Aims:** Heart disease is the second leading cause of death in Japan, and is mainly caused by atherosclerosis. Antioxidants are known to reduce such risks. We previously reported that boysenberry contained polyphenols more than raspberries and had potential antioxidants. It's thought that oxidized LDL cholesterol is a risk factor to induce atherosclerosis. We think if the absolute amount of oxidized LDL cholesterol would be reduced, the risk of developing atherosclerosis might be decreased. In this study, we aim to investigate the effects of boysenberries on cholesterol metabolism.

**Methods:** As samples, we used commercial boysenberry juice in Japan and ellagic acid that is the main polyphenol of boysenberry. Human hepatoma cells HepG2 and, human colon cells Caco2 were cultured in a medium containing samples. At 24 h after treatment in samples, we analyzed the mRNA expression by RT-real-time PCR.

**Results:** In the Caco2 cell, the expression of *ABCG5* and *ABCG8* in the 0.001% boysenberry juice was increased by half compared to the control medium having nothing ( $p < 0.05$ ,  $n = 8$ ). In the HepG2 cell, the expression of *ABCA1* in the 1  $\mu$ M ellagic acid was increased by half ( $p < 0.05$ ,  $n = 7$ ). *ABCA1*, *ABCG5* and *ABCG8* are factors in cholesterol excretion.

**Conclusions:** Our Results suggest that cholesterol excretion in the small intestine is promoted by adding boysenberries and thus the amount of oxidized LDL cholesterol might be reduced. We deduce that boysenberries influences cholesterol metabolism and its bioactivity does not depend on antioxidants. Boysenberries might have the potential to prevent atherosclerosis.

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## P22

### ANXIETY LEVELS MODERATE THE PROTECTIVE EFFECT OF DARK CHOCOLATE POLYPHENOL INTAKE AGAINST METABOLIC SYNDROME: THE ATTICA STUDY

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**Background/Aims:** Consumption of dark chocolate has been associated with favourable reduction in several markers of cardio-metabolic risk. However, these associations have not been explored with respect to levels of anxiety, this is despite that chronic stress is also correlated with unfavourable metabolic profiles. Therefore, the aim of the present analysis is to examine the association of dark chocolate consumption with the presence of Metabolic Syndrome (MetS), under the prism of anxiety.

**Methods:** During 2001–2002, 1514 men and 1528 women (age >18 years) without any clinical evidence of CVD or any other chronic disease, at baseline, living in greater Athens area, Greece, were enrolled (ATTICA study). In 2011–2012, the 10-year follow-up was performed in 2583 participants (75% retention). MetS was defined by the National Cholesterol Education Program Adult Treatment panel III (revised NCEP ATP III) definition. Dark chocolate intake was calculated using validated FFQs and anxiety levels were assessed using the Spielberg Anxiety Questionnaire.

**Results:** Individuals with MetS reported significantly higher levels of anxiety than MetS-free participants (mean  $\pm$  SD: 43  $\pm$  12 vs. 40  $\pm$  12;  $p = 0.029$ ). Among subjects with lower level of anxiety, every increase of 25 mg in daily dark chocolate polyphenols intake was associated with 5% less odds of MetS presence (OR: 0.951, 95%CI: 0.915, 0.988), after adjustment for gender, age and physical activity levels, but no significant association was revealed for participants with lower anxiety levels ( $p > 0.05$ ).

**Conclusions:** The findings suggest that the daily dark chocolate consumption could have an important favourable effect on the development of MetS in individuals with low levels of chronic stress and anxiety in this population sample. Furthermore, this moderating effect of stress in chocolate intake warrants further investigation.

**Funding source(s):** Coca-Cola SA, Hellenic Atherosclerosis Society

## P23

### DARK CHOCOLATE POLYPHENOL INTAKE IS AN EFFICIENT PREDICTOR OF METABOLIC SYNDROME: THE ATTICA STUDY

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**Background/Aims:** There is increasing interest and evidence that there is a potential favourable association between the daily consumption of dark chocolate and cardio-metabolic risk. However, this association has not been evaluated for its predictive ability. The aim of this analysis is to assess the role of dark chocolate consumption in predicting the presence of Metabolic Syndrome (MetS).

**Methods:** During 2001–2002, 1514 men and 1528 women (age >18 years) without any clinical evidence chronic disease (including CVD), living in greater Athens area, Greece, were enrolled (ATTICA study). MetS was defined by the National Cholesterol Education Program Adult Treatment panel III (revised NCEP) Chocolate intake was assessed with a valid FFQ.

**Results:** Daily dark chocolate polyphenols intake was a significant diagnostic tool for the presence of MetS, (AUC = 0.420,  $p = 0.001$ ). Additionally, for every 25 mg increase in the daily intake of dark chocolate polyphenols, the odds ratio of MetS presence decreased by 8% (Odds Ratio = 0.992, 95% CI: 0.988, 0.996)

**Conclusions:** Daily dark chocolate polyphenols consumption appears to be associated with the presence of metabolic syndrome. Further studies are required to examine the mechanisms through which dark chocolate mitigates the risk of developing MetS.

**Funding source(s):** Coca-Cola SA, Hellenic Atherosclerosis Society