Scientific Advisory Committee on Nutrition

SUMMARY OF NARRATIVE SYNTHESIS OF THE HEALTH EFFECTS OF POTENTIAL DIETARY FIBRE COMPONENTS

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1. Introduction

The Food Standards Agency asked the Scientific Advisory Committee on Nutrition (SACN) to consider which components should be included in the definition of dietary fibre and to review the available evidence on potential dietary fibre components.

To enable SACN to assess the available evidence the Food Standards Agency with SACN input commissioned Human Nutrition Research (HNR), Cambridge (via competitive tender) to undertake a comprehensive review of the health effects of potential dietary fibre components following the guidelines outlined in the SACN framework for the evaluation of evidence (2002) (www.sacn.gov.uk/reports_position_statements/reports/risk_assessment.html)
This paper was used as a background paper to enable SACN to produce a position statement the "SACN statement on Dietary Fibre" (www.sacn.gov.uk)

A summary of the evidence reviewed is presented in appendices A-E of this document.

2. Method

A narrative synthesis of the health effects of potential dietary fibre components was produced using the SACN Framework for the Evaluation of Evidence (2002) www.sacn.gov.uk/reports_position_statements/reports/risk_assessment.html

2.1 Literature

The literature review was based on a structured search of the electronic bibliographic database PubMed, and also the reference lists from relevant primary studies, meta analyses and review articles, including the WHO/FAO Scientific Update on Carbohydrate and Human Nutrition (2007), the CRC Handbook of Dietary Fibre in Human Nutrition, the Institute of Medicine of the National Academy of Sciences, Report on the Dietary Reference Intakes for Macronutrients, the WCRF Report on Food, Nutrition, Physical Activity and the Prevention of Cancer (2007) and research registers, such as The Cochrane Controlled Trials Register. The types of study that were included for the narrative synthesis were randomised control trials, acute experimental studies, prospective cohort and cross sectional studies.

2.2 Search terms and inclusion/exclusion criteria

2.2.1 Obesity and metabolic disease

The following criteria were used to help identify journal articles to be included in the review. Articles were included if:

- They were carried out in human subjects and reported in English
- Fibre was quantified and measured using the AOAC method, Asp method, Englyst method, Southgate method, or Neutral Detergent Fibre for insoluble fibre.
- For effects on body weight: studies reported either body weight as an outcome or another shorter-term outcome with a plausible link to body weight (including appetite, energy intake/expenditure hormones linked to satiety)
- For effects on metabolic health: studies reported type 2 diabetes incidence or another shorter-term outcome with a plausible link to this endpoint (including fasting or postprandial glucose/insulin, insulin sensitivity, glucose tolerance)

Exclusion criteria were as follows:

- 'Crude fibre' was used to define fibre
- Multiple dietary/lifestyle factors were changed such that the effect of fibre could not be separated from that of other dietary/lifestyle factors
- For weight and diabetes outcomes (but not shorter-term metabolic outcomes) cross-sectional observational studies were excluded because of the potential for reverse-causality
- Studies including subjects who were diabetic at the point of inclusion in the study (as treatment of diabetes was not considered in the report)
- Blood pressure and cholesterol/triacylglycerol outcomes were excluded from the obesity section as these were for considered in the context of cardiovascular

A PubMed search was performed using the following terms:

- Fiber OR Fibre OR Non-starch polysaccharide OR Resistant starch OR Fructo(-) oligosaccharide OR Galacto(-)oligosaccharide OR Polydextrose OR Inulin OR Lignin

AND

- Weight OR Obesity OR Obese OR Overweight OR BMI OR Hunger OR Satiety OR Fullness OR Appetite OR Insulin OR Glucose OR Diabetes OR Metabolic

7545 articles were identified; 595 were potentially relevant and abstracts examined in further detail; 242 full papers were obtained for consideration; 159 of these were relevant for inclusion. A further 42 papers were identified for inclusion from scrutiny of reference lists of journal articles and book chapters.

2.2.2 Cardiovascular disease

The following criteria were used to help identify journal articles to be included in the review. Articles were included if:

- They were carried out in human subjects and reported in English
- The fibre content was measured using the method of the Association of Official Analytical Chemists (AOAC), the Englyst method, Southgate method (or Neutral Detergent Fibre (NDF) in the case of insoluble fibre sources)
- They reported blood lipid fractions (i.e. total cholesterol, low density lipoprotein cholesterol, high density lipoprotein cholesterol, and/or triacylglycerol) or blood pressure.
- They specified the amount and the type of dietary fibre employed*

* Observational studies were included if the quantity of total dietary fibre could be determined from whole grain intake. If for example, dietary fibre (g/d) was tabulated according to quartile or quintiles of whole grain intake and met the other predetermined inclusion criteria, an observational study examining the association between dietary fibre intake and cardiovascular disease was included.

Articles were excluded if:

- Fibre content was defined as 'crude fibre'.
- The intervention was of a short duration (< 3 weeks)*
- Participants were taking lipid-lowering drugs or antihypertensive medication**
- Participants achieved significant weight loss (pre Vs post treatment)***
- A dietary portfolio (combination diet) was the intervention, e.g. the prescribed diet included plant sterols, soy protein, viscous fibres, and nuts etc.
- If the study reported C-Reactive Protein (CRP) as an intermediate marker of cardiovascular disease. It was considered that raised CRP levels were not a suitable indicator of disease related to atherosclerosis, especially in an epidemiological setting. Raised CRP measures may reflect inflammation in the body associated with infection and disease independent of cardiovascular disease.

* In proposing to authorise the use on food labels of health claims on the association between oat products and reduced risk of coronary heart disease, the Food and Drug Administration (1994) considered whether the intervention studies that it evaluated were of long enough duration to ensure stabilization of blood lipids (greater than or equal to 3 weeks duration).

** Studies were included if only a small number of the participants were reported to be taking medication to treat hyperlipidemia or to treat hypertension.or where participants were taking a stable dose of lipid-lowering or antihypertensive drugs the study has been included in the review.

In some instances a meta-analysis was taken as the starting point from which to search for relevant scientific literature. This was the case for several types of soluble fibre. The meta-analysis of Brown et al (1999) included 67 controlled trials and quantified the cholesterol-lowering effect of oat products, psyllium, pectin and guar gum. Studies published from 1966 to June 1996 were included in this meta-analysis. Relevant journal articles published subsequent to these dates were considered in relation to this review.

A literature search was also carried out on studies relating concerned with the relating blood pressure to fibre intake published subsequent to the meta-analysis of Streppel et al (2005).

A PubMed search was performed using the following terms:

- Fiber OR Fibre OR Oligosaccharide OR Resistant starch OR Fructo(-)oligosaccharide OR Galacto(-)oligosaccharide OR Polydextrose OR Inulin OR Lignin

AND

- Cholesterol OR Cardiovascular disease OR Blood lipids OR Blood pressure OR Hypertension OR Guar gum OR Psyllium OR Pectin

2.2.3 Colorectal cancer

The following criteria were used to help identify journal articles to be included in the review. Articles were included if:

- They referred to human subjects and reported in English
- They specified the amount and the type of dietary fibre investigated
- The fibre content was measured using the method of the Association of Official Analytical Chemists (AOAC), the Englyst method, Southgate method (or Neutral Detergent Fibre (NDF) in the case of insoluble fibre sources)
- They reported incident colon, rectal or colorectal cancer, and/or incidence or recurrence of colorectal adenoma.

Articles were excluded if:

- Effect estimates for fibre as a main exposure were not given
- Data were not prospective
- The amount of fibre consumed per day was not given
- A combination diet was the intervention, e.g. the prescribed diet included increased fibre and reduced fat content
- Fibre content was defined as 'crude fibre'
- More than a single type of fibre was incorporated into the fibre supplement

Search Terms/Strategy

A PubMed search was performed using the following terms:

Fiber OR fibre OR resistant starch

AND

colorectal cancer OR colon cancer OR colorectal adenoma

Reference lists of appropriate meta-analyses such as the WCRF 2007 report on Food, Nutrition, Physical Activity, and the Prevention of Cancer, the Pooling Project of Prospective Studies of Diet and Cancer and the Cochrane Review on dietary fibre for the prevention of colorectal adenomas and carcinomas were scrutinised for additional relevant papers. Initial searches in PubMed: 197 papers, of which 22 were included. Searching of reference lists led to a further 4 papers. Searches using 'colorectal adenoma' instead of 'colorectal cancer' produced no additional papers. 26 prospective investigations involving 17 cohort studies (table 1C) and 2 RCTs with single interventions published between 1989 and 2007 were reviewed (table 2C). Studies using aggregate data, such as ecological studies, were not reviewed as the effects of an individual's dietary intake of fibre on their risk of colorectal cancer are difficult to determine using group level data on average intakes and disease rates.

2.2.4 Colonic function

The following criteria were used to help identify journal articles to be included in the review. Articles were included if:

- They referred to human studies and were in English
- They specified the amount and the type of dietary fibre employed
- The fibre content was measured using the method of the Association of Official Analytical Chemists (AOAC), the Englyst method, Southgate method (or Neutral Detergent Fibre (NDF) in the case of insoluble fibre sources)
- They reported faecal output in g/d, collected from at least a 24 hour collection of all stools passed.

Articles were excluded if:

- The faecal measure was something other than daily faecal output in g/d, including measures of 'stool' weight (generally obtained where only one stool was collected.)
- Fibre content was defined as crude fibre.

Search Terms/Strategy

A PubMed search was performed using the following terms:

- Fiber OR Fibre OR Resistant starch OR Fructo(-)oligosaccharide OR Polydextrose OR Inulin OR Lignin

AND

- Colon OR Bowel OR Faecal OR fecal

Additionally, a manual search was made using reference lists of original research articles and review articles to help identify any further relevant articles.

2.2.5 Prebiotics

The following criteria were used to help identify journal articles to be included in the review. Articles were included if:

They refer to candidate materials which fulfilled the prebiotic requirement criteria set out by (Gibson et al, 2004):

- resists gastric acidity, hydrolysis by mammalian enzymes and gastrointestinal absorption
- is fermented by intestinal microflora
- selectively stimulates the growth and/or activity of intestinal bacteria associated with health and well-being.

- They were reported in the English language
- They were in human subjects, including infants

Articles were excluded if:

- They did not fully meet the three prebiotic criteria

A PubMed search was performed using the following terms:

- Prebiotic OR Bifidobacteria OR Lactobacilli OR Inulin OR Fructo(-)oligosaccharide OR Galacto(-)oligosaccharide OR Lactulose

Excluded terms:

- Non-selective saccharolytic fermentation OR Proteolysis OR Upper gut absorption OR Clinical situations

Reference lists of recent books on prebiotics were also searched for articles fulfilling the above search criteria.

2.3 Presentation of data

The data were extracted from papers and tabulated in accordance with the SACN framework. Where the term fibre is used in the review it reflects the terminology used by the author of the paper and does not necessarily reflect SACNs opinion.

3. Results

Results for all sections are presented in the tables the appendices A-E.

3.1 Obesity and metabolic health

Studies investigating fibre intake and weight related outcomes, type II diabetes and metabolic risk factors are listed in Tables 1A-14A. Metabolic risk factors include measures of insulin sensitivity and glucose response.

Evidence from four of the five prospective cohort studies identified suggest that increasing amounts of total fibre (as determined by AOAC method) in the diet are associated with lower body weight and waist circumference (Table 1A). There is no evidence for an association of fibre intake with weight change in children.

Prospective studies investigating total fibre intake and the incidence of type 2 diabetes are detailed in Table 2A. In terms of total fibre, the evidence is inconsistent. For cereal fibre, nine of the ten studies observed that increasing intake significantly reduced the risk of type 2 diabetes, but overall, the evidence does not support a positive association for fibre from fruit, vegetables or legumes on the outcomes investigated. Two of three studies observed an association with insoluble fibre intakes, but no association with soluble fibre (Meyer *et al* 2000; Montonen *et al* 2003). Seven of the nine cross sectional studies (table 3A) reported an association between fibre intake and various measures of insulin sensitivity and glucose tolerance.

Intervention studies have investigated the relationship between fibre supplements and food sources of fibre on weight and related outcomes such as energy intake and excretion (Tables 4A-8A). Although different forms of fibre have been administered, in general those studies that have provided, fibre as part of *ad libitum* diet or in the context of healthy eating regimens have not shown conclusive evidence that fibre intake in general is related to weight related outcomes. However, supplementation appears to be efficacious in overweight and obese subjects when dietary advice is given. The balance of evidence suggests that fibre supplementation with certain fibres in sufficient amounts is more likely to be efficacious in assisting weight loss as an adjunct to a weight-reducing diet in overweight and obese subjects (Table 6A). It should be noted that, due to the variation in study duration, and fibre types and amounts, it is difficult to draw conclusions about the overall role of fibre intake in relation to the more important outcome of long term weight loss. There is no evidence to suggest an effect of fibre supplementation on weight control in children (Table 9A); this is consistent with the evidence from observational studies.

Studies evaluating the effect of fibre supplementation on metabolic risk factors such as insulin sensitivity and glucose tolerance are listed in Tables 10A-13A. There is heterogeneity in the study designs, and fibre types and amounts, but overall, beneficial effects of supplementation have been reported when more sensitive measures, such as the euglycaemic hyperinsulinaemic clamp have been used, with fewer effects seen in those studies using fasting measures. This suggests that any effect size is likely to be small. Furthermore, improvements in metabolic risk factors have generally been observed in subjects at higher metabolic risk, with very little evidence to suggest that insulin sensitivity or glucose tolerance can be further improved in healthy subjects. A wide range of supplements has been used in these studies, with few direct comparisons between types of fibre, making it difficult to draw conclusions about health benefits of different components. These data suggest that there may be some beneficial effect of increasing total fibre/non starch polysaccharide intake in reducing metabolic disease risk, independent of weight.

In terms of insulin sensitivity and glucose tolerance, only a small number of studies have investigated the effects of resistant starch (Table 11A), isolated oligosaccharides (Table 12A), or polydextrose (Table 13 A). The four studies which have assessed the effect of resistant starch suggest that it could have a positive effect on insulin sensitivity and glucose tolerance; however, further research is required to confirm this relationship. There is insufficient evidence to show an association between oligosaccharides, inulin, or polydextrose on weight outcomes or metabolic profiles.

Table 14A lists acute experimental feeding studies, which have investigated immediate post-prandial effects associated with the consumption of fibre and subsequent glucose and insulin responses. There is a trend towards reductions in post-prandial glucose and insulin levels with a number of different sources of fibre, especially resistant starch, oat bran and guar gum. Some studies have reported transient increases in satiety with specific fibres, but there is much less evidence that these fibres produce decreases in food intake at later meals. The limited number of studies, together with the diversity of study design and outcome measures makes it difficult to draw clear conclusions on the acute effects of different types of fibre and whether any effects may translate into long term health benefits.

3.2 Cardiovascular disease

Studies investigating fibre and cardiovascular disease risk are listed in Tables 1B-18B. The majority of studies have focussed on lipid outcomes (cholesterol and triglyceride levels) with only a few measuring the effect of fibre intake on blood pressure or disease endpoints.

Prospective studies investigating cardiovascular disease risk are detailed in Table 1B: of the six studies five measured disease end points. Two studies reported that total fibre (Jensen et al 2004; Pietinen et al 1996b) and cereal fibre intake (Pietinen et al 1996b; Wolk et al 1999) decreased the risk of cardiovascular disease. Four cross-sectional studies were identified that evaluated the effect of fibre consumption on lipid outcomes (Table 1B). Of these two observed that increasing total fibre intake was related to lower cholesterol levels (McKeown et al 2002; Newby et al 2007). Newby et al (2007) also noted an association with cereal fibre. In terms of observational studies, the findings are inconsistent, thus making it difficult to draw any firm conclusions about fibre intake and cardiovascular disease.

RCT's which have investigated the effect of supplemention with various components on lipid profiles are listed in Tables 6B-16B. In terms of oat products: the 13 of the 16 studies demonstrated that consumption of soluble fibre had significant effects on lowering total- and LDL-C levels (Tables 5B and 6B). Psyllium intake was also associated with lower total or LDL-cholesterol levels in three out of five trials (Table 7B and 8B). Data from a meta-analysis of 67 RCT's looking at the outcome of different types of fibre on the levels of blood lipids, which included 17 on oat products, 17 on psyllium, 7 on pectin and 18 on guar gum was also considered (Brown et al 1999). Taken together with the studies presented in the tables, the evidence suggests that soluble fibre, in particular that from oats, psyllium, pectin and guar gum may be effective in lowering total cholesterol and LDL cholesterol.

Three of the intervention studies (Behall et al 2004a; Behall et al 2004b; Keenan et al 2007) which investigated barley products were identified (Table 10B) demonstrated that fibre from barley could be effective in lowering total and LDL cholesterol concentrations in hypercholesterolemic subjects.

The findings from trials investigating isolated polysaccharides, wheat, fibre supplement mixtures, legumes, resistant starch and oligosaccharides and inulin are inconsistent (Tables 11B-16B), therefore there is insufficient evidence to conclude whether these different components are associated with lipid outcomes. In terms of legumes, three out of the five studies (Cobiac et al 1990; Fruhbeck et al 1997; Pittaway et al 2006; Anderson et al 1990) suggested that fibre from this source may have a cholesterol lowering effect (Table 14B), However, due to limitations in study design, it is difficult to draw any firm conclusions.

Studies investigating the effect of fibre intake on blood pressure are listed in Tables 3B, 4B, 17B and 18B. There is insufficient evidence from the five observational (prospective and cross sectional) and four intervention studies to demonstrate that dietary fibre has any effect on blood pressure. These studies were considered in addition to a meta-analysis of 24 trials investigating fibre supplementation with blood pressure (Streppel et al 2005), which overall did not find any evidence for an association.

3.3 Colorectal cancer

Studies which have evaluated the effect of fibre intake and the risk of colorectal cancer and adenoma are listed in Tables 1C-7C. The majority of the data were derived from prospective cohort studies with only two RCT's reporting on the effect of fibre supplementation.

For colorectal cancer the evidence was variable, with eight out of 17 cohort studies finding no statistically significant association after multiple adjustment for confounding factors between AOAC determined dietary fibre and colorectal cancer (Table 1C). Of these, the EPIC Europe study was one of the largest studies, and utilised the techniques of increased dietary heterogeneity and calibration to reduce measurement error. This study showed a strong protective effect of dietary fibre.

Nine studies have investigated the link between fruit, vegetable and grain sources of fibre and colorectal cancer (Bingham et al 2003; Bingham et al 2005; Fuchs *et al* 1999; Giovannucci *et al* 1994; Lin *et al* 2005; Michels *et al* 2005; Nomura *et al* 2007; Schatzkin *et al* 2007; Terry *et al* 2001; Wakai *et al* 2007; Willett *et al.,* 1990) (Table 6C). and most of these reported no significant effect. Two of the studies which involved an increased intake of vegetable fibre, and one study investigating grain fibre, reported a reduced the risk of colorectal cancer. Of the two cohort studies which assessed the intake of soluble and insoluble fibre in relation to the risk of colorectal cancer (Table 7C), one found an association with insoluble fibre.

It should be noted that all but one of the cohort studies (Pietinen et al 1999) on dietary fibre and colorectal cancer measured total fibre, as determined by the AOAC method. This method does not allow separation into the different components, therefore the individual fibre components cannot be directly associated with risk of colorectal cancer. In addition, there are no reliable biomarkers of fibre intake, and it is possible that measurement error in dietary assessment leading to misclassification of exposure may have affected the results of the observational studies.

Table 3C details five cohort studies investigating the risk of colorectal adenoma with total fibre intake. Of these, two studies reported an association with adenoma occurrence (Giovanucci et al 1992; Peters et al 2003). Three studies have distinguished between fibre from fruit, vegetable and grain sources and risk of colorectal adenoma (Giovannucci et al 1992; Jacobs et al 2002; Platz et al 1997) (Table 4C). Two of these studies showed a decreased risk of adenoma with fruit fibre intake and only one study found an association with vegetable and grain fibre. Platz et al (1997) reported that soluble fibre intake was associated with a decreased risk of adenoma; however, this was the only study which quantified soluble and insoluble fibre in the diet (Table 5C).

Table 2C lists two RCTs (The Wheat Bran Fibre Trial (WBFT) and European Cancer Prevention Organisation Intervention Study (ECPOIS)) which evaluated fibre supplementation and colorectal adenoma reoccurrence (Alberts *et al* 2000; Bonithon-Kopp *et al* 2000). These both investigated wheat bran and psyllium supplements, respectively, and found no evidence of an effect on subsequent adenoma risk. Therefore there is insufficient evidence from trials that dietary fibre components can reduce the occurrence of colorectal adenoma.

The findings suggest that increased overall fibre intake may reduce cancer risk; however further evidence is required to confirm this observation. On balance, due to the paucity of data and inconsistent findings, there is not enough evidence to conclude whether specific forms of fibre intake have an association with the risk of colorectal cancer or adenoma.

3.4 Colonic function

Studies which have evaluated the effect of intake of different types of ‘dietary fibre’ and colonic function are listed in Tables 1D-4E.

There are very few observational studies where diet has been assessed accurately and faecal collections made for sufficient periods to evaluate the effect of dietary fibre on faecal output in free-living individuals, so that intake of ‘dietary fibre’ that may contribute to faecal output can be examined. These are listed in table 1D.Colonic function as determined by faecal weight has been demonstrated to relate to NSP intake (Davies et al 1986; Cummings et al 1992; Birkett et al 1997) but not intakes of starch or resistant starch (Birkett et al 1997).

Several small intervention studies have investigated the effect of ‘fibre’ components including fibre from grains and vegetables, isolated polysaccharides, resistant starch and oligosaccharides on faecal weight. Results are presented in tables 2D-4D.

The mean increase in daily faecal weight was greater for components such as wheat bran (5.4g/g) followed by fruit and vegetables (4.1g/g), gums such as psyllium (4g/g), soya products (2.5g/g) and pectin least of all (1.2g/g) (Cummings 2001). It should be noted that many of these studies were only on a small number of subjects and were insufficiently powered.

Table II: Summary of studies on effect of dietary fibre on faecal weight (from Cummings, 2001)

Fibre type or source	**Number of studies**	**Mean increase in daily faecal weight g/g Dietary Fibre fed (SEM)**	**Comments**
Wheat	41	5.4 (0.7)	Mainly bran. Raw 7.2 g/g; cooked 4.9 g/g
Fruit and vegetables	28	4.1 (0.7)	Carrot, cabbage, peas, apple, potato, banana, prunes, mixed sources
Gums and mucilages	27	3.7 (0.5)	Psyllium/ispaghula 4.0 g/g (n=14); gum Arabic 4.0 g/g (n=9); tragacanth, sterculia, bassara, xylan, agar
Cellulose	7	3.5 (0.8)	Also carboxymethylcellulose, 4.9 g/g (n=3), methylcellulose 8.9 g/g (n=4)
Oats	4	3.4 (1.1)	Oat bran or oats
Corn	5	3.3 (0.3)	Corn meal or bran
Legumes	17	2.2 (0.3)	Soya products 2.5 g/g (n=11)
Pectin	11	1.2 (0.3)	Degree of methoxylation not important

Intervention studies have investigated the effect of fibre from various grains including wheat, rye and barley. Only one study investigating wheat was identified (a wheat fibre supplement; Fibrotein) (Vuksan et al 1999) and this increased faecal bulk significantly compared to the negative control group ($P \leq 0.01$). Based on the two studies (Grasen et al 2000;McIntosh et al 2003) in table 2D, rye would appear to have a significant effect on faecal weight and transit time. Three intervention studies investigating barley were identified (Bird et al 2008, Li et al 2003, Lupton et al 1993) and demonstrated that barley significantly increased faecal weight. A number of studies investigated various new fibre supplements made from plant sources (see table 2D iv) including sugar beet (Castaglia-Delavind et al 1998), potato (Cherbut et al 1997) and flax (Dahl et al 2005). Overall these plant sources have a significant effect on stool weight. Fours small intervention studies (Chen et al 2006; Chaplin et al 2000; Daly et al 1993 and Robinson et al 2001) investigated isolated polysaccharides in the form of powders and gels. Overall these did not provide evidence of stool bulking.

Seven intervention studies on resistant starch and colonic function were reviewed by, Cummings et al (2001). These described 11 treatments where the effects of resistant starch on colonic function were studied. Several of these investigated the same resistant starch product, namely Hylon VII, either RS_2 or RS_3. Four studies (Jenkins et al 1998; Behall et al 2002; Muir et al 2004; Grubbens et al 2001) were considered in addition to those reported by Cummings et al. (see table 3D). Overall, resistant starch has a modest effect on faecal weight (Cummings et al 2001; Jenkins et al 1998; Behall et al 2002; Muir et al 2004; Grubbens et al 2001) and this could not be considered of a size which would make it appropriate for consideration as a dietary fibre according to this criterion

Table I: Effects of resistant starch on faecal weight (Cummings 2001)

Reference	**Source of RS**	**Number of subjects**	**Amount of RS fed (g)**	**Increase in daily faecal weight (g/g RS fed)**
Cummings et al (1996)	Potato RS2	9	26.8	1.6
Cummings et al (1996)	Banana RS2	8	30.0	1.7
Cummings et al (1996)	Wheat RS2	9	17.4	2.5
Cummings et al (1996)	Maize RS2	8	19.0	2.7
Heijnen et al (1998)	Hylon VIIRS2	23	32	1.4
Heijnen et al (1998)	Hylon VIIRS3	23	32	2.2
Hylla et al (1998)	Hylon VII	12	55	0.8
Silvester et al (1997)	Mixed potato RS2 and Hylon VII	8	40	0.9
Phillips et al (1995)	Mixed food sources	11	39	1.8
Tomlin and Read (1990)	Cornflakes	8	10	-1.9
Van Munster et al (1994)	Hylon VII RS2	14	28	1.0

Ten studies on oligosaccharides and inulin are summarised in table 4D. Overall oligosaccharides (Alles et al 1999; Bouhnik et al 2007; Brighenti et al 1999;; Chen et al 2001;Molis et al 1996; Ten Bruggencate 2006) and inulin (Causey et al 2000; Den Hond et al 2000; Sairanen et al 2007) had very little effect on faecal weight or transit time when these materials are fed and hence an effect on faecal weight is not a criterion that is satisfied by these materials to enable them to be considered dietary fibre.

In addition, several studies reported no significant change in SCFA concentration (Alles et a 1999; Causey et al 2000) and two studies (Chen et al 2001; Scholtens et al 2006) reported a decrease in butyrate concentration. Four studies investigated diets with mixed fibre sources from fruit, vegetables and/or grains. All four studies reported an increase in faecal weight when fibre was increased in the diet.

3.5 Prebiotics

Studies which have evaluated the effect of prebiotics on the gut microflora in adults and infants are detailed in tables 1E and 2E. Studies investigating prebiotics were of short durations (often days or weeks) and on a very small number of human subjects. Overall studies demonstrate that lactulose, fructo-oligosaccharides and galacto-oligosaccharides significantly increased bifidobacteria but as yet there is no convincing evidence that as potential fibre components they confer any specific health benefit to the human host.

4. Interpretation of results

In formulating a recommendation SACN considered the strength of the available evidence from both intervention and observational studies. Consideration was given to the sample size, dose, duration and significance of the studies presented.

There were concerns regarding the quality of some studies presented in the report and where there appear to be conflicting results in outcomes, this may be accounted for by differences in study quality. Furthermore, studies have often poorly characterised the fibre components under investigation as in the use of AOAC method to determine fibre or the use of generic terms such as soluble or insoluble fibre. Therefore, making it difficult to distinguish which specific components could be contributing to any associations observed or readily compare the findings of different studies.

In addition consideration was given to whether the studies demonstrated a clear physiological effect on human health.

The data presented in the appended tables will contribute to the cardio-metabolic health and colorectal health sections of the SACN Carbohydrate and Health report once the committee have finished their deliberation.

5. SACN recommendation

SACN consider that a material can be considered as dietary fibre if it is resistant to digestion and absorption in the small intestine and has a demonstrable physiological effect potentially associated with health benefits in the body, such as increasing stool bulk, decreasing intestinal transit time or decreasing post prandial glycaemia. Evidence only of increased fermentation in the gut should not be included under this definition, since although this has a direct effect on the microflora, it must also be shown to have a demonstrable benefit to the host to be considered as dietary fibre.

6.0 Carbohydrate definitions

Monosaccharides- single sugar molecules e.g. glucose, fructose galactose.

Disaccharides- consist of two monosaccharides linked together e.g. sucrose, lactose, maltose, trehalose.

Oligosaccharides- short chain carbohydrates comprising of 3-9 monomers joined together by glycosidic linkages.

Polysaccharides- long chain carbohydrates comprising of ≥ 10 monomers.

Sugars- monosaccharides, disaccharides and polyols (sugar alcohols).

Alpha glucans- oligosaccharides with an alpha linkage between monomers.

Inulin, Fructooligosaccharides (FOS)- non-α-glucan oligosaccharides, known as fructans, and are the storage component of artichokes and chicory.

Polydextrose -non- α–glucan oligosaccharide.

Galactooligosaccharides (GOS)/ milk oligosaccharides- oligosaccharides found in milk, which principally contain galactose.

Non starch polysaccharide (NSP)- non- α -glucan polysaccharides that are mainly found in the plant cell walls and consist of a large umber of monosaccharides. This includes cellulose, hemicellulose, pectin, arabinoxylans, plant gums, ß-glucans.

Pectin- an NSP which is common to all cell walls.

Gums/mucilages- an NSP which is which is chemically related to the cell wall, but is not strictly a cell wall component. Plant gums are sticky exudates which are formed at the site of injury e.g. guar gum.

Starch- the storage carbohydrate of plants, such as cereals, root vegetables and legumes, and consists of only glucose molecules.

Resistant starch- the sum of starch and products of starch digestion (such as maltose, maltotriose and α-limit dextrins) that are not absorbed by the small bowel.

Prebiotic- a non-digestible food component that stimulates the growth and/ or activity of the bacteria in the bowel.

Lignin- non-carbohydrate component associated with plant walls.

Englyst method- specifically determines NSP using an enzymatic-chemical method, which can be modified to yield soluble and insoluble fractions.

American Association of Analytical Chemists (AOAC)/ enzymatic-gravimetric method-

Determines total, soluble and insoluble residue containing carbohydrate and non-carbohydrate material in unknown proportions by measuring total residue weight and subtracting ash and protein content.

Soluble fibre- relates to NSP components which can be rendered soluble by changing the pH conditions. These generally undergo significant fermentation, and viscous forms of these may also slow rates of glucose and lipid absorption from the small intestine[A]. Examples of soluble fibres include pectin, beta-glucan (from oats and barley) and psyllium.

Insoluble fibre- NSP components that tend to undergo slow and incomplete fermentation and can have a greater effect on bowel habit[A]. Insoluble fibres are found in vegetables and wholegrain products.

Available and unavailable carbohydrate- relates to carbohydrates which are available to the body for metabolism (starch/soluble sugars), or those which are not (cellulose and hemicellulose) and pass to the colon. It should be noted that carbohydrate reaching the colon is still able to provide energy through fermentation and, therefore the definition is not exact.

Glycaemic carbohydrates- carbohydrates which provide glucose following digestion and absorption in the small intestine e.g. mono- and disaccharides, some oligosaccharides (maltodextrins), rapid and slowly digested starch.

Non-glycaemic carbohydrates- carbohydrates which pass to the large intestine e.g. other oligosaccharides, resistant starch, NSP.

[A]*The division between soluble and insoluble fibre is extremely pH dependent. Also, a large proportion of insoluble fibres are completely fermented and not all soluble fibre have effects on glucose and lipid absorption. Therefore, WHO have considered these definitions to be less useful when characterising fibre components.*

Appendix A: Obesity and metabolic Health

Table 1 A: Prospective studies of fibre intake and body weight/composition

Table 2A: Prospective studies of fibre intake and type 2 diabetes incidence

Table 3A: Cross sectional studies of fibre intake and metabolic risk factors

Table 4A: Highly-controlled intervention studies of fibre intake and body weight/weight-related outcomes

Table 5A: Effect of fibre on body weight in 'healthy-eating' dietary interventions

Table 6A: Effect of fibre supplementation of habitual diets on body

Table 7A: Effect of fibre supplementation of weight-reducing diets on body

Table 8A: Effect of fibre supplementation in maintenance of weight-loss

Table 9A: Effect of fibre supplementation on body weight in children

Table 10A: Effect of fibre supplementation on metabolic risk factors

Table 11A: Effect of resistant starch on weight and metabolic outcomes

Table 12A: Effect of oligosaccharides and inulin on weight and metabolic outcomes

Table 13A: Effect of polydextrose on weight and metabolic outcomes

Table 14A: Acute experimental studies

Table 1A: Prospective studies of fibre intake and body weight/composition

Reference Cohort	Subjects N (M/F) Age Follow-up	Determination of fibre	Fibre intake	Adjusted result/OR/RR	P/Ptrend[A]	Factors adjusted for
Iqbal et al (2006) Danish 1936 cohort (n=284) & MONICA1 study (n=1478)	1,762 (862/900) 30-60 years 5 years follow-up	AOAC-defined total dietary fibre by 7 day weighed record (baseline)	Mean ± SD (g/d) M: 18.8 ± 7.3 F: 13.9 ± 5.5	Mean change in body weight (kg) (β ± SE) per 1 kg/d increase in fibre intake 8.6 ± 6.9 -22.3 ± 13.4	 0.17 0.10	Baseline BMI, age, physical activity, smoking, education, cohort, dietary volume, energy intake
Koh-Banerjee et al (2003) Health Professionals Follow-up Study	16,587 (M) 40-75 years 9 year follow-up	AOAC-defined total dietary fibre by FFQ	Baseline / follow-up mean intake ± SD (g/d): 40-49y: 18.8 ± 7.3 / 21.3 ± 7.1 50-59y: 21.1 ± 6.7 / 22.7 ± 7.3 60-75y: 22.3 ± 7.4 / 24.2 ± 7.6	Mean waist change ± SE (cm) with 12 g/d increase in total fibre intake: -0.23 ± 0.09	 0.008	Age, baseline waist, baseline and change in BMI, baseline and change in energy intake, change in smoking status, baseline and change in physical activity, baseline and change in alcohol intake
Koh-Banerjee et al (2004) Health Professionals Follow-up Study	27,082 (M) 40-75 years 8 year follow-up	AOAC-defined total dietary fibre by FFQ	Tertile median change in intake (g/d): Total fibre Q1: -5.2 Q2: +0.5 Q3: +8.5 Cereal fibre Q1: -2.2 Q2: +1.0 Q3: +5.1 Fruit fibre Q1: -2.2 Q2: +0.2 Q3: +3.7 Vegetable fibre Q1: -3.2 Q2: 0.0 Q3: +4.1	Mean weight change ± SE (kg) 1.40 ± 0.20 1.04 ± 0.20 0.39 ± 0.20 1.30 ± 0.27 1.15 ± 0.26 0.91 ± 0.26 1.59 ± 0.27 0.96 ± 0.26 0.64 ± 0.26 1.08 ± 0.27 1.26 ± 0.26 1.12 ± 0.26	 <0.0001 0.0004 <0.0001 0.8	Age, baseline weight, baseline smoking status, baseline and change in other dietary factors (including other fibre types), baseline and change in physical activity

[A] When data is reported across tertiles, quartiles or quintiles (up to Q3, Q4, or Q5) the values represent Ptrend
BMI- body mass index; FFQ Food frequency questionnaire

Reference **Cohort**	**Subjects** **N (M/F) Age** **Follow-up**	**Determination of fibre**	**Fibre intake**	**Adjusted result/OR/RR**	**P/Ptrend**[A]	**Factors adjusted for**
Lindstrom et al (2006a) Finnish Diabetes Prevention Study Cohort	500 40-64 years 3 year follow-up from 3 year active intervention period	AOAC-defined total dietary fibre by 3 day food record (mean of intervention years 1-3)	Quartile range (g/4.18MJ) Q1: <10.85 Q2: 10.85-13.00 Q3: 13.00-15.55 Q4: >15.55	Mean weight change year 1 to 3 (kg) (LOCF) -0.4 -1.6 -2.5 -3.0	0.001	Intervention group, gender, age, VLCD-use, baseline weight, baseline & follow-up physical activity, baseline fibre intake (NOT fat intake)
			Quartile range (g/4.18MJ) Q1: <10.85 Q2: 10.85-13.00 Q3: 13.00-15.55 Q4: >15.55	Mean waist change year 1 to 3 (cm) (LOCF) -1.6 -2.2 -2.5 -2.9	0.033	
Liu et al (2003) Nurses Health Study	74,091 (F) 38-63 years 2-4 years follow-up	AOAC-defined total dietary fibre by FFQ	Quintile Q1 Q2 Q3 Q4 Q5	Mean ± SE weight change (kg) 1.73 ± 0.03 1.50 ± 0.03 1.37 ± 0.02 1.34 ± 0.02 0.97 ± 0.02	<0.0001	Age, baseline BMI; changes in exercise, smoking, HRT, alcohol, caffeine, total energy, SFA, PUFA, MUFA, transFA and protein
Ludwig et al (1999) CARDIA Study	1,302 to 1,602 depending on outcome 18-30 years 10 year follow-up	AOAC-defined total dietary fibre by FFQ	Quintile median (g/4.18MJ) White (n=1,602) Q1: 5.2 Q5: 12.3 Black (n=1,307) Q1: 5.2 Q5: 12.3	Mean year 10 body weight (kg) 79.2 75.6 84.2 80.6	<0.001 0.001	Baseline weight, gender, age, field centre, education, energy intake, physical activity, smoking, alcohol, vitamin supplement use
			Quintile median (g/4.18MJ) White (n=1,598) Q1: 5.2 Q5: 12.3 African-American (n=1,302) Q1: 5.2 Q5: 12.3	Mean year 10 waist-to-hip ratio 0.813 0.801 0.809 0.799	0.004 0.05	

[A] When data is reported across tertiles, quartiles or quintiles (up to Q3, Q4, or Q5) the values represent Ptrend
BMI- body mass index; FFQ Food frequency questionnaire; SFA- saturated fatty acids; PUFA- polyunsaturated fatty acids; transFA- trans fatty acids

STUDIES IN CHILDREN						
Reference Cohort	**Subjects N (M/F) Age Follow-up**	**Determination of fibre**	**Fibre intake**	**Adjusted result/OR/RR**	**P**	**Factors adjusted for**
Berkey et al (2000) Growing Up Today Study	10,769 (4,620/6,149) 9-14 years 1 year follow-up	AOAC-defined total dietary fibre by FFQ	Baseline mean age-specific intake ± SD (g/d) M9y: 16.9 ± 4.2 M14y: 17.8 ± 4.4 F9y: 16.4 ± 4.1 F14y: 16.8± 4.6	Mean annual change in BMI (β ± SE) per 1 g/d increase in fibre intake in year before baseline BMI -0.0059 ± 0.0045 0.0023 ± 0.00415	 0.186 0.577	Race, menarche history, annual height growth, baseline BMI, age, Tanner stage, energy & fat intake, Physical activity measures
Newby et al (2003) North Dakota WIC Program	1,379 (690/689) 2-5 years 1 year follow up	AOAC-defined total dietary fibre by FFQ	Baseline mean intake ± SD (g/d) M: 11.9 ± 3.0 F: 11.9 ± 3.1	Mean annual change in weight (kg) (β ± SE) per 1 g/d increase in baseline fibre intake 0.001 ± 0.02	 0.96	Age, gender, energy intake, ethnicity, residence, poverty level, maternal education, birth weight

FFQ Food frequency questionnaire, BMI- body mass index

Table 2A: Prospective studies of fibre intake and type 2 diabetes incidence

Reference Cohort	Subjects N (M/F) Age Follow-up	Determination of fibre	Fibre intake	Adjusted result/OR/RR (95%CI)	P/Ptrend[A]	Factors adjusted for
Colditz et al (1992) Nurses Health Study	84,360 (F) 702 cases 30-55 years 6 years follow-up	Southgate-defined total dietary fibre by FFQ	Energy-adjusted total fibre intake BMI<29 Q1 Q2 Q3 Q4 Q5 BMI≥29 Q1 Q2 Q3 Q4 Q5	 1.00 (ref) 0.89 0.82 1.19 0.75 (0.50-1.13) 1.00 (ref) 1.21 1.21 1.04 1.08 (0.78-1.48)	 0.60 0.97	Age, BMI, alcohol, family history of diabetes, prior weight change & time period
Hodge et al (2004) Melbourne Collaborative Cohort Study	31,641 40-69 years 4 years follow-up	AOAC-defined total dietary fibre by FFQ	Increase in intake (g/d) Total fibre: +20 Cereal fibre: +10 Fruit fibre: +10 Vegetable fibre: +5 Legume fibre: +1 Potato fibre: +1	 1.02 (0.81-1.30) 1.08 (0.88-1.32) 0.97 (0.81-1.16) 1.00 (0.86-1.17) 1.01 (0.96-1.06) 1.03 (0.91-1.16)	 0.46 0.71 0.96 0.67 0.65	Age, country of birth, physical activity, 5-year weight change, education, family history of diabetes, energy intake, BMI, waist:hip ratio
Hu et al (2001) Nurses Health Study	84,941 (F) 3,300 cases 34-59 years 16 years follow-up	AOAC-defined total dietary fibre by FFQ	Cereal fibre intake Q1 Q5	 1.00 (ref) 0.6 (0.5-0.7) (estimated from figure)	 <0.001	Age, time, family history of diabetes, menopausal status, HRT, smoking, BMI, physical activity, alcohol, PUFA:SFA, transFA, glycaemic load

[A] When data is reported across tertiles, quartiles or quintiles (up to Q3, Q4, or Q5) the values represent Ptrend

BMI- body mass index; FFQ Food frequency questionnaire; SFA- saturated fatty acids; PUFA- polyunsaturated fatty acids; transFA- trans fatty acids

Reference Cohort	**Subjects N (M/F) Age Follow-up**	**Determination of fibre**	**Fibre intake**	**Adjusted result/OR/RR (95%CI)**	**P/Ptrend[A]**	**Factors adjusted for**
Krishnan et al (2007) Black Women's Health Study	40,078 (F) 1,938 cases 21-69 years 8 years follow-up	AOAC-defined total dietary fibre by FFQ	Quintile median energy-adjusted cereal fibre intake (g/d) Q1: 1.7 Q2: 2.7 Q3: 3.7 Q4: 4.9 Q5: 7.6	1.00 (ref) 0.91 (0.78-1.05) 0.89 (0.76-1.04) 0.83 (0.70-0.96) 0.82 (0.70-0.96)	0.01	Age, BMI, energy intake, family history diabetes, physical activity, smoking, glycaemic index, protein, total fat intake
Lindstrom et al (2006a) Finnish Diabetes Prevention Study Cohort	500 114 cases 40-64 years 4 years follow-up from 3 year active intervention period)	AOAC-defined total dietary fibre by 3 day record (mean of intervention years 1-3)	Quartile range energy-adjusted fibre intake (g/d) Q1: <10.85 Q2: 10.85-13 Q3: 13-15.55 Q4: >15.55	1.00 (ref) 0.50 (0.28-0.89) 0.71 (0.40-1.23) 0.38 (0.19-0.77)	<0.05[B]	Intervention group, gender, age, VLCD-use, baseline weight, baseline & follow-up physical activity, baseline fibre intake, weight change
Lindstrom et al (2006b) Finnish Diabetes Prevention Study Cohort	406 69 cases 40-64 years 3 years follow-up from 3 year active intervention period	AOAC-defined total dietary fibre by 3 day record (mean of intervention years 1-3)	Energy-adjusted fibre intake (g/d) <15 by year 3 ≥15 by year 3	1.00 (ref) 0.97 (0.63-1.51)	>0.05	Also meeting fat, SFA & physical activity goals

A When data is reported across tertiles, quartiles or quintiles (up to Q3, Q4, or Q5) the values represent Ptrend
B Ptrend for this maximally adjusted model was not stated, however p-trend for a similar model was 0.04. The authors stated that the result was not affected by the additional adjustment.

BMI- body mass index; FFQ Food frequency questionnaire; SFA- saturated fatty acids; VLCD

Reference Cohort	Subjects N (M/F) Age Follow-up	Determination of fibre	Fibre intake	Adjusted result/OR/RR (95%CI)	Ptrend	Factors adjusted for
Montonen et al (2003) Finnish Mobile Clinic Health Examination Survey	4,316 (2,286/2,030) 156 cases 40-69 years 10 years follow-up	AOAC-defined total dietary fibre by diet history interview	Quartile range intake (g/d)			Age, gender, geographic area, energy intake, fruit, berry & vegetable intake
			Total fibre			
			Q1: 2.6-19.2	1.00 (ref)	0.04	
			Q2: 19.3-25.3	0.70 (0.46-1.07)		
			Q3: 25.4-33.1	0.67 (0.40-1.11)		
			Q4: 33.2-118	0.51 (0.26-1.00)		
			Soluble fibre			
			Q1: 0.53-4.5	1.00 (ref)	0.21	
			Q2: 4.6-5.8	0.50 (0.31-0.81)		
			Q3: 5.9-7.3	0.74 (0.44-1.25)		
			Q4: 7.4-22.7	0.57 (0.29-1.12)		
			Insoluble fibre			
			Q1: 1.1-8.7	1.00 (ref)	0.03	
			Q2: 8.8-12.0	0.75 (0.50-1.12)		
			Q3: 12.1-16.5	0.72 (0.45-1.17)		
			Q4: 16.6-69.3	0.47 (0.25-0.91)		
			Cellulose			
			Q1: 0.48-3.2	1.00 (ref)	0.19	
			Q2: 3.3-4.2	0.53 (0.32-0.85)		
			Q3: 4.3-5.3	0.67 (0.39-1.14)		
			Q4: 5.4-15.2	0.60 (0.29-1.21)		
			Lignin			
			Q1: 0.48-2.3	1.00 (ref)	0.16	
			Q2: 2.4-3.1	0.79 (0.52-1.20)		
			Q3: 3.2-4.1	0.69 (0.42-1.15)		
			Q4: 4.2-14.5	0.68 (0.36-1.30)		
			Cereal fibre			
			Q1: 0.47-12.0	1.00 (ref)	0.01	
			Q2: 12.1-17.3	0.81 (0.54-1.21)		
			Q3: 17.4-24.4	0.74 (0.46-1.18)		
			Q4: 24.5-111	0.39 (0.20-0.77)		
			Fruit fibre			
			Q1: 0-0.99	1.00 (ref)	0.87	
			Q2: 1.0-2.0	0.68 (0.39-1.20)		
			Q3: 2.1-3.3	0.79 (0.39-1.60)		
			Q4: 3.4-36.8	0.92 (0.40-2.13)		
			Vegetable fibre			
			Q1: 0.11-3.7	1.00 (ref)	0.86	
			Q2: 3.8-5.0	1.02 (0.58-1.79)		
			Q3: 5.1-6.7	0.89 (0.43-1.85)		
			Q4: 6.8-26.5	1.19 (0.46-3.04)		

Reference Cohort	**Subjects N (M/F) Age Follow-up**	**Determination of fibre**	**Fibre intake**	**Adjusted result/OR/RR (95%CI)**	**Ptrend**	**Factors adjusted for**
Salmeron et al (1997a) Nurses' Health Study	65,173 (F) 915 cases 40-65 years 6 year follow-up	AOAC-defined total dietary fibre by FFQ	Quintile median energy-adjusted fibre intake (g/d)			Energy, age, BMI, alcohol, smoking, physical activity, family history of diabetes
			Total fibre			
			Q1: 11.8	1.00 (ref)	0.02	
			Q2: 14.7	1.01 (0.83-1.24)		
			Q3: 17.0	0.90 (0.73-1.11)		
			Q4: 19.6	0.91 (0.74-1.13)		
			Q5: 24.1	0.78 (0.62-0.98)		
			Cereal fibre			
			Q1: 2.0	1.00 (ref)	0.001	
			Q2: 2.9	1.01 (0.83-1.23)		
			Q3: 3.7	0.85 (0.69-1.04)		
			Q4: 4.9	0.82 (0.66-1.01)		
			Q5: 7.5	0.72 (0.58-0.90		
			Fruit fibre			
			Q1: 1.4	1.00 (ref)	0.39	
			Q2: 2.6	0.87 (0.70-1.07)		
			Q3: 3.7	0.95 (0.77-1.18)		
			Q4: 5.1	0.94 (0.76-1.16)		
			Q5: 7.6	0.87 (0.70-1.08)		
			Vegetable fibre			
			Q1: 3.4	1.00 (ref)	0.54	
			Q2: 4.8	1.40 (1.13-1.73)		
			Q3: 5.9	1.23 (0.99-1.53)		
			Q4: 7.2	1.29 (1.04-1.61)		
			Q5: 9.6	1.17 (0.93-1.46)		

BMI- body mass index; FFQ Food frequency questionnaire

Reference Cohort	Subjects N (M/F) Age Follow-up	Determination of fibre	Fibre intake	Adjusted result/OR/RR (95%CI)	P/Ptrend	Factors adjusted for
Salmeron et al (1997b) Health Professionals' Follow-up Study	42,759 (M) 523 cases 40-75 years 6 year follow-up	AOAC-defined total dietary fibre by FFQ	Quintile median energy-adjusted fibre intake (g/d)			Energy, age, BMI, alcohol, smoking, physical activity, family history of diabetes
			Total fibre			
			Q1: 13.4	1.00 (ref)	0.70	
			Q2: 17.1	0.98 (0.75-1.29)		
			Q3: 20.0	1.08 (0.83-1.42)		
			Q4: 23.5	0.87 (0.65-1.17)		
			Q5: 29.7	0.98 (0.73-1.33)		
			Cereal fibre			
			Q1: 2.5	1.00 (ref)	0.007	
			Q2: 3.8	1.14 (0.89-1.46)		
			Q3: 5.0	0.95 (0.73-1.25)		
			Q4: 6.8	0.91 (0.69-1.20)		
			Q5: 10.2	0.70 (0.51-0.96		
			Fruit fibre			
			Q1: 1.2	1.00 (ref)	0.68	
			Q2: 2.8	1.01 (0.76-1.34)		
			Q3: 3.8	0.89 (0.67-1.19)		
			Q4: 5.3	1.14 (0.86-1.51)		
			Q5: 8.3	1.01 (0.76-1.36)		
			Vegetable fibre			
			Q1: 3.5	1.00 (ref)	0.65	
			Q2: 4.9	1.12 (0.85-1.49)		
			Q3: 6.3	1.22 (0.93-1.61)		
			Q4: 7.9	1.10 (0.83-1.46)		
			Q5: 11.3	1.12 (0.84-1.49)		

BMI- body mass index; FFQ Food frequency questionnaire

Reference **Cohort**	**Subjects** **N (M/F) Age** **Follow-up**	**Determination of fibre**	**Fibre intake**	**Adjusted result/OR/RR (95%CI)**	**P/Ptrend**	**Factors adjusted for**
Schulze et al (2004) Nurses Health Study II	91,249 (F) 741 cases 24-44 years 8 years follow-up	AOAC-defined total dietary fibre by FFQ	Quintile median energy-adjusted fibre intake (g/d) Total fibre Q1: 12.5 Q2: 15.4 Q3: 17.7 Q4: 20.2 Q5: 24.9 Cereal fibre Q1: 3.1 Q2: 4.2 Q3: 5.2 Q4: 6.4 Q5: 8.8 Fruit fibre Q1: 1.1 Q2: 2.0 Q3: 2.9 Q4: 4.1 Q5: 6.2 Vegetable fibre Q1: 3.4 Q2: 4.8 Q3: 6.1 Q4: 7.6 Q5: 10.4	 1.00 (ref) 0.94 (0.76-1.17) 0.87 (0.68-1.11) 0.84 (0.65-1.10) 1.00 (0.75-1.34) 1.00 (ref) 0.85 (0.69-1.05) 0.87 (0.69-1.08) 0.82 (0.65-1.04) 0.64 (0.48-0.86) 1.00 (ref) 0.93 (0.75-1.15) 0.80 (0.63-1.00) 0.77 (0.60-0.98) 0.79 (0.60-1.02) 1.00 (ref) 0.97 (0.77-1.22) 1.01 (0.80-1.28) 1.19 (0.94-1.51) 1.12 (0.87-1.46)	 0.80 0.004 0.04 0.192	Age, BMI, energy intake, alcohol, family history of diabetes, physical activity, smoking, HRT, oral contraceptive, history of high blood pressure or cholesterol, glyycaemic load, magnesium, caffeine; sub-types also adjusted for total fibre.

BMI- body mass index; FFQ Food frequency questionnaire

Reference Cohort	Subjects N (M/F) Age Follow-up	Determination of fibre	Fibre intake	Adjusted result/OR/RR (95%CI)	Ptrend	Factors adjusted for
Schulze et al (2007) EPIC-Potsdam Study	25,067 (9,702/1,536) 844 cases 35-65 years 9 years follow-up	AOAC-defined total dietary fibre by FFQ	Quintile median energy-adjusted fibre intake (g/d)			Energy, age, sex, education, sports activity, cycling, occupational activity, smoking, alcohol, BMI, waist, Mg, PUFA:SFA, MUFA:SFA, CHO, other types of fibre
			Total fibre			
			Q1: 15.8	1.00 (ref)	0.11	
			Q2: 18.8	1.10 (0.88-1.36)		
			Q3: 20.9	1.01 (0.80-1.27)		
			Q4: 23.4	0.96 (0.75-1.22)		
			Q5: 27.9	0.86 (0.65-1.14)		
			Soluble fibre			
			Q1: 5.3	1.00 (ref)	0.45	
			Q2: 6.4	0.85 (0.66-1.08)		
			Q3: 7.2	0.99 (0.75-1.30)		
			Q4: 8.1	0.91 (0.66-1.24)		
			Q5: 9.6	0.83 (0.57-1.22		
			Insoluble fibre			
			Q1: 10.3	1.00 (ref)	0.62	
			Q2: 12.3	1.11 (0.87-1.42)		
			Q3: 13.7	0.94 (0.70-1.26)		
			Q4: 15.4	0.99 (0.71-1.38)		
			Q5: 18.4	0.93 (0.62-1.40)		
			Cereal fibre			
			Q1: 6.6	1.00 (ref)	0.02	
			Q2: 9.0	0.86 (0.70-1.06)		
			Q3: 10.8	0.94 (0.76-1.16)		
			Q4: 12.8	0.85 (0.68-1.06)		
			Q5: 16.6	0.72 (0.56-0.93)		
			Fruit fibre		0.22	
			Q1: 0.2	1.00 (ref)		
			Q2: 1.0	0.93 (0.75-1.15)		
			Q3: 1.5	1.01 (0.81-1.26)		
			Q4: 2.8	0.93 (0.74-1.16)		
			Q5: 4.7	0.89 (0.70-1.13)		
			Vegetable fibre		0.66	
			Q1: 0.7	1.00 (ref)		
			Q2: 1.3	0.87 (0.70-1.08)		
			Q3: 1.7	0.94 (0.76-1.16)		
			Q4: 2.3	0.86 (0.68-1.07)		
			Q5: 3.4	0.93 (0.74-1.17)		

FFQ Food frequency questionnaire; BMI- body mass index; SFA- saturated fatty acids; PUFA- polyunsaturated fatty acids, MUFA- monounsaturated fatty acids, CHO- carbohydrate

Reference Cohort	Subjects N (M/F) Age Follow-up	Determination of fibre	Fibre intake	Adjusted result/OR/RR (95%CI)	P	Factors adjusted for
Stevens et al (2002) Atherosclerosis Risk in Communities (ARIC) Study	12,251 1,447 cases 9 years follow-up	AOAC-defined total dietary fibre by FFQ	Quintile median energy-adjusted fibre intake (g/d)			Age, BMI, gender, field centre, education, smoking, physical activity
			Total fibre			
			White			
			Q1: 11.2	1.00 (ref)	0.915	
			Q5: 27.5	0.999 (0.987-1.012)		
			African-American			
			Q1: 10.2	1.00 (ref)	0.849	
			Q5: 26.1	0.998 (0.980-1.017)		
			Cereal fibre			
			White			
			Q1	1.00 (ref)	0.006	
			Q5	0.956 (0.925-0.987)		
			African-American			
			Q1	1.00 (ref)	0.525	
			Q5	0.982 (0.927-1.039)		
			Fruit fibre			
			White			
			Q1	1.00 (ref)	0.841	
			Q5	1.002 (0.983-1.021)		
			African-American			
			Q1	1.00 (ref)	0.479	
			Q5	1.009 (0.985-1.033)		
			Legume fibre			
			White			
			Q1	1.00 (ref)	0.774	
			Q5	1.007 (0.959-1.058)		
			African-American			
			Q1	1.00 (ref)	0.366	
			Q5	0.961 (0.882-1.047)		

FFQ Food frequency questionnaire; BMI- body mass index

GESTATIONAL DIABETES						
Reference Cohort	**Subjects N (M/F) Age Follow-up**	**Determination of fibre**	**Fibre intake**	**Adjusted result/OR/RR (95%CI)**	**Ptrend**	**Factors adjusted for**
Zhang et al (2006) Nurses Health Study II	13,110 (F) 758 cases 8 years follow-up	AOAC-defined total dietary fibre by FFQ	Quintile median energy-adjusted fibre intake (g/d)			Age, parity, BMI, ethnicity, smoking, family history of diabetes, alcohol, physical activity, total E, other nutrients, separate fibre sources
			Total fibre Q1: 12.4 Q2: 15.4 Q3: 17.5 Q4: 20.1 Q5: 24.8	 1.00 (ref) 0.97 (0.78-1.20) 1.00 (0.80-1.24) 0.84 (0.66-1.07) 0.67 (0.51-0.90)	 0.005	
			Cereal fibre Q1: 2.9 Q2: 4.1 Q3: 5.1 Q4: 6.3 Q5: 8.9	 1.00 (ref) 1.04 (0.84-1.30) 0.83 (0.65-1.04) 0.89 (0.71-1.15) 0.76 (0.59-0.98)	 0.02	
			Fruit fibre Q1: 1.1 Q2: 2.0 Q3: 2.9 Q4: 4.1 Q5: 6.2	 1.00 (ref) 0.75 (0.60-0.94) 0.86 (0.69-1.07) 0.82 (0.65-1.04) 0.67 (0.51-0.87)	 0.02	
			Vegetable fibre Q1: 3.3 Q2: 4.8 Q3: 6.1 Q4: 7.7 Q5: 10.6	 1.00 (ref) 1.06 (0.86-1.32) 1.04 (0.83-1.29) 1.01 (0.80-1.28) 0.87 (0.67-1.13)	 0.24	

FFQ Food frequency questionnaire; BMI- body mass index

Table 3A: Cross sectional studies of fibre intake and metabolic risk factors

Reference Cohort	Subjects N (M/F) Age Follow-up	Determination of fibre	Fibre intake	Adjusted result/OR/RR (95%CI)	P/Ptrend[A]	Factors adjusted for
Boeing et al (2000) EPIC-Potsdam Study	1,773 (745/1,028) 35-64 years	AOAC-defined total dietary fibre by FFQ Mean ± SD (g/d) M: 27.1 ± 9.4 F: 24.2 ± 7.7	High (3rd tertile) HbA1c	Odds ratio (95%CI) Q1-5 total fibre intake 1.00 (ref) 1.05 (0.72-1.55) 0.83 (0.57-1.23) 0.97 (0.66-1.43) 0.93 (0.62-1.37)	0.595	Age, sex, obesity, physical activity level, education, smoking
Feskens et al (1994) Zutphen Elderly Study	389 (M) 70-89 years	AOAC-defined total dietary fibre by diet history interview (previous 2-4 weeks) Mean ± SD (g/d) 25.4 ± 7.3	OGTT AUC Insulin	Correlation coefficient -0.12	<0.05	Age, BMI, physical activity, prescribed diets, presence of coronary heart disease
			Fasting C-peptide	-0.11	<0.05	
			HOMA-IR	-0.15 (unadjusted)	<0.01	
			β-cell mass	-0.14 (unadjusted)	<0.01	
Lau et al (2005) Danish Inter99 Study	5,675 30-60 years	AOAC-defined total dietary fibre by FFQ	Change in HOMA-IR with 10g/d increase in intake	HOMA-IR Ratio (95%CI) 0.97 (0.96-0.99)	0.001	Age, gender, smoking, physical activity, energy intake, BMI, waist circumference
Liese et al (2005) Insulin Resistance Atherosclerosis Study	979 (442/537) 33% IGT 67% NGT 40-69 years	AOAC-defined total dietary fibre by FFQ Mean ± SD (g/d) 16.9 ± 7.9	FSIVGTT SI	β ± SE 0.1250 ± 0.0306	<0.001	Age, gender, ethnicity/clinic, family history of diabetes, current smoking, energy expenditure, energy intake
			Acute insulin response	0.0317 ± 0.0393	0.420	
			Glucose disposal	0.0933 ± 0.0452	0.039	
			Fasting insulin	-0.0815 ± 0.0361	0.024	

[A] When data is reported across tertiles, quartiles or quintiles (up to Q3, Q4, or Q5) the values represent Ptrend.

FFQ Food frequency questionnaire; IGT- impaired glucose tolerance; NGT- normal glucose tolerance; HOMA- IR homeostasis model assessment of insulin resistance; OGTT- oral glucose tolerance test; AUC- area under the curve; FSIVGTT- frequently-sampled intravenous glucose tolerance test; BMI- body mass index;

Reference Cohort	Subjects N (M/F) Age Follow-up	Determination of fibre	Fibre intake	Adjusted result/OR/RR (95%CI)	P/Ptrend[A]	Factors adjusted for
Lovejoy & DiGirolamo (1992)	45 (11/34) 22 lean 23 obese	AOAC-defined total dietary fibre by FFQ Mean ± SD (g/d) Lean: 15.8 ± 7.9 Obese: 10.8 ± 1	FSIVGTT SI	Partial R^2= 0.18 Data not shown	0.007 NSD	Multiple regression model with total energy intake, % energy from fat & CHO BMI
McKeown et al (2004) Framingham Offspring Cohort	2,834 (1,290/1,544) 26-82 years	AOAC-defined total dietary fibre by FFQ	Quintile median (g/d) Total fibre Q1: 11.6 Q2: 14.9 Q3: 17.4 Q4: 20.1 Q5: 25.5 Cereal fibre Q1: 2.6 Q2: 3.7 Q3: 4.6 Q4: 5.8 Q5: 8.0 Fruit fibre Q1: 0.7 Q2: 1.7 Q3: 2.8 Q4: 4.2 Q5: 5.8 Vegetable fibre Q1: 2.4 Q2: 3.7 Q3: 4.8 Q4: 6.1 Q5: 8.4 Legume fibre Q1: 0.23 Q2: 0.69 Q3: 1.0 Q4: 1.4 Q5: 2.5	Mean HOMA-IR (95%CI) 7.0 (6.8-7.3) 6.7 (6.5-7.0) 6.7 (6.5-7.0) 6.7 (6.5-7.0) 6.4 (6.1-6.1) 6.8 (6.5-7.0) 6.9 (6.7-7.2) 6.8 (6.6-7.0) 6.6 (6.4-6.9) 6.5 (6.3-6.8) 7.0 (6.7-7.2) 6.8 (6.5-7.0) 6.8 (6.5-7.0) 6.6 (6.4-6.8) 6.5 (6.2-6.7) 6.7 (6.4-6.9) 6.9 (6.6-7.2) 6.7 (6.4-6.9) 6.8 (6.5-7.0) 6.8 (6.5-7.0) 6.8 (6.5-7.0) 6.8 (6.6-7.1) 6.8 (6.5-7.0) 6.7 (6.5-6.9) 6.7 (6.5-7.0)	<0.001 0.02 <0.001 0.64 0.58	Age, gender, BMI, WHR, smoking, E intake, alcohol, %E SFA, %E PUFA, vitamin use, physical activity, BP treatment

[A] When data is reported across tertiles, quartiles or quintiles (up to Q3, Q4, or Q5) the values represent Ptrend.

Reference Cohort	**Subjects N (M/F) Age Follow-up**	**Determination of fibre**	**Fibre intake**	**Adjusted result/OR/RR (95%CI)**	**Ptrend**	**Factors adjusted for**
McKeown et al (2004) continued Framingham Offspring Cohort				Odds Ratio metabolic syndrome (95%CI) 1.00 (ref) 0.81 (0.61-1.09) 0.88 (0.65-1.19) 0.81 (0.59-1.07) 0.73 (0.51-1.03) 1.00 (ref) 0.87 (0.65-1.16) 0.88 (0.66-1.18) 0.74 (0.54-1.00) 0.62 (0.45-0.86) 1.00 (ref) 1.07 (0.80-1.43) 0.74 (0.55-1.01) 0.89 (0.65-1.21) 0.88 (0.64-1.22) 1.00 (ref) 1.08 (0.81-1.45) 1.04 (0.77-1.40) 1.00 (0.74-1.36) 1.15 (0.84-1.57) 1.00 (ref) 0.91 (0.68-1.23) 0.90 (0.67-1.20) 1.00 (0.75-1.34) 0.96 (0.72-1.29)	 0.11 0.002 0.36 0.51 0.98	Age, gender, BMI, WHR, smoking, Energy intake, alcohol, %E SFA, %Energy PUFA, vitamin use, physical activity, Blood pressure treatment

FFQ Food frequency questionnaire; BMI- body mass index; SFA- saturated fatty acids; PUFA- polyunsaturated fatty acids; CHO- carbohydrate; FSIVGTT- frequently-sampled intravenous glucose tolerance test; HOMA- IR homeostasis model assessment of insulin resistance; WHR- waist hip ratio

Reference Cohort	Subjects N (M/F) Age Follow-up	Determination of fibre	Fibre intake	Adjusted result/OR/RR (95%CI)	P/Ptrend	Factors adjusted for
Mooy et al (1998) Hoorn Study	2,226 (1,013/1,213) 50-74 years 1,878 NGT 239 IGT 109 newly diagnosed diabetics	AOAC-defined total dietary fibre by FFQ Mean ± SD (g/d) M: 28 ± 9 F: 26 ± 7 All: 27 ± 8	Fasting insulin	% change with +2SD fibre intake M: -1.5 F: -6.0 All: -3.0	NSD P<0.05 NSD	Age, family history diabetes, BMI, WHR, physical activity, alcohol, smoking, energy intake
Newby et al (2007) Baltimore Longitudinal Study of Ageing	455 to 1,324 depending on outcome 27-88 years	AOAC-defined total dietary fibre by FFQ Quintile median cereal fibre intake (g/d) Q1: 2.2 Q5: 9.5	Fasting glucose Mean ± SEM mmol/l n=1324 OGTT 2h glucose Mean ± SEM mmol/l n=882 Fasting insulin Mean ± SEM pmol/l n=460 OGTT 2h insulin Mean ± SEM pmol/l n=455	Q1-5 cereal fibre intake 5.55 ± 0.05 5.48 ± 0.05 5.53 ± 0.05 5.49 ± 0.05 5.52 ± 0.05 8.05 ± 0.21 7.94 ± 0.20 7.72 ± 0.19 7.55 ± 0.20 6.48 ± 0.21 68.9 ± 4.0 72.2 ± 3.8 73.0 ± 3.7 71.3 ± 3.8 73.0 ± 4.0 438 ± 38.8 477 ± 36.2 404 ± 35.8 356 ± 36.3 413 ± 38.2	0.95 0.02 0.68 0.33	Age, gender, total energy, decade of visit, BMI, race, education, supplement use, smoking, % energy from SFA & alcohol

[A] When data is reported across tertiles, quartiles or quintiles (up to Q3, Q4, or Q5) the values represent Ptrend.

IGT- impaired glucose tolerance; NGT- normal glucose tolerance; OGTT- oral glucose tolerance test; FFQ Food frequency questionnaire; BMI- body mass index; SFA- saturated fatty acids; NSD- no significant difference

Reference **Cohort**	**Subjects** **N (M/F) Age** **Follow-up**	**Determination of fibre**	**Fibre intake**	**Adjusted result/OR/RR (95%CI)**	**P**	**Factors adjusted for**
Ylonen et al (2003) Botnia Dietary Study	552 (248/304) 20-70 years	Enzymatic method of Asp et al 1983-total dietary fibre by 3 day diet record Median intake (IQR) (g/d) M: 21.6 (17.6-25.7) F: 17.1 (14.2-20.6)	HOMA-IR HOMA-IR HOMA-IR	Adjusted β ± SE Total fibre 0.17 ± 0.07 Insoluble fibre -0.15 ± 0.07 Soluble fibre -0.14 ± 0.07	0.012 0.024 0.049	Age, gender, BMI, waist: hip ratio, education, physical activity, blood pressure, blood lipids

HOMA-IR- homeostasis model assessment of insulin resistance; BMI- body mass index

Table 4A: Highly-controlled intervention studies of fibre intake and body weight/weight-related outcomes

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Barroso Aranda et al (2002)	19 (8/11) 34 years (mean) Healthy	2 x 3 days 3 day run-in & 4 day washout	Psyllium & chitosan supplement or placebo	300 mg/d psyllium 2100 mg/d chitosan	Mean faecal fat excretion (g/d)	9.30	5.82	0.002
Jenkins et al (1993)	43 (15/28) 29-70 years Hyper-lipidaemic	2 x 4 months 2 month run-in and 2 month washout Crossover	Controlled diet high in soluble (barley, legumes, oat bran, psyllium-enriched cereal) or insoluble (wheat bran cereal & bread, crackers) fibre; run-in & washout on NCEP step 2 diet	Mean fibre ± SE (g/d) soluble / insoluble diet: Total fibre: 49.8 ± 1.7 / 58.3 ± 2.1 Soluble fibre: 16.1 ± 0.5 / 10.2 ± 0.4 Insoluble fibre: 33.6 ± 1.2 / 47.9 ± 1.8	Mean ± SE Weight change (g/wk)	*Soluble diet:* 29 ± 16	*Insoluble diet:* 62 ± 19	 0.058
Rolls et al (1999)	33 (F) 18-45 years n=16 lean n=17 obese	2 x 1 week Crossover	Portion of each meal manipulated (low or high energy density) and consumed in full, rest of intake ad libitum	Low & high ED foods: identical energy and macronutrients Mean fibre intake from compulsory foods ± SEM (g/d): Lean: LED 25 ± 1.0 HED 11 ± 0.4 Obese: LED 34 ± 1.6 HED 15 ± 0.7	Mean energy intake ± SEM (MJ/d) Total (lean) Total (obese) Side dishes (lean) Side dishes (obese) Snacks (lean) Snacks (obese)	 8.03 ± 0.37 9.75 ± 0.42 2957 ± 213 3751 ± 237 0.99 ± 0.19 0.60 ± 0.13	 8.47 ± 0.37 10.52 ± 0.38 3.51 ± 0.18 4.47 ± 0.24 0.90 ± 0.21 0.68 ± 0.18	 NSD <0.025 <0.025 <0.025 NSD NSD
Ryttig et al (1990)	19 (10/9) 18-40 years Healthy	2 x 2 weeks 2 weeks run-in Crossover	Pectin or placebo supplement	7g/d soluble fibre from pectin	Mean ± SE Weight (kg) Lean mass (kg) Faecal energy excretion Basal metabolic rate (W) 24h energy expenditure (MJ)	 64.6 ± 2.0 47.0 ± 2.0 2.32 ± 0.25 81 ± 3.7 10.71 ± 0.09	 64.1 ± 2.0 46.5 ± 2.0 2.30 ± 0.19 82 ± 3.3 10.84 ± 0.36	 NSD NSD NSD NSD NSD

NCEP- National Cholesterol Education Program; NSD- no significant difference

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Southgate et al (1976)	5 (3/2) 25-67 years	2 x 1 week Crossover	Controlled diet with high or low fibre biscuits	Bran biscuits: 13.2 g/100g total fibre (9.2 non-cellulosic polysaccharide, 2.7 cellulose, 1.2 lignin) Mean increase in fibre intake ± SD (g/d): 13.8 ± 4.1	Energy excretion (MJ/d)	+0.08 to 0.40		Not stated
Stevens et al (1987)	12 (F) 22-38 years Healthy	4 x 1 week Crossover	Psyllium or wheat bran or psyllium + wheat bran or control crackers before meals, then ad libitum intake of pre-weighed low fibre meals	Psyllium (P): 7g/d insoluble + 17g/d soluble fibre Wheat bran (B): 21g/d insoluble + 1g/d soluble fibre Combination: 15g/d NDR + 7g/d soluble fibre Control: 3g/d NDR + 1g/d soluble fibre	Mean energy intake (MJ/d) Energy excretion (MJ/d)	Psyllium: 8.60 Bran: 9.02 P+B: 8.78 P: 0.67 ± 0.09 B: 0.67 ± 0.07 P+B: 0.66 ± 0.10	9.26 0.40 ± 0.10	<0.05 NSD <0.05 NSD relative to intake
Weinreich et al (1977)	25 19-29 years	2 week control period, 5 weeks intervention Within-subject	Controlled diet ± wheat bran	24g/d wheat bran added to food	Mean weight change (kg)	-0.4	0	Not stated
Wisker et al (1988)	6 (F) 23-27 years Healthy	2 x 3 weeks 4 weeks washout Crossover	Controlled diet with low or high fibre cereal products; constant weight maintained	High fibre (HF): 48.3 g/d (91% NSP, 9% lignin) Low fibre (LF): 19.7 g/d (98% NSP, 2% lignin) Carbohydrate intake HF>LF (314 ± 13 / 262 ± 12 g/d)	Mean total energy excretion ± SE (MJ/d) Mean energy intake ± SD (MJ/d) Difference in metabolisable energy (MJ/d) HF-LF	1.71 ± 0.42 9.80 ± 1.22 +297	1.06 ± 0.19 8.85 ± 1.25	<0.001 Not stated

NSD- no significant difference; NSP- non starch polysaccharide

Table 5A: Effect of fibre on body weight in 'healthy-eating' dietary interventions

Reference	**Subjects N (M/F) Age Health**	**Study duration & design**	**Intervention**	**Fibre dose**	**Outcome**	**Fibre group**	**Control group**	**P**
Cicero et al (2007)	141 (70/71) 50-70 years Overweight	6 months 4 week run-in Parallel	4 week run-in: all given AHA dietary advice, then guar gum or psyllium powder before meals or control - no placebo	3.5 g/d guar gum (G) or psyllium (P)	Mean changes: BMI ± SD (kg/m^2)	 G: -1.8 P: -1.1 (both P<0.01)	 -0.1 (NSD)	 <0.01 NSD
Frost et al (2004)	55 (49/6) 30-70 years CHD patients	12 weeks Parallel	Individual nutrition advice: low glycaemic index (GI) or general healthy-eating Only differences between diets were fibre & sucrose intakes	Mean fibre intake ± SE (g/d) Southgate Low GI: 27 ± 2 Control: 21 ± 2 (P=0.0334) Englyst Low GI: 20 ± 1 Control: 15 ± 1 (P=0.0059) Mean sucrose intake ± SE (g/d) Low GI: 37 ± 5 Control: 27 ± 2 (P=0.0029)	Mean changes: Weight (kg) Waist:Hip ratio	 -1.4 -0.01	 -2.1 -0.01	 NSD NSD

CHD- coronary heart disease; HOMA-IR- homeostasis model assessment of insulin resistance; HOMA-β- an index of pancreatic β–cell function ; AHA- American Heart Association; NSD- no significant difference

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Howard et al (2006) Women's Health Initiative	46,808 (F) 50-79 years	7.5 years Parallel	Group & individual counselling sessions to promote behaviour change to reduce fat & increase fruit, vegetables & grains; Control group given Dietary Guidelines for Americans	Mean fibre intake ± SD (g/d) Baseline: 14.4 ± 6.0 Intervention: 16.9 ± 7.1 Control: 14.4 ± 6.1 ($P<0.001$)	Mean weight loss ± SD (kg)	0.8 ± 10.1	0.1 ± 10.1	<0.001
Mackay & Ball (1992)	39 (22/17) 28-66 years	3 x 6 weeks 4 week run-in Crossover	Low fat diet run-in, then + high (HF) or low fibre (LF) oat bran or beans (quantity to match soluble fibre content of HF oat bran)	HF bran: 55g/d (5.4% β-glucan) Beans: 80g/d LF bran: 55g/d (3.5% β-glucan)	Mean weight ± SD (kg) Mean energy intake ± SD (MJ/d)	*HF bran:* 76.6 ± 14.0 *Beans:* 76.9 ± 14.1 *HF bran:* 7.84 ± 2.31 *Beans:* 7.16 ± 1.67	*LF bran:* 76.7 ± 13.5 *LF bran:* 7.61 ± 1.79	NSD NSD NSD NSD
Reyna-Villasmil et al (2007)	38 (M) 55-72 years Overweight	8 weeks Parallel	AHA step II diet with bread ± β-glucan	6g/d β-glucan	Mean changes: Weight ± SE (kg)	 -5.8	 -3.8	 <0.002
Tuomilehto et al (1980)	32 (F)	4 months Parallel	Guar gum (n=10) or placebo (n=11) or no treatment (n=11)	15 g/d guar gum	Mean weight ± SE (kg)	-2.5 ($P<0.0005$)	-0.4 (NSD) Untreated: -0.5 (NSD)	Not given

AHA- American Heart Association; NSD- no significant difference

Table 6A: Effect of fibre supplementation of habitual diets on body weight

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Davy et al (2002)	36 (M) 50-75 years Overweight and obese	12 weeks Parallel	Wholegrain oat or wheat cereals substituted into diet	Both 14 g/d fibre; similar energy and macronutrient contents Oat products: 5.5g/d β-glucan	Mean (SD) Weight (Kg) BMI (Kg/m^2) Waist circumference (cm)	*Oat* 92.1 (± 3.0) 29.8 (± 0.8) 104.5 (± 2.1)	*Wheat* 93.2 (± 3.0 29.5 (± 0.8 105.1 (± 2.1)	 * * Not stated
Effertz et al (1991)	30 (1/29) 18+ years Overweight and obese	12 week 2 week run-in Parallel	Isocaloric crackers 3x/d ± soy polysaccharide	Soy polysaccharide crackers 20.3 g/d fibre (83% insoluble, 17% soluble) placebo crackers 0.7g/d fibre	Mean weight change (kg) Mean change in energy intake (MJ)	-0.04 -1.36	+0.76 -0.84	NSD NSD
Eliasson et al (1992)	63 (39/24) 18-75 years	3 months Parallel	Fibre (n=32) or placebo (n=31) tablet	7 g/d beet, barley & citrus fibre	Mean weight change (kg)	-0.8 (P=0.05)	-0.2 (NSD)	0.04
Evans & Miller (1975)	11 (4/7)	2 x 2 week	Methylcellulose or guar gum supplement	2 x 15.5g/d methylcellulose granules (64% methylcellulose) 2 x 16g/d guar supplement (56% guar gum)	 Mean energy intake as % baseline ± SE Mean weight change ± SE (kg/wk)	Supplements similarly efficacious so results combined: Obese: 75 ± 8 Non-obese: 96 ± 3 Obese: -1.7 ± 0.4 Non-obese: -0.1 ± 0.1		 <0.05 NSD <0.01 NSD
Howarth et al (2003)	11 (4/7) 23-46 years Healthy	2 x 3 week 4 week washout Crossover	Fermentable (pectin, β-glucan) or non-fermentable (methylcellulose) fibre supplement before meals	30g/d fibre	 Mean energy intake ± SE (MJ/d) Mean weight change (kg) Mean change body fat (%)	*Non-fermentable:* 7.7 ± 0.5 -0.3 (NSD) +0.13 (NSD)	*Fermentable* 8.2 ± 0.8 -0.1 (NSD) +0.13 (NSD)	 NSD NSD NSD

Authors stated that there were significant changes over time (P<0.05), but the differences between groups are significant was not reported.

BMI= body mass index; NSD- no significant difference

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Lo & Cole (1990)	18 (10/8) 27-60 years Healthy	2 x 6 weeks 3 week washout	Cereal & bread ± soy fibre substituted into diet	15g/d soy cotyledon fibre 79% NSP (Englyst): 21% soluble, 58% insoluble	Weight	No change	No change	NSD
Marett & Slavin (2004)	54 (28/26) 18-55 years Healthy	6 month	Larch (n=19) or tamarack (n=19) arabinogalactan supplement or placebo (n=17)	8.4g/d arabinogalactan (L or T)	Weight Mean change in fasting glucose (mmol/l) Mean change in fasting insulin (pmol/l)	No change L: -0.28 (P<0.05) T: -0.33 (P<0.05) L: -1.04 (NSD) T: +0.48 (NSD)	No change -0.51 (P<0.01) -0.76 (NSD)	NSD NSD NSD
Pelkman et al (2007)	29 (F) 20-40 years Overweight and obese	3 x 1 week 1 week washout Crossover	Alginate-pectin beverage or placebo	1.0 or 2.8g alginate + pectin	Mean energy intake ± SD (MJ/d)	1.0g: 10.86 ± 0.46 2.8g: 10.85 ± 0.46	11.37 ± 0.46	NSD
Ross et al (1983)	5 (M) 30-55 years Healthy	1 week control period then 3 week intervention	Gum arabic supplement	25 g/d Gum arabic	Dietary intakes Median faecal fat excretion (range) (mmol/24h)	- 18.6 (8.4-46.6)	- 15.2 (9.7-24.1)	NSD
Rigaud et al (1987)	20 (10/10) 21-30 years Healthy	2 x 4 week 2 week run-in Crossover	Fibre or placebo tablets	7.3g/d total fibre	Mean energy intake (95%CI) Mean faecal energy (95%CI) (MJ/d)	8.19 (7.35-9.03) 0.72 (0.68-0.77)	8.24 (7.54-8.95) 0.64 (0.57-0.72)	NSD <0.05
Vajifdar et al (2000)	114 (91/23) 35-84 years Chronic IHD	6 months Parallel	Fibre or placebo powder supplement 2x/d after meals	9.2 g/d fibre (5.8 g/d soluble, 3.4 g/d insoluble)	Mean weight change (kg) Mean change in waist (cm)	-1.0 (P=0.002) -1.3 (P=0.03)	-0.8 (P=0.002) 0	NSD NSD
Walsh et al (1984)	20 (F) Obese	8 weeks Parallel	Glucomannan supplement vs placebo	1g/d glucomannan	Mean weight change ± SE (kg)	-2.5 ± 0.7	+0.7 ± 0.7	<0.005

NSD- no significant difference; NSP non starch polysaccharide

Table 7A: Effect of fibre supplementation of weight-reducing diets on body weight

Reference	**Subjects N (M/F) Age Health**	**Study duration & design**	**Intervention**	**Fibre dose**	**Outcome**	**Fibre group**	**Control group**	**P**
Astrup et al (1990)	22 Obese	2 x 2 weeks Crossover	VLCD formula (M: 1.95 MJ/d, F: 1.62 MJ/d) ± fibre	30 g/d birch fibre (98.5% cellulose)	Weight loss (kg)	- 38.0	- 44.5	NSD P<0.01
Birkevedt et al (2000)	53 (F) 18-67 years Overweight	24 weeks Parallel	5.0 MJ/d diet with 15 g/d dietary fibre + fibre supplement or placebo	6g/d 8 weeks, then 4g/d cereal & citrus fibre (85% insoluble, 15% soluble)	Mean weight change ± SD (kg)	-	-	NSD
Birkevedt et al (2005)	167 30-60 years Overweight	5 weeks Parallel	5.0 MJ/d diet + fibre tablet or placebo	(1) glucomannan (4320 mg/d) + guar (900 mg/d) + alginate (900 mg/d) (2) glucomannan (1240 mg/d) (3) glucomannan (420 mg/d) + guar (420 mg/d)	Mean weight change ± SD (kg)	(1) -4.4 ± 2.0 (2) -3.8 ± 0.9 (3) -4.1 ± 0.6 NSD between supplements	-2.7 ± 1.3 -2.5 ± 0.5 -2.1 ± 0.5	<0.001 <0.01 <0.01
Duncan et al (1960)	57 (7/50) 38-78 years Obese	8 weeks 4 week run-in Parallel	Methylcellulose supplement or placebo	4.5g/d methylcellulose	Mean weight change ± SD (kg)	-0.3 ± 1.9	-0.1 ± 1.2	NSD
Hylander & Rossner (1983)	110 (8/102) 15-72 years Obese	2 weeks Parallel	5.86 MJ/d dietary advice + wheat bran (n=44) or psyllium granules (n=43) before meals or control - no placebo (n=23)	19.8 g/d wheat bran or psyllium	Mean weight change ± SD (kg)	*Bran:* -4.6 ± 2.3 *Psyllium:* -4.2 ± 3.2	-4.6 ± 2.7	NSD NSD

VLCD- very low calorie diet; NSD- no significant difference

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Kovacs et al (2001)	28 (M) 19-56 years Overweight	3 x 2 weeks 1 week run-in	Low energy meals ± fibre for breakfast, lunch and snack; dinner *ad libitum*	7.5 g/d guar gum	Mean weight change ± SD (kg)	-2.1 ± 0.3	-1.6 ± 0.2	NSD
					Mean energy intake snacks ± SD (MJ/d)	0.8 ± 0.2	1.0 ± 0.2	<0.01
					Mean energy intake dinner ± SD (MJ/d)	3.2 ± 0.2	3.4 ± 0.2	NSD
Rossner et al (1987)	54 (F) 18-60 years Obese	2 months Parallel	5.86 MJ/d diet with 5 g/d fibre + fibre tablet or placebo	1.68 g/d cereal & citrus fibre	Mean weight change (95%CI) (kg)	-7.0 (-5.7,-8.2) (P<0.01)	-6.0 (-4.7,-7.4) (P<0.01)	<0.05
	41 (F) 18-60 years Obese	3 months Parallel	6.70 MJ/d diet with 7 g/d fibre + fibre tablet or placebo	2.16 g/d vegetable, cereal & citrus fibre	Mean weight change (95%CI) (kg)	-6.2 (-4.5,-7.8) (P<0.001)	-4.1 (-1.9,-6.2) (P<0.001)	<0.05
Rossner et al (1988)	62 (F) 20-60 years Obese	12 weeks Parallel	6.7 MJ/d diet + fibre tablet or placebo	6 g/d vegetable, cereal & citrus fibre	Mean weight change (range) (kg)	-4.1 (-11.4, 0.2) (P<0.05)	-4.4 (-16.9, 0.6) (P<0.05)	NSD
					Waist circumference	Decrease (P<0.05)	Decrease (P<0.05)	NSD
Ryttig et al (1989)	97 (F) 18-55 years Overweight	27 weeks Parallel	11 week 5 MJ/d diet with 26g/d fibre + fibre supplement (n=62) or placebo (n=35); then 16 week 6.72 MJ/d diet with 34g/d fibre + fibre supplement or placebo	6g/d fibre (predominantly insoluble)	Mean weight change ± SE (kg)	-3.8 ± 0.5	-2.8 ± 0.9	<0.05
					Change in Waist:Hip	Decrease (P<0.01)	Decrease (P<0.01)	NSD
Rigaud et al (1990)	52 (11/41) 16-60 years Overweight	6 months Parallel	25-30% hypoenergetic diet + fibre tablet or placebo	7g/d beet, barley and citrus fibre	Mean weight change ± SE (kg)	-5.5 ± 0.7	-3.0 ± 0.5	0.005
					Mean energy intake ± SE (MJ/d)	8.35 ± 0.46	9.17 ± 0.65	<0.01

NSD- no significant difference

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Saltzman et al (2001a; 2001b)	41 (20/21) 19-30 and 64-78 BMI 20.5-33.9	6 weeks 2 week run-in	Run-in on controlled low soluble fibre diet & energy requirement established; 6 weeks 4.18 MJl/d reduction: macronutrient matched diets with oat or low fibre wheat products	45 g oats/4.18 MJ Mean fibre intake ± SD (g/d): Total Oat 16.3 ± 6.9 Control 12.5 ± 5.1 Soluble Oat 7.2 ± 3.5 Control 3.5 ± 1.4	Mean changes: Weight ± SD (kg)	-3.9 ± 1.6	-4.0 ± 1.1	NSD
Solum et al (1987)	60 (F) 30-60 years Overweight	12 weeks Parallel	5.0 MJ diet with 25 g/d dietary fibre + fibre tablet or placebo	6 g/d cereal & citrus fibre	Mean weight change (95%CI) (kg)	-8.5 (-7.5,-9.5) (P<0.01)	-6.4 (-4.8,-8.0) (P<0.01)	<0.01
Yudkin (1959)	20 Overweight	6 weeks	Low carbohydrate diet with unlimited fat and protein ± fibre tablet – no placebo	10g/d methylcellulose	Mean weight change ± SE (kg)	-4.4 ± 0.7	-2.8 ± 0.5	0.05
Valle-Jones (1980)	53 (13/40) 19-65 years Overweight	6 weeks Parallel	4.18 MJl/d diet ± fibre supplement	20g/d fibre supplement (60% vegetable gums: sterculia & guar gum)	Median weight change (kg)	-3.6	-1.8	<0.005

NSD- no significant difference

Table 8A: Effect of fibre supplementation in maintenance of weight-loss

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Cairella et al (1995)	30 (8/22) Obese	85 days Parallel	15 days VLCD 10 days re-introduction food 60 days fibre tablet or placebo	6 g/d vegetable, citrus & cereal fibre	Mean BMI ± SD (kg/m^2)	32.3 ± 4.0	32.9 ± 3.8	<0.01
Pasman et al (1997a)	31 (F) 41 years (mean) Obese	2 month VLCD, then 14 months Parallel	2 month VLCD then fibre (n=20) or control - no placebo (n=11) Fibre group subdivided by compliance A: >80% (n=10) B: 50-80% (n=10)	20g/d guar gum	Mean weight regain ± SD (%)	A: 65 ± 65 B: 123 ± 63	61 ± 66	0.07
Pasman et al (1997b)	17 (F) 39 years Overweight & obese	2 x 1 week Crossover	3 months after 10 kg weight loss on VLCD Energy intake of 4 or 6 MJ/d prescribed ± fibre supplement	20 g/d guar gum	Mean energy intake ± SEM (MJ/d)	5.4 ± 0.24	6.7 ± 0.39	<0.05

VLCD- very low calorie diet

Table 9A: Effect of fibre supplementation on body weight in children

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Gropper et al (1987)	8 (3/5) 6-12 years Overweight	2 x 4 weeks Crossover	2.1 MJ/d less than habitual diet + fibre supplement or placebo	Fibre tablet (corn bran, wheat bran, oat flakes, corn germ meal) 15g/d fibre	Mean weight loss (g)	336	33	NSD
Pena et al (1989)	80 (40/40) 10-15 Overweight	4 weeks Parallel	High or low fibre diet ± physical activity	Total dietary fibre 20 ± 5 vs 3-6g/d	Weight loss high vs low fibre	-	-	NSD
Vido et al (1993)	60 8-14 years Overweight	2 months Parallel	Glucomannan or placebo supplement	2g/d Glucomannan	% overweight mean ± SD (%)	49.5 ± 18.3 to 46.1 ± 18.7 (P=0.01)	43.9 ± 19.7 to 41.7 ± 18.0 (P=0.05)	NSD

NSD- no significant difference

Table 10A: Effect of fibre supplementation on metabolic risk factors

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Aller et al (2004)	53 (19/34) 18-70 years Healthy	3 months Parallel	Fibre-enriched diet or control diet	30.5 g/d total fibre Control: 10.4 g/d total fibre	Change in mean ± SE Fasting glucose (mmol/l) Fasting insulin (pmol/l)	 -0.7 (P<0.05) +3.9 (NSD)	 +0.1 (NSD) +2.1 (NSD)	 NSD NSD
Birkevedt et al (2000)	53 (F) 18-67 years Overweight	24 weeks Parallel	5.0 MJ/d diet with 15 g/d dietary fibre + fibre supplement or placebo	6g/d 8 weeks, then 4g/d cereal & citrus fibre (85% insoluble, 15% soluble)	Change in fasting glucose	-	-	NSD
Cicero et al (2007)	141 (70/71) 50-70 years Overweight	6 months 4 week run-in Parallel	4 week run-in: all given AHA dietary advice, then guar gum or psyllium powder before meals or control - no placebo	3.5 g/d guar gum (G) or psyllium (P)	Fasting glucose ± SD (mmol/l) Fasting insulin ± SD (mmol/l) HOMA-IR ± SD	G: -0.4 P: -1.3 (both P<0.01) G: -18.8 P: -35.4 (both P<0.01) G: -0.8 P: -2.9 (both P<0.01)	-0.7 (P<0.01) +2.1 (NSD) -0.3 (NSD)	NSD <0.01 <0.01 <0.01 NSD <0.01
Chearskul et al (2006)	28 (F) 18-20 years Healthy	3 menstrual cycles Within-subject	Controlled diet provided: low fibre for 1 cycle then high fibre for 2 successive cycles	High fibre: 25-30 g/d fibre Low fibre: 8-10 g/d fibre	Mean ± SE Fasting glucose (mmol/l) Fasting insulin (pmol/l)	 5.20 ± 0.07 60.91 ± 7.15	 5.26 ± 0.10 62.99 ± 7.15	 NSD NSD

NSD- no significant difference

Reference	**Subjects N (M/F) Age Health**	**Study duration & design**	**Intervention**	**Fibre dose**	**Outcome**	**Fibre group**	**Control group**	**P**
Davy et al (2002)	36 (M) 50-75 years Overweight and obese	12 weeks Parallel	Wholegrain oat or wheat cereals substituted into diet	Both 14 g/d fibre; similar energy and macronutrient contents Oat products: 5.5g/d β-glucan	Mean change in:	*Oat diet:*	*Wheat diet:*	
					IVGTT SI	0.0	-0.4	NSD
					IVGTT SG (min)	-0.0011	+0.0036	0.03
					Acute insulin response (pmol/ml/min)	-55.7	-4.5	NSD
					Fasting glucose (mmol/l)	+0.2	0	NSD
					Fasting insulin (pmol/l)	-5.4	+3.5	NSD
Eliasson et al (1992)	63 (39/24) 18-75 years	3 months Parallel	Fibre (n=32) or placebo (n=31) tablet	7 g/d beet, barley & citrus fibre	Mean change in fasting insulin (μU/ml)	28.5 (P<0.05)	+8.3 (NSD)	NSD
					Mean change in HbA1c (%)	-0.8 (P<0.0005)	-1.1 (P<0.0005)	NSD
Frost et al (2004)	55 (49/6) 30-70 years CHD patients	12 weeks Parallel	Individual nutrition advice: low glycaemic index (GI) or general healthy-eating Only differences between diets were fibre & sucrose intakes	Mean fibre intake ± SE (g/d) Southgate Low GI: 27 ± 2 Control: 21 ± 2 (P=0.0334) Englyst Low GI: 20 ± 1 Control: 15 ± 1 (P=0.0059) Mean sucrose intake ± SE (g/d) Low GI: 37 ± 5 Control: 27 ± 2 (P=0.0029)	Fasting glucose (mmol/l)	+0.01	-0.24	NSD
					Fasting insulin (pmol/l)	+4.6	-8.53	NSD
					HOMA-Sensitivity	-9.2	-6.76	NSD
					HOMA-β	+3.08	+4.2	NSD
					HbA1c (%)	+0.04	+0.02	NSD

CHD- coronary heart disease; HOMA-IR- homeostasis model assessment of insulin resistance; HOMA-β- an index of pancreatic β–cell function; IVGTT- SI : intravenous glucose tolerance test- insulin sensitivity IVGTT- SG: intravenous glucose tolerance test—glucose effectiveness; NSD- no significant difference

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Garcia et al (2007)	11 (4/7) 48-70 years Overweight IGT	2 x 6 week 6 week washout	Arabinoxylan supplement as bread rolls & powder or control rolls & powder	15g/d arabinoxylan	Change in mean ± geometric SE			
					Fasting glucose (mmol/l)	0	+0.3	0.029
					Fasting insulin (pmol/l)	-8.0	+10.0	NSD
					MTT AUC glucose	< Placebo		0.005
					MTT AUC insulin	< Placebo		0.003
					MTT AUC ghrelin	< Placebo		<0.001
Hanai et al (1997)	38 (20/18) 35-68 years 20 obese IGT 8 lean IGT 10 lean NGT	2 x 6 month Crossover	Corn bran supplementation then control period - no placebo	2 x 5g/d hemicellulose	Mean ± SE			
					<u>Fasting glucose</u> (mmol/l):			
					Obese IGT	5.78 ± 0.93	7.11 ± 0.79	<0.05
					Non-obese IGT	7.11 ± 0.79	7.67 ± 0.93	P<0.05
					Non-obese NGT	4.23 ± 7.1	4.76 ± 0.53	NSD
					<u>Glucose response to</u> OGTT:			
					Obese IGT	Decrease		<0.05
					Non-obese IGT	Decrease		<0.05
					Non-obese NGT	No change		NSD
					Fasting insulin (pmol/l):			
					Obese IGT	74.2 ± 13.5	91.0 ± 23.6	NSD
					Non-obese IGT	33.72 ± 12.0	47.22 ± 20.2	NSD
					Non-obese NGT	40.44 ± 12.0 (Decreases in hyperinsulinaemic subjects)	46.92 ± 12.0	NSD
					<u>Insulin response to</u> OGTT:			
					Obese IGT	Decrease		<0.05
					Non-obese IGT	No change		NSD
					Non-obese NGT	No change		NSD
					HbA1c (%):			
					Obese IGT	6.8 ± 0.3	6.3 ± 0.2	<0.05
					Non-obese IGT	Data not given	-	NSD
					Non-obese NGT	Data not given	-	NSD

IGT- impaired glucose tolerance, NGT- normal glucose tolerance; MTT- meal tolerance test; AUC- area under the curve; OGTT- oral glucose tolerance test; NSD- no significant difference

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Jenkins et al (1977)	3 (M) Healthy	3 week control period then 6 week intervention	Metabolically controlled diet (control) then same diet + pectin supplement	36g/d pectin	Mean ± SE Fasting glucose (mmol/l) Fasting insulin (pmol/l)	 4.51 ± 0.28 24 ± 36	 4.97 ± 0.33 30 ± 6	 NSD NSD
Jenkins et al (1993)	43 (15/28) 29-70 years Hyper-lipidaemic	2 x 4 months 2 month run-in and 2 month washout Crossover	Controlled diet high in soluble (barley, legumes, oat bran, psyllium-enriched cereal) or insoluble (wheat bran cereal & bread, crackers) fibre; run-in & washout on NCEP step 2 diet	Mean fibre ± SE (g/d) soluble / insoluble diet: Total fibre: 49.8 ± 1.7 / 58.3 ± 2.1 Soluble fibre: 16.1 ± 0.5 / 10.2 ± 0.4 Insoluble fibre: 33.6 ± 1.2 / 47.9 ± 1.8	Day-profile glucose (mmol/l) Day-profile insulin (pmol/l)	5.61 ± 0.22 224 ± 20	5.78 ± 0.11 251 ± 35	NSD NSD
Keogh et al (2003)	18 (M) 18-65 years Overweight	2 x 4 weeks 4 weeks washout Crossover	Identical provided diets + enriched barley fibre or glucose (control)	8.1-11.9g/d β-glucan from enriched barley fibre Mean NSP intake ± SD (Englyst; g/d) Barley: 35.8 ± 4.8 Control: 28.7 ± 2.6 (P<0.001)	Mean ± SE Fasting glucose (mmol/l) OGTT AUC glucose	 5.23 ± 0.11 Data on figure	 5.28 ± 0.10 Data on figure	 NSD NSD
Kestin et al (1990)	24 (M) 25-65 years	3 x 4 weeks 3 weeks run-in Crossover	Run-in on low fibre diet, then supplementation with fibre from wheat or rice or oat bran	Low fibre run-in diet: 11.2 g/d total fibre, then +11.8g/d fibre Soluble: Insoluble fibre ratio: Wheat bran 0.26 Rice bran 0.32 Oat bran 1.20	Fasting glucose Fasting insulin MTT glucose response MTT insulin response	Data not given	Data not given	NSD NSD NSD NSD
Li et al (2003)	10 (F) 20 (mean) Healthy Lean	2 x 4 weeks Crossover	Barley or control (100% rice) diet	Barley: carbohydrate 30% from barley 70% rice	Mean ± SD Fasting glucose (mmol/l) HbA1c (%) OGTT AUC glucose	 4.94 ± 0.77 5.1 ± 0.8 12.39 ± 2.61	 5.44 ± 0.77 5.4 ± 0.7 12.89 ± 1.72	 NSD NSD NSD

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Maki et al (2007)	60 (33/17) 40+ years Overweight and obese	12 weeks Parallel	NCEP dietary advice + 3 servings/d provided foods: β-glucan-enriched or control (cereal, powder)		Mean change ± SE			
					Fasting glucose (mmol/l)	+0.08 ± 0.16	+0.11 ± 0.09	NSD
					OGTT AUC glucose (mmol/l/hr)	+8 ± 37	+38 ± 33	NSD
					OGTT peak glucose (mmol/l)	-0.21 ± 0.29	+0.19 ± 0.20	NSD
					Fasting insulin (pmol/l)	+2.8 ± 4.9	+1.4 ± 12.5	NSD
					OGTT AUC insulin ((pmol/l)h)	-3209 ± 2507	-278 ± 4487	0.034
					OGTT peak insulin (pmol/l)	-41.0 ± 35.4	+0.7 ± 63.9	0.037
Munoz et al (1979)	15 (M) 19-54 years	30 days Crossover	Controlled low fibre diet ± fibre supplement in bread	26 g/d fibre supplement % fibre in supplements: wheat bran 50.8 white wheat 44.1 corn bran 92.1 soy hulls 86.7 apple powder 25.6 carrot powder 31.0	OGTT AUC glucose Wheat bran White wheat Corn bran Soy hull Apple Carrot OGTT AUC insulin All	Data on figure	Data on figure	NSD NSD <0.05 <0.05 <0.05 <0.05 NSD
Landin et al (1992)	25 (M) 52 years (mean) Healthy	2 x 6 week 2 week run-in & 2 week washout	Granulated guar gum or placebo before meals	30g/d granulated guar gum	Mean ± SD			
					Fasting insulin (pmol/l)	57 ± 14	57 ± 14	NSD
					Fasting glucose (mmol/l)	4.5 ± 0.5	4.8 ± 0.4	<0.001
					Glucose disposal (mg/kgLBM/min)	15.0 ± 2.4	13.9 ± 2.8	<0.01

OGTT; oral glucose tolerance test; NCEP- National Cholesterol Education Program; MTT- meal tolerance test; AUC- area under the curve; OGTT- oral glucose tolerance test; NSD- no significant difference

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Pereira et al (2002)	11 (5/6) 21-65 years Overweight and obese	2 x 6 weeks 6-9 weeks washout	Controlled whole (WG) or refined grain (RG) diet	Fibre intakes whole / refined grain diet (g/d): Total fibre: 28.0 / 17.8 Insoluble fibre: 19.7 / 10.8 Soluble fibre: 7.7 / 6.7	Mean ± SE Hunger Fasting insulin (2,4,6 wk) (pmol/l) HOMA-IR (2,4,6 wk) Difference in clamp insulin sensitivity (95%CI) WG-RG	 WG<RG 141 ± 3.9 5.4 ± 0.18 0.7 (0.03-1.44) $x10^{-5}$	 156 ± 3.9 6.2 ± 0.18	 0.08 <0.01 <0.01 <0.01
Reyna-Villasmil et al (2007)	38 (M) 55-72 years Overweight	8 weeks Parallel	AHA step II diet with bread ± β-glucan	6g/d β-glucan	Fasting glucose ± SE (mmol/l)	-0.3	-0.1	NSD
Sabovic et al (2004)	42 (31/11) 18-70 years	5 weeks Parallel	High fibre, high carbohydrate, low fat dietary advice ± wheat fibre supplement - no placebo	10.5g/d wheat fibre powder for 1st week, then 21g/d	Change in mean fasting glucose (95%CI) (mmol/l)	-0.4 (P<0.05)	+0.1 (NSD)	Not given
Saltzman et al (2001a; 2001b)	41 (20/21) 19-30 and 64-78 BMI 20.5-33.9	6 weeks 2 week run-in	Run-in on controlled low soluble fibre diet & energy requirement established; 6 weeks 4.18 MJl/d reduction: macronutrient matched diets with oat or low fibre wheat products	45 g oats/4.18 MJ Mean fibre intake ± SD (g/d): Total Oat 16.3 ± 6.9 Control 12.5 ± 5.1 Soluble Oat 7.2 ± 3.5 Control 3.5 ± 1.4	Fasting glucose ± SD (mmol/l) Fasting insulin ± SD (pmol/l) HOMA-IR	-0.0005 ± 0.9 -9.3 ± 46.7 -0.5 ± 2.1	-0.21 ± 0.29 -28.7 ± 26.5 -1.1 ± 1.2	NSD NSD NSD
Villaume et al (1984)	5 (M) 21 years (mean) Healthy MTT-	3 week control period then 7 week intervention Within-subject	Metabolically controlled diet (control) then same diet + wheat bran supplement Controlled diet: 32g/d fibre (Southgate)	20g/d wheat bran supplement (11g fibre)	Mean ± SD Mean 30 min MTT glucose (mmol/l) Day 0 Day 24 Day 48 60 min MTT insulin (pmol/l) Day 0 Day 24 Day 48	 7.38 ± 0.11 5.00 ± 1.11 Data not given Data not given 61.8 ± 8.9 45.5 ± 12.3		 <0.05 NSD NSD <0.02

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Vuksan et al (2000)	11 (5/6) 45-65 years IGT	2 x 3 weeks 8 weeks run-in & 2 weeks washout Crossover	Controlled matched NCEP step 2 diet enriched with konjac-mannan (KJM) or wheat bran (WB) fibre (control); all meals provided	15 g/4.18 MJ total fibre from konjac-mannan or wheat bran Total fibre (g/d) Baseline 24.2 ± 11.0 KJM 34.7 ± 8.4 WB 33.4 ± 9.6	Mean change ± SE			
					Fasting glucose (mmol/l)	-13.0 ± 2.48 (P<0.05)	-9.6 ± 4.27 (NSD)	NSD
					Fasting glucose (pmol/l)	-0.91 ± 8.88 (NSD)	-3.0 ± 9.67 (NSD)	NSD
					Fructosamine	-5.6 ± 1.46 (P<0.05)	-0.4 ± 1.3 (NSD)	0.0013
Weickert et al (2006)	17 (F) 53 years (mean) Overweight and obese	3 days Crossover	3 macronutrient-matched portions per day of oat-fibre enriched or control bread as only food Energy provided = 1.5 x Resting Energy Expenditure	Oat fibre product: 70% cellulose, 25% hemicellulose, 3-5% lignin, 0.2% β-glucan, 0.1% fat, 0.25% protein	Mean ± SE			
					Fasting glucose (mmol/l)	4.91 ± 0.10	4.96 ± 0.10	NSD
					Fasting insulin (pmol/l)	29.7 ± 4.3	32.3 ± 4.9	NSD
					Fasting C-peptide (nmol/l)	0.65 ± 0.05	0.68 ± 0.06	NSD
					Adiponectin (μg/ml)	15.4 ± 1.7	16.3 ± 1.9	NSD
					Ghrelin (pg/ml)	163.7 ± 17.5	175.9 ± 18.8	NSD
					Respiratory quotient	0.87 ± 0.02	0.86 ± 0.01	NSD
					Resting energy Expenditure (MJ/d)	4.61 ±0.19	4.66 ± 0.20	NSD
					Glucose disposal (mg/min/kg)	6.56 ± 0.32	6.07 ± 0.27	0.043
					Steady state insulin (mU/ml)	183.7 ± 5.2	193.7 ± 4.9	NSD
					Insulin action (mg/min/kg/mU/l)	3.61 ± 0.20	3.21 ± 0.22	0.023
					Posthepatic insulin clearance (l/min)	1.03 ± 0.04	0.98 ± 0.04	NSD

AHA- American Heart Association; NCEP- National Cholesterol Education Program; HOMA-IR- homeostasis model assessment of insulin resistance MTT- meal tolerance test; NSD- no significant difference

Table 11A: Effect of resistant starch on weight and metabolic outcomes

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Noakes et al (1996)	23 (13/10) 44-64 years Overweight + risk factor	3 x 4 weeks Crossover	High-amylose starch or oat bran or low-amylose starch products incorporated into low fat (15%E), low fibre (<10g/d) background diet	(a) High-amylose starch: Fibre (g/d) M: 48 ± 7, F: 33 ± 3 RS products 33% RS (b) Oat bran: Fibre (g/d) M: 42 ± 9, F: 30 ± 6 Low RS (c) Low-amylose starch: Fibre (g/d) M: 21 ± 3, F: 16 ± 3 Low RS	Mean ± SD Weight Fasting glucose (mmol/l) Fasting insulin	 (a) 5.67 ± 0.64 (b) 5.73 ± 0.57 (a) 79 ± 50 (b) 80 ± 50	 (c) 5.58 ± 0.65 (c) 77 ± 57	 NSD NSD <0.01 NSD NSD
Park et al[A](2004)	25 (F) 26-57 years Overweight and obese	3 weeks Parallel	Resistant corn starch (n=12) or corn starch as controls (n=13) supplement	Both supplements 40g/d starch	Fasting glucose Fasting insulin	↓ (P<0.05) No change	No change No change	Not Stated Not stated
de Roos et al (1995)	24 (M) 20-27 years Healthy	3 x 1 week Crossover	RS_2 or RS_3 or control (glucose) supplement	Both RS supplements: 32 g/d RS Placebo: 4 g/d RS All: 2g/d fibre	Energetic compensation for supplement (%) C-peptide excretion	*RS_2*: -5% (increase in energy intake) *RS_3*: 15% RS_2: 4.39 ± 1.46 RS_3: 3.74 ± 1.42	 24% 4.71 ± 1.73	 Not stated NSD 0.0001

[A] Park et al (2004) glucose and insulin measurements only shown graphically. Fasting serum glucose was significantly different compared to baseline following resistant starch supplementation (p<0.05), but not following the control starch intervention.
NSD- non significant difference; RS2- high amylase corn starch; RS3- extruded and retrograde high amylose corn starch

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Robertson et al (2005)	10 (4/6) 24-61 years Healthy	2 x 4 week 4 week washout Crossover	RS_2 or placebo supplement	50 g/d Hi-Maize 260 (30 g RS_2 + 20 g RDS) Placebo: 20g/d (0 g RS_2 + 20 g RDS)	Mean ± SD			
					Weight (kg)	71.0 ± 3.88	70.6 ± 3.74	NSD
					Lean body mass (kg)	52.5 ± 3.08	51.4 ± 3.03	0.003
					HOMA-Sensitivity	76.75 ± 6.72	77.4 ± 5.55	NSD
					HOMA-β	138 ± 8.83	128 ± 9.21	NSD
					Fasting glucose (mmol/l)	5.06 ± 0.14	5.04 ± 0.12	NSD
					AUC glucose (mmol/300min/l)	1830 ± 28.9	1890 ± 27.7	NSD
					Fasting insulin (pmol/l)	84 ± 17.4	80 ± 16.0	NSD
					AUC insulin (pmol/300min/l)	55200 ± 10500	63000 ± 10600	0.024
					C-peptide:insulin AUC	7.48 ± 0.734	6.08 ± 0.523	0.027
					Oral insulin sensitivity ($x10^{-3}$)	1.82 ± 0.36	1.36 ± 0.19	0.050
					Adipose tissue glucose uptake (µmol/100ml)	141.0 ± 59.3	54.4 ± 62.5	0.007
					Skeletal muscle glucose clearance	43.9% > control		0.013
					Clamp insulin sensitivity ($x10^{-2}$ M/I)	9.7 ± 1.09	8.5 ± 0.87	0.027

RS2- high amylose corn starch; RDS- rapidly digestible starch; AUC- area under the curve; HOMA- homeostasis model assessment; HOMA-β- an index of pancreatic β–cell function; NSD- no significant difference

Table 12A: Effect of oligosaccharides and inulin on weight and metabolic outcomes

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Brighenti et al (1999)	12 (M) 23 years Healthy	2 x 4 weeks 4 week washout Healthy	50 g/d cereal ± inulin substituted for habitual breakfast	9 g/d inulin/FOS mixture	Mean weight ± SD	73.3 ± 4.3	78.4 ± 4.2	NSD
Cani et al (2006)	10 (5/5) 21-39 years Healthy	2 x 2 weeks	FOS or placebo at breakfast and dinner	16 g/d FOS	Energy intake	8.94 ± 0.92	9.44 ± 0.70	0.05
Castiglia-Delavaud et al (1998)	9 (M) 22 years (mean) Healthy	3 x 4 weeks Crossover	Provided diet ± sugar beet fibre (SBF) or inulin	Control diet: 22g/d NSP Supplemented with 50g/d sugar beet fibre or inulin (amount built up over 1st 2 weeks)	Mean faecal energy excretion (MJ/d) Metabolisability Energy expenditure (MJ/d)	*Inulin:* 0.707 *SBF:* 0.734 *Inulin:* 0.891 *SBF:* 0.889 *Inulin:* 9.90 *SBF:* 10.04	0.59 0.900 9.84	<0.01 <0.001 <0.01 <0.001 NSD <0.05
Daubioul et al (2005)	7 (M) 37-66 years NASH patients	2 x 8 week 5 week washout Crossover	FOS or placebo at breakfast & dinner	16 g/d FOS	Change in mean ± SE Energy intake Weight Body composition Fasting glucose (mmol/l) Fasting insulin (pmol/l) Fasting C-peptide (pmol/l)	 No change No change No change -0.7 -16.0 -133	 No change No change No change +0.6 +9.7 +219	 NSD NSD NSD NSD NSD NSD

FOS- fructo-oligosaccharides; NSD- no significant difference

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Ellegard et al (1997)	10 (5/5) 30-71 years Ileostomy patients	3 x 3 days Crossover	Matched meals with inulin or FOS or sucrose (control)	17g/d inulin or FOS (control: 7g/d sucrose)	Mean (95%CI) Energy excretion relative to control (kJ/d) Recovery (% of ingested)	*Inulin:* +245 (190-307) 88 (76-100)	*FOS:* +230 (217-315) 89 (64-114)	 <0.05
Giacco et al (2004)	27 46 years (mean)	2 x 2 months 1 month run-in	FOS or placebo supplemented beverage; avoidance of foods containing FOS	10.6 g/d FOS supplement	Mean ± SD Weight Fasting glucose (mmol/l) Fasting insulin (pmol/l)	 No change 5.44 ± 1.00 51.7 ± 15.1	 No change 5.38 ± 0.83 50.2 ± 11.0	 NSD NSD NSD
Jackson et al (1999)	54 35-65 years Healthy	8 weeks Parallel	Inulin or placebo (maltodextrine) in beverage	10 g/d inulin	Mean ± SD Weight Fasting glucose (mmol/l) Fasting insulin (pmol/l)	 No change 4.84 ± 0.51 37.5 ± 18.3	 No change 4.99 ± 0.49 44.9 ± 27.5	 NSD NSD NSD
Luo et al (1996)	12 (M) 19-32 years Healthy	2 x 4 weeks 2 week washout Crossover	FOS or sucrose supplemented cookies	20 g/d FOS	Mean ± SE Weight Fasting glucose (mmol/l) Fasting insulin (pmol/l) Clamp steady state: Glucose Insulin C-peptide Glucagon	 No change 4.90 ± 0.11 57 ± 5	 No change 4.86 ± 0.09 56 ± 3	 NSD NSD NSD NSD NSD NSD NSD

FOS- fructo-oligosaccharides; NSD- no significant difference

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Schaafsma et al (1998)	30 (M) 33-64 years Healthy	2 x 3 week 1 week washout Crossover	Fermented milk drink ± FOS with meals	3 x 125ml/d fermented milk drink ± 2.5% FOS with habitual meals	Weight Fasting glucose (mmol/l)	No change 5.47	No change 5.37	NSD NSD
Whelan et al (2006)	11 (5/6) 25-30 years Healthy	2 x 2 weeks 6 weeks washout Crossover	Enteral formula (amount based on calculated TEE) ± pea-fibre and FOS	Pea-fibre Mean (95%CI) (g/d): 18.3 (16.8-19.9) (control: 0) FOS Mean (95%CI) (g/d): 9.8 (8.9-10.7) (control: 0)	Mean weight change (95%CI)	-1.6 (1.0-2.3)	-1.3 (1.0-2.3)	NSD
STUDIES IN CHILDREN								
Abrams et al (2007)	97 (49/48) 9-13 years Healthy	1 year 1 year follow-up Parallel	FOS + inulin or placebo (maltodextrin) in calcium-fortified juice/milk at breakfast	8 g/d FOS + inulin mix	Mean ± SD BMI Z-score BMI (kg/m^2) Weight Fat mass Follow-up BMI difference (kg/m^2)	 0.25 ± 0.045 19.52 ± 0.15 47.7 ± 0.4 11.24 ± 0.25	 0.38 ± 0.044 20.03 ± 0.15 49.0 ± 0.4 12.07 ± 0.25 +0.68 ± 0.36	 0.048 0.016 0.048 0.022 0.061

FOS- fructo-oligosaccharides; BMI-body mass index; TEE- total energy expenditure; NSD- no significant difference

Table 13A: Effect of polydextrose on weight and metabolic outcomes

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome	Fibre group	Control group	P
Schwab et al (2006)	66 (29/37) 30-65 years Non-obese (10 T2D)	12 weeks	Nutrition counselling (dietary goals for prevention of CVD & T2D) + sugar beet pectin (SBP) or polydextrose (PDX) or control drink	16g/d sugar beet pectin or polydextrose	Change in mean weight (kg)	*PDX:* -1.0 (P=0.007) *SBP:* -0.3 (NSD)	-0.9 (0.007)	NSD NSD
					Change in mean HbA1c (%)	*PDX:* +0.2 *SBP:* +0.1 (both P<0.05)	0.0	NSD NSD
					Change in mean fasting glucose (mmol/l)	*PDX:* +0.1 *SBP:* +0.1 (both NSD)	+0.2 (0.007)	NSD NSD

T2D- type 2 diabetes; CVD- cardiovascular disease; NSD- non significant difference

Table 14A: Acute experimental studies

Reference	Subjects N (M/F) Age Health	Duration	Intervention	Glucose	Insulin	Other
Wheat						
Benini et al (1995)	8 (5/3) 28-41 Healthy	4 hours	High (M:17.4; F:14.0g) or low (M:3.5; F:2.8g) wheat fibre matched meals	↓ AUC (P<0.05)		↓ hunger at 120 & 180 min post-consumption (P<0.03)
Delargy et al (1995)	12 (M) Healthy	14 hours	High (20g, 50:50 insoluble: soluble) or low (3g) fibre cereals			NSD appetite or later energy intake (#)
Fontvieille et al (1988)	12 (8/4) 24 (mean) Healthy	3 hours	Bran-enriched (4.2g fibre) or control (1.3g fibre) toast	NSD AUC (#)	NSD AUC (#)	
Grimes & Gordon (1978)	12 Healthy		Wholemeal or control white bread			↓ amount consumed to reach point of fullness (P<0.05)
Hallfrisch et al (2002)	24 (12/12) 41 (mean) Healthy	3 hours	OGTT + 0.08 / 0.17 / 0.33g/kg body weight insoluble fibre (Z-trim: oat, wheat, corn, rice, soy and pea)	NSD AUC (#); ↓ peak with ↑ dose (P=0.04)	NSD AUC (#); delayed peak with ↑ dose (P<0.0001)	NSD glucagon responses (#)
Hamberg et al (1989	8 (5/3) 23-30 Healthy	2 hours	OGTT ± 30g pea fibre (PF) / 36g wheat bran (WB) / 22g sugar beet fibre (SBF)	↓ AUC with PF only (P<0.05); NSD AUC with WB/SBF (#)	NSD AUC (#); ↓ at 30 min with PF only (P<0.05)	
Jeffrys (1974)	6 (4/2) 20-25 years Healthy	2 hours	Glucose ± unprocessed wheat bran / bagasse / wood cellulose (0.2g/kg body weight)	Bran ↓ AUC (P<0.01); Others ↑ peak (P<0.01)		
Jenkins et al (1981)	13 (6/7) 30 (mean) Healthy	2 hours	High / low fibre bread (10.2/2.8g), pasta (7.3/2.0g), rice (3.5/1.4g)	NSD AUC (#)	NSD AUC (#)	
McIntosh et al (2003)	28 (M) 40-65 Overweight	1 hour	High rye fibre (RF) or wheat fibre meal (WF) or control low fibre meal	↓ fed (1hr) – fasted change RF & WF (P<0.0001)	↓ fed (1hr) – fasted change RF & WF(P<0.0005)	
Molnar et al (1985)	10 (4/6) 12 (mean) Obese	3 hours	OGTT ± 15 g unprocessed wheat bran (21% cellulose, 26% hemicellulose, 3% pectin, 4% lignin)	↓ 30 min (P<0.02)	↓ 30 min (P<0.02)	
Porikos & Hagamen (1986)	50 (M) 18-25 Healthy	1 hour	High (3.3g) or control low (0.2g) wheat fibre bread meal			↓ hunger (immediate post-consumption P<0.005; 30 min P=0.08) ↓ later energy intake (P<0.05 in total sample; obese subjects only P<0.025)
Samra & Anderson (2007)	16 (M) 20-35 Healthy	1.5 hours	High (33g insoluble) or low (1g) fibre cereal	NSD AUC (#)		↓ energy intake at 75 min (P<0.05) NSD appetite AUC (#)
	15 (M) 20-35 Healthy	1.5 hours	High (33g insoluble) or low (1g) fibre cereal	NSD AUC (P=0.4)		NSD glucose tolerance to set second meal (#)

Reference	Subjects N (M/F) Age Health	Duration	Intervention	Glucose	Insulin	Other
Weickert et al (2005)	14 (F) 24 (mean) Healthy	2 hours	Fibre-enriched bread: 10.5g wheat fibre (WF; 94.5% insoluble) / 10.6g oat fibre (OF; 93% insoluble) or un-enriched control bread	NSD AUC (P>0.15)	↑ early (45 min) AUC with OF (P=0.027), NSD WF (P>0.15); NSD 180 min AUC (P>0.15)	Earlier GIP peak with OF (P<0.01)
Wolever et al (2004)	77 (M) 18-75 Healthy	2 hours	High (36.7g fibre, 35.8g insoluble) or low (0.5g fibre) fibre cereal	↓ AUC & peak (both P<0.001)	↓ AUC (P=0.015) & peak (P=0.012)	
Other grains						
Behall et al (2005)	10 (F) 28-58 Overweight	3 hours	Oat / barley meals (flour & flakes) or glucose (control)	↓ AUC & peak with all (P<0.05)	↓ AUC & peak with barley meals only (P<0.05); NSD with oats (#)	NSD glucagon (P>0.71) or leptin (P>0.80) AUC
Bourdon et al (1999)	12 (M) 21-42 Healthy	6 hours	High barley (A: naturally high β-glucan, B: enriched with β-glucan; both 15.7g fibre, 5g β-glucan) or low (4.6g) fibre meals	NSD AUC & peak (#)	NSD AUC with both (#); ↓ peak with B (P<0.05) but NSD with A (#)	NSD CCK AUC (#)
Braaten et al (1994)	11 (7/4) 52 (mean) Healthy	3 hours	Wheat farina + oat gum / oat bran / wheat farina (control) breads (insoluble/soluble fibre (g): 0.6/9.5, 10.8/9.2, 0.7/0.8)	↓ AUC & peak with both (P<0.05); NSD between oat breads (#)	↓ AUC with gum (P<0.05), NSD AUC with bran (#); NSD between oat breads (#)	
Dahl et al (2005)	11 Overweight	2 hours	White bread ± flax fibre	↓ AUC & peak (both P<0.05)		
Karlstrom et al (1988)		4 hours	Cereal (19g fibre) / legume (15.4g fibre) / mixed (18.4g fibre) / control low (5.7g fibre) fibre meal	NSD AUC (#)	↓ AUC legume only (P<0.05), NSD AUC other meals (#)	
O'Dea et al (1980)	6 (M) 20-28 Healthy	4 hours	Brown or white rice meals	NSD AUC (#)	NSD AUC (#)	
Turnbull & Thomas (1995)	17 (F) 23 (mean) Healthy	24 hours	MTT ± 20g plantago granules / placebo / water			↑ fullness at 1 hour vs water & placebo (P>0.05), NSD at 2 hours (P=0.88) & 3 hours (0.35) NSD later energy intake (#)

Reference	Subjects N (M/F) Age Health	Duration	Intervention	Glucose	Insulin	Other
Wood et al (1994)	9 (4/5) 32 (mean) Healthy	3 hours	OGTT ± oat gum: 1.8g / 3.6g / 7.2g	↓ AUC (P<0.05) & peak (P<0.001) dose-response with ↑ dose	↓ AUC (P<0.05) & peak (P<0.01) dose-response with ↑ dose	
	11 (6/5) 38 (mean) Healthy	3 hours	OGTT ± oat gum: 7.2g low / high viscosity	NSD AUC & peak (#)	NSD AUC & peak (#)	
Fruit						
Bolton et al (1981)	Not given 20-43 Healthy	3 hours	Whole grapes (1.4% fibre) or grape juice (0% fibre)	NSD AUC (#); ↓ rate increase (P<0.005)	↑ AUC (P<0.02)	↑ satiety (P<0.05)
			Whole oranges (2.5% fibre) or orange juice (0% fibre)	NSD AUC (#); ↓ reactive late hypoglycaemia (P<0.05)	↓ AUC (P<0.02) & peak (P<0.05)	↑ satiety (P<0.05)
Haber et al (1977)	10 (5/5) 22-40 Healthy	3 hours	Whole apples (2.9% fibre) or apple juice (0% fibre)	↓ reactive late hypoglycaemia (P<0.05)	↓ AUC (P<0.01) & peak (P<0.005)	↑ satiety (P<0.05)
Kay (1978)	10 (F) 20-22 Healthy	3 hours	Whole oranges (8g pectin) or orange juice (0.2g pectin)	NSD AUC (#); ↑ level at 180 min P<0.01)		↓ hunger during 3rd hour (#)

Reference	Subjects N (M/F) Age Health	Duration	Intervention	Glucose	Insulin	Other
Vegetables						
Moorhead et al (2006)	36 (F) 21-40 Healthy	3.5 hours	Whole carrots (4.4g fibre) or carrot nutrients (0g fibre)			↑ satiety (P<0.05) ↓ later energy intake (P<0.05)
Onyechi et al (1998)	15 (12/3) 24-38 Healthy	2.5 hours	MTT ± vegetable flours: detarium (legume) or cissus (shrub); Both 10-11g total NSP	↓ AUC (detarium: P<0.001; cissus: P<0.0005)	NSD AUC (pooled P=0.4)	
Raben et al (1994)	10 (M) 20-50 Healthy	6 hours	Pea fibre (4.7g/4.18MJ) or low fibre (1.7g/4.18MJ) meal	NSD AUC (P=0.48)		↓ DIT (P<0.05) NSD suppression fat oxidation (P=0.11)
Legumes						
Bourdon et al (2001)	8 (M) 21-45 Healthy	6 hours	MTT ± bean flakes (11.8g fibre, 3.2g insoluble)	NSD AUC (#)	NSD AUC (#)	↑ CCK AUC (P<0.05)
Burley et al (1993)	18 (9/9) Healthy	4.5 hours	High (11g fibre: 33% chitin 64% insoluble β-glucan cell wall material) or low (3g) fibre lunch			↓ hunger at 4 hrs only (P<0.04) ↓ energy intakes at 4.5 hrs (P<0.001)
Tredger et al (1981)	6 (4/2) 18-21 Healthy	3 hours	MTT ± 20g sugar beet pulp	NSD AUC (#)	NSD AUC (#)	
Turnbull et al (1993)	13 (F) 25 (mean) Healthy	3 hours	Mycoprotein (16.8g fibre) or control (10.1g fibre) meals			↓ appetite at 3 hrs (P<0.01) ↓ later energy intake (test day: P<0.01; following day: P<0.05)
Mixed sources						
Burton-Freeman et al (2002)	15 (7/8)	6 hours	High (20g/4.18MJ) or low (7g/4.18MJ) fibre mixed meal	↓ AUC (P<0.005)	NSD AUC (#)	↓ hunger (in women only; P<0.05) ↑ CCK AUC (P<0.0002)
Fraser et al (1983)	25 (F) Pregnant	24 hours	High (51.4g) or low (12.4g) fibre mixed meals	↓ mean at 29 (P<0.001) but not at 35 (#) weeks gestation	↓ mean at 35 P<0.0001) but not at 29 (#) weeks gestation	
Scalfi et al (1987)	7 (M) 30 (mean) Healthy	6 hours	High (26g, 9.7g cellulose) or low (8g, 1.4g cellulose) fibre meal	↓ AUC (P<0.05)	↓ AUC (P<0.05)	↓ DIT (P<0.05)
			Low (8g, 1.4g cellulose) fibre meal ± 6g glucomannan	↓ AUC (P<0.05)	↓ AUC (P<0.05)	↓ DIT (P<0.01)
Sparti et al (2000)	14 (7/7) 20-30 Healthy	24 hours	High (60g) or low (3g) fibre mixed meals			↑ fullness post-meals (#) ↓ carbohydrate oxidation post-meals (P<0.05), but NSD 24 hr substrate oxidation (#)
Isolated polysaccharide sources						
Bergmann et al (1992)	12 (3/12) 18-65 Healthy	6 hours	Psyllium or placebo immediately before MTT			↓ rate gastric emptying 3-6 hrs (P<0.05), NSD 0-2 hrs (#) ↓ hunger & ↑ satiety at 6 hrs (P=0.05), NSD 0-5 hrs (#)

Reference	Subjects N (M/F) Age Health	Duration	Intervention	Glucose	Insulin	Other
Burley et al (1987)	20 (F) Healthy	2.5 hours	MTT ± guar gum (12.5 or 3.0g fibre)			NSD fullness or later energy intakes (#)
Di Lorenzo et al (1988)	9 (1/8) 24-53 Healthy	2 hours	MTT + 10g pectin (P) or 10g methylcellulose (M)			↓ rate gastric emptying P vs M (P<0.001) ↑ satiety (P<0.001) & time to next meal (P<0.05) P vs M
Durrant & Royston (1978)	13 Overweight		0.84 MJ preload ± 1 g methylcellulose			NSD hunger (#)
Ebihara et al (1981)	7 (M) 22-32 Overweight	3 hours	OGTT ± 5g konjac-mannan fibre	NSD AUC (#); ↑ 180 min (P<0.01)	↓ AUC (P<0.05) & peak (P<0.05)	
Edwards et al (1987)	16 (12/4) 18-25 Healthy	2.5 hours	OGTT ± 2.5g various viscous polysaccharides (guar (G), xanthan (X), locust bean gum (LBG), meyproydn (M), X/LBG, X/M)	↓ AUC X only (P<0.05); NSD others (#)	↓ AUC X (P<0.01), G (P<0.001) & X/LBG (P<0.01)	No correlation between *in vitro*-determined viscosity & AUC
Ellis et al (1985)	9 (4/5) 23-54 Healthy	2 hours	Bread ± guar: 5% (3.2g), 10% (5.9g), 15% (7.7g)			↑ satiety at 0-60 min post-consumption with 10 & 15% (P<0.05), at 120 min with 15% only (P<0.05), NSD at any time with 5% (#)
Fairchild et al (1996)	10 (3/7) 22 (mean) Healthy	4 hours	Guar-enriched (5.5g soluble, 3.6g insoluble fibre) or control wheatflakes (1.0g soluble, 3.0g insoluble fibre)	↓ AUC to 60 and 120 (P<0.05) but not 240 min (#)	↓ AUC to 60, 120 and 240 min (P<0.05)	NSD AUC C-peptide (#)
French & Read (1994)	8 (M) 22-30 Healthy	1 hour	High/low fat MTT ± 12g guar gum			↓ rate gastric emptying with guar for both high & low fat meals (P<0.05) ↑ time to return of hunger with guar for high fat meal only (P<0.05)
Frost et al (2003)	10 (4/6) 34 (mean) Healthy	4 hours	High/low fat MTT ± 1.7g psyllium	↓ AUC for high fat meal (P=0.004), NSD low fat meal (#)	NSD AUC (#)	NSD GLP-1 AUC (#)
Geleva et al (2003)	33 20-75 Healthy		LMTT ± 5g solubilised cellulose gel (74.5% cellulose, 23% lignin, 1.5% hemicellulose)	NSD AUC (P=0.22) & peak (P=0.51)		↓ CCK AUC (P=0.08) & peak (P=0.01)
Greundel et al (2006)	20 (9/11) 22-62 Healthy	6 hours	Liquid meals enriched with 0, 5, 10 or 20g carob fibre (68.4% insoluble)	NSD AUC (#)	NSD AUC (#)	↓ ghrelin response (10g: P=0.021, 20g P=0.046) ↓ glucose oxidation (P<0.001) ↓ triglycerides (P<0.001) ↑ energy expenditure (P<0.001)
Groop et al (1986)	10 (3/7) 40-55 Healthy	7 hours	5g guar gum or placebo before meals	NSD AUC (#)	NSD AUC (#)	↑ AUC C-peptide & GIP (both P<0.05) NSD glucagon (#)
Heini et al (1998)	25 (F) 46 (mean) Healthy		LMTT ± 8g partially hydrolysed guar gum	NSD AUC (#)	NSD AUC (#)	↑ CCK peak (P<0.01)
Hoad et al (2004)	12 (3/9) 19-29 Healthy	4 hours	LMTT ± 3g guar / weakly-gelling alginate (WGA) / strongly-gelling alginate (SGA)			NSD gastric emptying (P=0.51) ↑ fullness at same gastric volume (all P<0.05) ↓ hunger at 4 hrs with SGA (P=0.041), guar & WGA NSD (#)

Reference	Subjects N (M/F) Age Health	Duration	Intervention	Glucose	Insulin	Other
Innami et al (2005)	7 (M) 21-25 Healthy	2 hours	OGTT ± 6g or 15g Jew's mellow leaves powder (viscous)	↓ peak (P<0.05)	NSD peak (#)	
Jarjis et al (1984)	16 (11/5) 20-30 Healthy	2 hours	OGTT ± 2.5g or 14.5g guar gum	↓ 30 & 60 min (both P<0.05)	↓ 30 (P<0.01) & 60 (P<0.05) min	NSD gastric emptying
			OGTT ± 3.5g or 7g psyllium	NSD AUC (#)	NSD AUC (#)	
Jenkins et al (1977)	13 (11/2) 19-33 Healthy	2 hours	LMTT ± 14.5g guar flour	↓ 30 min (P<0.05)	NSD any time point (#)	
			MTT ± 10g pectin	↓ 15 min (P<0.01)	↓ 15, 30 (P<0.01) & 45 (P<0.05) min	
			MTT ± 14.5g guar flour + 10g pectin	↓ 15 (P<0.002) & 30 min (P<0.01)	↓ all time points (P<0.05)	
Krotkiewski (1984)	9 (F) 30-57 Obese	2 hours	MTT ± 10g guar gum	↓ 30 min (P<0.05)		No further suppression by guar gum after 8 weeks supplementation when excluding outliers
Lavin et al (1995)	10 (M) 21-32 Healthy	3 hours	OGTT ± 5g guar gum	↓ AUC (P<0.004) & peak (P<0.05)	↓ AUC (P<0.0001) & peak (P<0.003)	↓ hunger (P<0.002) & ↑ satiety (P<0.029) & fullness (P<0.003) over 3 hrs post-consumption NSD gastric emptying (#)
Leclere et al (1994)	6 (3/3) 21-39 Healthy		Oral glucose (G) or starch (S) + high or low (control) viscosity guar gum	G: ↑ 120-180 min (P<0.05); S: ↓ 45 min (P<0.05)	G: ↓ 45-90 min (P<0.05); S: ↓ 45-75 min (P<0.05)	
Leeds et al (1978)	5 (F) 21-25 Healthy	2 hours	OGTT ± 12g guar gum			No H_2 production after either meal meaning glucose was not malabsorbed (indicating prevention of glucose absorption by guar is not the mechanism by which it causes ↓ postprandial glycaemia)
Levitt et al (1980)	12 (M) Healthy	4 hours	MTT ± 5g guar + 5g pectin	↓ AUC (P<0.05)	NSD AUC (#)	↑ AUC glucagon (P<0.05) NSD AUC GIP (#)
Maki et al (2007a)	31 (6/25) 18-64 Healthy	3 hours	MTT with 8g cellulose (control) or 4g high-viscosity hydroxypropylmethycellulose (HV-HPMC) + 4g cellulose or 8g HV-HPMC	↓ AUC (P<0.05) & peak (P<0.001) both doses	↓ AUC (P<0.05) & peak (P<0.01) both doses	
Maki et al (2007b)	49 (24/25) 18-64 Healthy	2 hours	OGTT + 1 or 2g high-viscosity (HV) hydroxypropyl-methylcellulose (HPMC) or 2g ultra-high-viscosity (UHV) HPMC or 4g medium-viscosity (MV) HPMC	NSD AUC (#); ↓ peak UHV only (P<0.001)	↓ AUC (P<0.001) & peak (#) with all formulations	
Mattes (2007)	25 (10/15) 27 (mean) Healthy	5 hours	High fibre (4.5g from guar + alginate) or placebo meal replacement bar			NSD hunger (#) NSD later energy intake (#)
Morgan et al (1990)	6 (M) 20 (mean) Healthy	3 hours	MTT ± 10g galactomannan (guar gum)	↓ AUC (P<0.02)	↓ AUC (P<0.02)	↓ AUC GIP (P<0.05)
			MTT ± 5g glucomannan (konjac-mannan)	NSD AUC (#)	↑ AUC (P<0.02)	NSD AUC GIP (#)
			MTT ± 10g sugar beet fibre	↓ AUC (P<0.05)	NSD AUC (#)	↑ AUC GIP (P<0.05)
			MTT ± 10g soy cotyledon fibre	NSD AUC (#)	↑ AUC (P<0.02)	NSD AUC GIP (#)

Reference	Subjects N (M/F) Age Health	Duration	Intervention	Glucose	Insulin	Other
Rigaud et al (1998)	14 (7/7) 18-50 Healthy	3 hours	7.4g psyllium or placebo preload to MTT	↓ AUC (P<0.05)		NSD gastric emptying (#) ↓ hunger (P<0.05) ↓ later energy intake (total: P<0.05, snacks: P<0.02, dinner; NSD #)
Sanaka et al (2007)	10 (M) 21-33 Healthy	2 hours	MTT ± 2.6g pectin or 2.5g agar	NSD AUC (#)		
Sels et al (1992)	11 (5/6) 18-34 Healthy	2 hours	MTT ± 8.1g guar	NSD AUC (#)		NSD C-peptide AUC (#)
Sierra et al (2001)	10 (F) 30-48 Healthy	2 hours	OGTT ± 10.5g guar gum	NSD AUC (#)	↓ AUC (P<0.05)	
			OGTT ± 10.5g psyllium	↓ AUC (P<0.05)	↓ AUC (P<0.05)	
Tiwary et al (1997)	74 (49/25) 18-53 Healthy		LMTT ± 5, 10, 15 or 20g pectin			↑ satiety (P<0.001 at all time points), NSD between doses (#) ↑ satiety after 2nd fixed meal (P≤0.014 at all time points)
Tomlin (1995a; 1995b)	17 (10/7) 21-31 Healthy	26 hours	Liquid fibre (8.5g ethyl hydroxy ethyl cellulose) or placebo drink			↓ hunger at 0.5-1 hour (P<0.01) ↑ time to next meal (P≤0.01) NSD next day energy intake (P=0.13)
Van den Ven (1994)	24 (F) 24-40 Healthy	24 hours	5 / 10g guar gum or placebo preload 1 hr before meal			↓ energy intake at both doses (preload + meal; P<0.001) NSD 24 hr energy intake (#)
Wilmshurst & Crawley (1980)	7 36 (mean) Healthy	8 hours	MTT ± 2g guar gum			↓ rate gastric emptying (P<0.05) Delayed return of hunger (P<0.01)
Wolf et al (2003)	30 (13/17) 18-75 Healthy	3 hours	MTT ± 5g guar gum	↓ AUC (P<0.01)		
Wolever et al (1991)	9 (4/5) Healthy	1.5 hours	Branflakes (15.8g fibre) ± psyllium: 5, 10, 15, 20% (17.1, 21.3, 23.4, 24.3g fibre)	↓ AUC dose-response (P<0.002)		No effect of psyllium before cereal (#)
Resistant starch						
Behall & Hallfrisch (2002)	25 (13/12) 23-58 Healthy	3 hours	30-70% amylose bread (2.0-13.4g RS) (10% increments)	↓ AUC with ↑ % amylose (P<0.0001)	↓ AUC with ↑ % amylose (P<0.0001)	
Behall et al (2006)	20 (F) 43 (mean) 10 normal wt 10 overweight	4 hours	MTT: glucose control & muffins with 0.9/3.4/6.5 g RS (at levels of 0.3/0.9/3.7g β-glucan)	↓ AUC with ↑ RS (P<0.05)	↓ AUC with ↑ RS (P<0.0001)	
Brighenti et al (2006)	10 (8/2) 40 (mean) Healthy	8.5 hours	High (13g) or control low (1g) RS breakfast, followed by standardised lunch at 5 hrs	↓ 30 min peak (P<0.03)	↓ 1 hr peak (P<0.02) & 2 hr P<0.05)	↓ glucose response to lunch (P<0.05 at 4 hr post-lunch) NSD insulin response to lunch (#)
Granfeldt et al (1995)	9 (4/5) Healthy	3 hours	45g starch from high amylose corn (16g RS) or dent corn arepas (control; 1.8g RS)	↓ at 30, 45 & 70 min (P<0.05)	↓ at 30 & 45 min (P<0.05)	
Heijenen et al (1995)	10 (M) 20-26 Healthy	5 hours	50g raw (54% RS2) or pregelatinised potato starch (control; 100% digestible)	↓ peak (P<0.0001)	↓ peak (P<0.01)	↓ DIT (P<0.05)

Reference	Subjects N (M/F) Age Health	Duration	Intervention	Glucose	Insulin	Other
Leeman et al (2005)	13 (3/10) 19-32 years Healthy	2 hours	50g starch from boiled & cooled (5.2% RS) or freshly boiled (control; 3.3% RS) potatoes	↓ 1 hr AUC (P<0.05); NSD 2 hr AUC (#)	NSD 1 hr AUC (#); ↓ 2hr AUC (P<0.05)	
Liljeberg et al (1999)	10 (4/6) 22-57 Healthy	7 hours	50g starch from white bread + raw potato starch (9.7g RS) or white bread (control; 0.1g RS) for breakfast, followed by standardised lunch at 4 hrs	NSD AUC (GI 92 vs 100; #)	NSD AUC (II 92 vs 100; #)	NSD glucose response to lunch (#) NSD insulin response to lunch (#)
Meance et al (1999)	8 (4/4) 19-43 Healthy		Non-extruded (5.4% RS) or extruded (control; 1.1%) corn flour-based porridge			NSD satiety scores (AUC marginally higher extruded vs non-extruded; P=0.06)
Raben et al (1994a)	10 (M) Healthy		50g raw (54% RS2) or pregelatinised potato starch (control; 100% digestible)	↓ AUC (P=0.0015)	↓ AUC (P=0.0008)	↓ AUC GIP (P=0.03) & GLP-1 (P=0.06) ↑ satiety (P=0.03) & fullness (P=0.012)
Ranganathan et al (1994)	7 (M) 23-26 Healthy	12 hours	RMR measured then 30g cellulose / pectin / lintner (RS) consumed	NSD AUC (#)	NSD AUC (#)	
Robertson et al (2003)	10 (4/6) 23-65 Healthy	24 hours	Low fibre meals + 100g high amylose maize starch (60g RS + 40g digestible starch) or 40g waxy maize starch (40g digestible starch) then fibre-free MTT	↓ AUC following MTT (P=0.037)	↓ AUC following MTT (P=0.038)	↑ C-peptide: insulin AUC (#) NSD HOMA-IR (#) / HOMA-β (#)
Tagliabue et al (1995)	15 (M) 20-31 Healthy	5 hours	50g raw (54% RS2) or pregelatinised potato starch (control; 100% digestible)			↓ DIT (P=0.008) ↑ fat oxidation (P=0.013) ↓ carbohydrate oxidation (<0.0005)
Yamada et al (2005)	20 (9/11) 50 (mean) 12 hyper-glycaemic, 8 normal	2 hours	Bread with 6g RS or control bread (0g RS)	NSD AUC (#)	↓ AUC (P<0.05)	Subdivision of group: ↓ AUC insulin in high fasting glucose group (P<0.05) but NSD in normal group (#)
Oligosaccharides/inulin						
Archer et al (2004)	33 (M) 37-64 Healthy	4.5 hours	Sausage patty + 24g inulin / lupin kernal fibre (LKF)			↓ AUC satiety inulin vs LKF (P<0.05)
van Dokkum et al (1999)	12 (M) 23 (mean) Healthy		50g glucose + 5g inulin / FOS / GOS / nothing added	NSD (#)	NSD (#)	
Polydextrose						
King et al (2005)	16 (8/8) 30 (mean) Healthy	1.5 hours	Yogurt + 25g polydextrose (P) / 12.5g polydextrose + 12.5g xylitol (PX) / 25g xylitol (X) / 10g sucrose (control)			↑ fullness following XP only (P=0.003) ↓ energy intake following P only after accounting for differing energy content of yoghurts (P<0.001)

AUC	Area Under the Curve
CCK	Cholecystokinin
DIT	Diet-Induced Thermogenesis
GI	Glycaemic Index
GIP	Gastric Inhibitory Polypeptide
GLP-1	Glucagon-Like Peptide-1
HOMA-IR	Homeostasis Model Assessment of Insulin Resistance
HOMA-β	Homeostasis Model Assessment of beta-cell function
II	Insulinaemic index
MTT	Meal Tolerance Test
NSD	No significant difference
OGTT	Oral Glucose Tolerance Test
RMR	Resting Metabolic Rate
RS	Resistant Starch
#	P value not given

Appendix B: list of cardiovascular disease tables

Table 1B: Prospective studies investigating the association of fibre and cardiovascular disease risk

Reference	Subject Population	Measure of Exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Jensen et al (2004) Health Professionals Follow-Up Study	42,850 men 1818 cases of coronary heart disease 40-75 years 14 y follow-up	Total dietary fibre according to quintile of mean whole-grain intake by FFQ	Quintile mean fibre intake (g/d) Total fibre Q1: 17 Q2: 19 Q3: 21 Q4: 22 Q5: 26	Hazard Ratio 1.00 (ref) 0.97 (0.84, 1.11) 0.94 (0.82, 1.09) 0.86 (0.74, 1.01) 0.82 (0.70, 0.96)	0.01	Age, energy intake, smoking, alcohol intake, physical activity, family history of myocardial infarction, vitamin E use, intakes of fats (saturated, polyunsaturated, and trans fats), fruit, vegetables and fish.
Liu et al (2002a) Women's Health Study	38,480 women 570 cases of cardiovascular disease 46-64 years 6 y follow-up	AOAC defined total dietary fibre by FFQ	Quintile mean fibre intake (g/d) Total fibre Q1: 12.5 Q2: 15.7 Q3: 18.2 Q4: 21.1 Q5: 26.3 Cereal fibre Q1: 3.0 Q2: 3.8 Q3: 4.4 Q4: 5.0 Q5: 6.5 Vegetable fibre Q1: 5.9 Q2: 6.4 Q3: 6.8 Q4: 7.2 Q5: 8.0 Fruit fibre Q1: 2.5 Q2: 3.5 Q3: 4.2 Q4: 4.9 Q5: 6.0	1.00 (ref) 0.81 (0.61, 1.07) 0.85 (0.64, 1.12) 0.78 (0.57, 1.05) 0.79 (0.58, 1.09) 1.00 (ref) 1.00 (0.75, 1.33) 1.09 (0.82, 1.45) 1.08 (0.81, 1.43) 1.11 (0.84, 1.46) 1.00 (ref) 0.89 (0.67, 1.18) 1.10 (0.83, 1.44) 1.07 (0.81, 1.41) 0.96 (0.72, 1.28) 1.00 (ref) 0.94 (0.72, 1.24) 1.10 (0.85, 1.44) 0.80 (0.60, 1.06) 0.82 (0.61, 1.09)	0.17 0.38 0.78 0.09	Age, smoking, exercise, alcohol intake, use of postmenopausal hormones, body mass index, use of multivitamin or vitamin C supplements, history of hypertension, high cholesterol or diabetes mellitus, parental history of myocardial infarction before age 60, energy intake.

Reference	Subject Population	Measure of Exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Liu et al (2002a) continued			Soluble fibre Q1: 3.7 Q2: 4.8 Q3: 5.6 Q4: 6.5 Q5: 8.6 Insoluble fibre Q1: 9.5 Q2: 12.3 Q3: 14.2 Q4: 16.5 Q5: 21.8	1.00 (ref) 0.99 (0.75, 1.32) 1.02 (0.77, 1.35) 0.99 (0.74, 1.31) 0.90 (0.68, 1.21) 1.00 (ref) 0.92 (0.62, 1.03) 0.75 (0.56, 1.00) 0.78 (0.59, 1.00) 0.78 (0.57, 1.06)	0.50 0.09	
Liu et al (2002b) Women's Health Study	38,480 women Myocardial Infarction 46-64 years 6 y follow-up	AOAC defined total dietary fibre by FFQ	Quintile mean fibre intake (g/d) Total fibre Q1: 12.5 Q2: 15.7 Q3: 18.2 Q4: 21.1 Q5: 26.3 Cereal fibre Q1: 3.0 Q2: 3.8 Q3: 4.4 Q4: 5.0 Q5: 6.5 Vegetable fibre Q1: 5.9 Q2: 6.4 Q3: 6.8 Q4: 7.2 Q5: 8.0 Fruit fibre Q1: 2.5 Q2: 3.5 Q3: 4.2 Q4: 4.9 Q5: 6.0	1.00 (ref) 0.70 (0.44, 1.15) 0.66 (0.40, 1.09) 0.58 (0.33, 0.99) 0.68 (0.39, 1.22) 1.00 (ref) 0.93 (0.58, 1.50) 0.54 (0.31, 0.96) 0.95 (0.59, 1.53) 0.91 (0.56, 1.47) 1.00 (ref) 0.87 (0.51, 1.49) 1.39 (0.86, 2.66) 1.21 (0.73, 2.00) 0.89 (0.52, 1.53) 1.00 (ref) 1.88 (1.14, 3.11) 1.50 (0.89, 2.54) 1.23 (0.71, 2.12) 1.11 (0.62, 1.96)	0.13 0.74 0.87 0.63	Age, smoking, exercise, alcohol intake, use of postmenopausal hormones, body mass index, use of multivitamin or vitamin C supplements, history of hypertension, high cholesterol or diabetes mellitus, parental history of myocardial infarction before age 60, energy intake.

Reference	Subject Population	Measure of Exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Liu et al (2002b) continued			Soluble fibre Q1: 3.7 Q2: 4.8 Q3: 5.6 Q4: 6.5 Q5: 8.6 Insoluble fibre Q1: 9.5 Q2: 12.3 Q3: 14.2 Q4: 16.5 Q5: 21.8	 1.00 (ref) 0.93 (0.57, 1.49) 0.79 (0.47, 1.33) 0.77 (0.45, 1.33) 0.83 (0.47, 1.48) 1.00 (ref) 1.04 (0.65, 1.67) 0.79 (0.47, 1.31) 0.71 (0.41, 1.21) 0.74 (0.42, 1.30)	 0.40 0.12	
Liu et al (2000) Nurses' Health Study	75, 521 women 352 cases of ischemic stroke 38-63 years 12 y follow-up	Total dietary fibre according to quintile of whole-grain servings (median/d) by FFQ	Quintile mean fibre intake (g/d) Total fibre Q1: 14 Q2: 15 Q3: 16 Q4: 18 Q5: 20	 1.00 (ref) 0.72 (0.53, 1.00) 0.78 (0.58, 1.08) 0.60 (0.43, 0.86) 0.69 (0.50, 0.98)	 0.08	Age, body mass index, physical activity, smoking, alcohol intake, parental history of myocardial infarction at <60y, aspirin use, menopausal status, self-reported hypertension, self-reported high blood cholesterol level, multivitamin use, vitamin E use, saturated fat intake, trans fatty acids, energy intake.
Ludwig et al (1999) Cardia study	2506 men and women Cholesterol levels (mean) 18-30 years 10 y follow-up	AOAC defined total dietary fibre by FFQ	Quintile median fibre intake (g/4184KJ/d) Q1: <5.9 Q5: >10.5	LDL-cholesterol (mmol/l) Adjusted means White Men & Women Q1: 2.93 Q5: 2.81 Black Men & Women Q1: 2.82 Q5: 2.72 HDL-cholesterol (mmol/l) White Men & Women Q1: 1.21 Q5: 1.27 Black Men & Women Q1: 1.34 Q5: 1.36	 0.06 0.20 0.005 0.28	Baseline value of respective risk factor (except fibrinogen), age, sex, Cardia field centre, education, energy intake, physical activity, smoking, alcohol, vitamin supplement use.

Reference	Subject Population	Measure of Exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Ludwig et al (1999) Continued				Triglyceride (mmol/l) White Men & Women Q1: 1.0 Q5: 0.91 Black Men & Women Q1: 0.79 Q5: 0.74 Fibrinogen White Men & Women Q1: 7.76 Q5: 7.29 Black Men & Women Q1: 8.06 Q5: 7.91	 0.05 0.11 0.005 0.80	

Pietinen et al (1996b)	21,930 men	Englyst defined dietary fibre (NSP) by FFQ	Total fibre			Age, treatment group, smoking, body mass index, blood pressure, energy intake, alcohol intake, saturated fatty acid intake, education, physical activity, beta-carotene intake, vitamin C intake, and vitamin E use.
Alpha-Tocopherol Beta-Carotene Cancer Prevention Study	581 cases of coronary heart disease		Q1: 16.1	1.00 (ref)		
			Q2: 20.7	0.91 (0.72, 1.15)	0.004	
			Q3: 24.3	0.83 (0.64, 1.06)		
			Q4: 28.3	0.72 (0.55, 0.93)		
			Q5: 34.8	0.73 (0.56, 0.95)		
			Soluble fibre			
			Q1: 3.7	1.00 (ref)		
			Q2: 4.7	0.73 (0.58, 0.93)	0.003	
			Q3: 5.4	0.77 (0.61, 0.98)		
			Q4: 6.2	0.54 (0.41, 0.71)		
			Q5: 7.4	0.61 (0.46, 0.79)		
			Insoluble fibre			
			Q1: 12.2	1.00 (ref)		
			Q2: 15.9	0.98 (0.77, 1.24)	0.01	
			Q3: 18.9	0.86 (0.67, 1.10)		
			Q4: 22.3	0.74 (0.57, 0.97)		
			Q5: 27.7	0.75 (0.58, 0.98)		
			Cereal fibre			
			Q1: 8.8	1.00 (ref)		
			Q2: 12.8	0.92 (0.72, 1.17)	0.01	
			Q3: 16.0	0.92 (0.72, 1.17)		
			Q4: 19.9	0.83 (0.64, 1.07)		
			Q5: 26.3	0.74 (0.57, 0.96)		
			Vegetable fibre			
			Q1: 2.9	1.00 (ref)		
			Q2: 3.9	0.86 (0.68, 1.09)	0.08	
			Q3: 4.7	0.89 (0.70, 1.14)		
			Q4: 5.6	0.66 (0.49, 0.87)		
			Q5: 7.1	0.88 (0.66, 1.99)		
			Fruit fibre		0.77	
			Q1: 0.7	1.00 (ref)		
			Q2: 1.5	1.09 (0.84, 1.41)		
			Q3: 2.4	1.39 (1.06, 1.84)		
			Q4: 3.4	1.26 (0.92, 1.73)		
			Q5: 5.3	1.16 (0.80, 1.67)		

Reference	Subject Population	Measure of Exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Wolk et al (1999) Nurses' Health Study	68, 782 women 591 cases of coronary heart disease 37-64 years 10 y follow-up	AOAC defined total dietary fibre by FFQ	Quintile median fibre intake (g/d) Total fibre Q1: 11.5 Q2: 14.3 Q3: 16.4 Q4: 18.8 Q5: 22.9 Cereal fibre Q1: 2.2 Q2: 3.1 Q3: 3.8 Q4: 4.9 Q5: 7.7 Vegetable fibre Q1: 3.6 Q2: 4.9 Q3: 5.9 Q4: 7.1 Q5: 9.5	 1.00 (ref) 0.98 (0.77, 1.24) 0.92 (0.71, 1.18) 0.87 (0.66, 1.15) 0.77 (0.57, 1.04) 1.00 (ref) 1.06 (0.85, 1.34) 0.71 (0.55, 0.93) 0.76 (0.58, 0.99) 0.66 (0.49, 0.88) 1.00 (ref) 1.05 (0.80, 1.37) 1.11 (0.82, 1.49) 1.10 (0.79, 1.52) 1.13 (0.77, 1.64)	 0.07 < 0.001 0.63	Age, study period, body mass index, smoking, menopausal status, aspirin use, multivitamin supplement use, vitamin E use, physical activity, hypertension, parental history of myocardial <60 y, alcohol intake, carbohydrate intake, energy intake. Cereal, vegetable and fruit fibre also adjusted for the other sources of fibre, folate, vitamins B6, C, and E, beta carotene and magnesium intake.

Table 2B: Cross-sectional studies investigating the association of fibre with serum lipid outcomes

Reference	Subject Population	Measure of Exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Lairon et al (2005) SU.VI.MAX study	2,532 men 3,429 women 35-60 years Cholesterol (>6.2 mmol/l Vs ≤ 6.2 mmol/l)	AOAC defined total dietary fibre by 24-h recalls	Mean (g/d) Men: 21.9 Women: 17.9	 1.00 (ref) 0.84 (0.71, 1.01) 0.85 (0.70, 1.02) 0.83 (0.68, 1.02) 0.68 (0.53, 0.87)	 0.15	Age, sex, energy intake, tobacco use, carbohydrate intake, saturated fatty acid intake, alcohol intake, leisure-time exercise, intervention supplement.
McKeown et al (2002)	1338 men 1603 women Cholesterol levels 54 years (mean)	Total dietary fibre according to quintile of whole-grain servings/wk (median) by FFQ	Total fibre Q1: 13.8 Q2: 15.0 Q3: 17.3 Q4: 19.0 Q5: 21.2	Total Cholesterol (mmol/l) Q1: 5.20 Q2: 5.14 Q3: 5.24 Q4: 5.18 Q5: 5.09 HDL-C (mmol/l) Q1: 1.20 Q2: 1.21 Q3: 1.21 Q4: 1.18 Q5: 1.23 LDL-C (mmol/l) Q1: 3.16 Q2: 3.13 Q3: 3.21 Q4: 3.16 Q5: 3.04 TAG (mmol/l) Q1: 1.69 Q2: 1.61 Q3: 1.64 Q4: 1.68 Q5: 1.58	0.06 0.16 0.02 0.07	Age, sex, energy intake, treatment of hypertension, smoking, alcohol intake, multivitamin use, estrogen use, physical activity, body mass index, % of polyunsaturated fatty acids, intakes of meat, fish, fruit & vegetables.

Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL-C low density lipoprotein cholesterol; TAG- triacylglycerol

Reference	Subject Population	Measure of Exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Newby et al (2007) Baltimore Longitudinal Study of Aging	1516 men Cholesterol levels 27-88 years	Total dietary fibre according to quintile of whole-grain intake (median/d) by 7d food diaries	Total fibre Q1: 13.9 Q5: 24.7	Total-C (mmol/l) Q1: 5.71 Q5: 5.49 HDL-C (mmol/l) Q1: 1.27 Q5: 1.22 LDL-C (mmol/l) Q1: 3.16 Q5: 2.96 TAG (mmol/l) Q1: 1.23 Q5: 1.16	0.02 0.07 0.04 0.22	Age, sex, energy intake, decade of visit, race, education, vitamin supplement use, smoking, % energy from saturated fat, alcohol, body mass index, lipid-lowering medication, hypercholesterolemia.
			Cereal fibre Q1: 14.5 Q5: 25.9	Total-C (mmol/l) Q1: 5.73 Q5: 5.44 HDL-C (mmol/l) Q1: 1.23 Q5: 1.25 LDL-C (mmol/l) Q1: 3.13 Q5: 2.99 TAG (mmol/l) Q1: 1.24 Q5: 1.15	0.005 0.59 0.07 0.12	

Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL-C low density lipoprotein cholesterol; TAG- triacylglycerol

Table 3B: Prospective studies investigating the association of fibre with blood pressure

Reference	Subject Population	Measure of Exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Ascherio et al (1996) Nurses' Health Study	41,541 women 2526 cases of self-reported hypertension 38-63 years 4 y follow up	AOAC defined total dietary fibre by FFQ	Total dietary fibre (g/d) Category <10.0 10.0-14.9 15.0-19.9 20.0-24.9 ≥25.0	1.0 (ref) 1.04 (0.85, 1.28) 0.99 (0.81, 1.22) 1.02 (0.82, 1.27) 1.01 (0.80, 1.29)	0.75	Age, BMI & alcohol intake.
Ludwig et al (1999) Cardia study	2,731 men & women 18-30 years Blood pressure at 10 y follow-up	AOAC defined total dietary fibre by FFQ	Quintile median fibre intake (g/4184KJ/d) Q1: <5.9 Q5: >10.5	Mean SBP (mmHg) White Men & Women Q1: 109.1 Q5: 106.9 Black Men & Women Q1: 111.6 Q5: 111.5 Mean DBP (mmHg) White Men & Women Q1: 72.4 Q5: 69.7 Black Men & Women Q1: 74.0 Q5: 73.3	0.01 0.77 <0.001 0.70	Age, sex, Cardia field centre, education, energy intake, physical activity, smoking, alcohol, vitamin supplement use.

SBP- systolic blood pressure; DBP- diastolic blood pressure

Table 4B: Cross-sectional studies investigating the association of fibre with blood pressure

Reference	Subject Population	Measure of Exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Lairon et al (2005) SU.VI.MAX study	2,532 men 3,429 women 35-60 years Hypertension (Yes vs No) (defined as systolic BP >140 mm Hg, diastolic BP >90 mm Hg, or use of antihypertensive medication)	AOAC defined total dietary fibre by 24-h recalls	Mean (g/d) Men: 21.9 Women: 17.9	Total fibre 1.00 (ref) 0.88 (0.73, 1.07) 0.74 (0.60, 0.91) 0.83 (0.66, 1.04) 0.71 (0.54, 0.93) Insoluble fibre 1.00 (ref) 0.84 (0.69, 1.01) 0.77 (0.62, 0.95) 0.78 (0.62, 0.98) 0.68 (0.52, 0.89)	0.02 0.01	Age, sex, energy intake, tobacco use, carbohydrate intake, saturated fatty acid intake, alcohol intake, leisure-time exercise, intervention supplement.
McKeown et al (2002)	2480 men & women Blood pressure outcomes 54 years (mean)	Total dietary fibre according to quintile of whole-grain servings/wk (median) by FFQ	Total fibre Q1: 13.8 Q2: 15.0 Q3: 17.3 Q4: 19.0 Q5: 21.2	Mean SBP (mmHg) Q1: 124.4 Q2: 123.2 Q3: 123.3 Q4: 122.5 Q5: 123.1 Mean DBP (mmHg) Q1: 75.6 Q2: 74.4 Q3: 74.6 Q4: 74.7 Q5: 73.8	0.38 0.19	Age, sex, energy intake, treatment of hypertension, smoking, alcohol intake, multivitamin use, estrogen use, physical activity, body mass index, % of polyunsaturated fatty acids, intakes of meat, fish, fruit & vegetables.
Newby et al (2007) Baltimore Longitudinal Study of Aging	1516 men Blood pressure outcomes 27-88 years	Total dietary fibre according to quintile of whole-grain intake (median/d) by 7d food diaries	Total fibre Q1: 13.9 Q5: 24.7	Mean SBP (mmHg) Q1: 129.2 Q5: 128.3 Mean DBP (mmHg) Q1: 79.8 Q5: 79.2	0.79 0.42	Age, sex, energy intake, decade of visit, race, education, vitamin supplement use, smoking, % energy from saturated fat, alcohol, body mass index, blood pressure-lowering medication, hypertension.

SBP- systolic blood pressure; DBP- diastolic blood pressure

Table 5B: Intervention trials investigating the effect of oat products on cholesterol levels

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Noakes et al (1996)	23 (10/13) 51y (mean) Hyper-TAG	3 x 4 weeks Crossover No washout period	High-amylose diet Diet high in oat bran Low-amylose diet	87g/d oat bran (women) 121g/d oat bran (men)	Mean ± SD Total-C HDL-C LDL-C TAG	 6.04 ± 0.85 0.88 ± 0.16 3.98 ± 0.69 2.61 ± 0.75*	High-amylose Low-☐rabic☐ 6.06 ± 0.71 6.12 ± 0.86 0.91 ± 0.21 0.93 ± 0.23 3.77 ± 0.74 3.74 ± 0.86 3.05 ± 0.87 3.23 ± 1.10	 *P<0.02
Pick et al (1996)	8 (M) 45y (mean) Type II DM	2 x 12 weeks Crossover No washout period	Individualized diet plans constructed + Oat bran concentrate bread or White bread	40g/d oat bran concentrate (mean)	Mean ± SE Total-C HDL-C LDL-C TAG	 4.56 ± 0.11 1.04 ± 0.05 2.59 ± 0.12 2.03 ± 0.16	 5.30 ± 0.11 0.96 ± 0.05 3.36 ± 0.12 2.14 ± 0.16	 P < 0.01 NS P < 0.01 NS
Gerhardt et al (1998)	44 (23/21) 51 y (mean) Mod Hyper-chol	6 weeks Parallel	Low fat diet + Rice starch Rice bran or Oat bran	84g/d of each product added to usual low fat diet	Mean ± SD Total-C HDL-C LDL-C TAG	 6.25 ± 0.58 1.33 ± 0.33 4.19 ± 0.50 1.61 ± 1.03	Rice starch Rice bran 7.20± 0.78 6.34 ± 0.76 1.30± 0.33 1.43 ± 0.28 5.02 ± 0.56 4.26 ± 0.74 2.04 ± 0.87 1.41 ± 0.97	 NS NS NS NS
Onning et al (1999)	52 (M) 62 y (mean) Mod Hyper-chol	2 x 5 weeks Crossover 5 week washout	Oat milk Rice milk 0.25ldrunk 3 x daily. Substitution of test beverages for usual beverages	Oat milk: 3.8g/d ß-glucan Rice milk:0.15g/d ß-glucan	Mean ± SD Total-C HDL-C LDL-C TAG	 6.25 ± 0.67 1.37 ± 0.33 4.14 ± 0.56 1.67 ± 0.67	 6.58 ± 0.80 1.39 ± 0.34 4.38 ± 0.82 1.85 ± 0.92	 P < 0.005 NS P < 0.036 NS
Lovegrove et al (2000)	62 (31/31) 35-70y Mod Hyper-chol	8 weeks Parallel	Habitual diet + Oat bran concentrate or Wheat bran (control)	20g/d of each product consumed with low-fat yoghurt or low-fat milk Oat bran: 3g/d ß-glucan	Mean ± SD Total-C HDL-C LDL-C TAG	 6.3 ± 1.1 1.4 ± 0.5 4.2 ± 0.8 1.5 ± 0.8	 6.5 ± 0.8 1.5 ± 0.7 4.3 ± 0.8 1.7 ± 0.8	 NS NS NS NS
Davy et al (2002)	36 (M) 50-75y Overweight	12 weeks Parallel	Habitual diet + Oat cereal or Wheat cereal	136g/d oat cereal (5.5g/d ß-glucan). Both cereals provided 14g/d dietary fibre.	Mean ± SE Total-C HDL-C LDL-C TAG	 5.15 ± 0.21 0.86 ± 0.05 3.49 ± 0.14 1.71 ± 0.18	 5.22 ± 0.18 0.85 ± 0.05 3.57 ± 0.14 1.83 ± 0.17	 NS NS P = 0.02 NS

Hyper-chol- hypercholesterolemia; NS- non significant; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol;TAG- triacylglycerol

Reference	**Subjects N (M/F) Age Health**	**Study duration & design**	Intervention	**Fibre dose**	**Outcome (mmol/l)**	**Fibre group**	**Control group**	**P**
Keenan et al (2002)	18 44 y (mean) Hypertensive	6 weeks Parallel (pilot study)	Habitual diet + Oat cereal Low fibre cereal	137g/d oat cereal (5.52 g/d ß-glucan)	Mean ± SE Total-C HDL-C LDL-C TAG	 4.75 ± 0.15 1.08 ± 0.10 2.96 ± 0.20 2.10 ± 0.67	 5.10 ± 0.17 1.06 ± 0.08 3.38 ± 0.16 1.70 ± 0.24	 P < 0.05 NS P < 0.05 NS
Pins et al (2002)	88 (45/43) 48 y (mean) Hypertensive	12 weeks Parallel	Habitual diet + Oat cereal Low fibre cereal	137g/d oat cereal (11.7g/d fibre, 5.52 g/d ß-glucan)	Mean ± SE Total-C HDL-C LDL-C TAG	 4.68 ± 0.14 1.16 ± 0.04 3.04 ± 0.11 1.95 ± 0.07	 5.36 ± 0.17 1.12 ± 0.04 3.42 ± 0.12 2.08 ± 0.08	 NS NS P < 0.05 NS
Kerckhoffs et al (2003a)	48 (21/27) 18-65y Mild Hyper-chol	3 week control period then 4 week intervention Parallel	ß-glucan bread & cookies or Control bread & cookies	ß-glucan bread & cookies: 5.9g/d ß-glucan (mean)	Mean ± SE Total-C HDL-C LDL-C TAG	 5.85 ± 0.18 1.47 ± 0.08 3.86 ± 0.17 1.13 ± 0.14	 6.04 ± 0.15 1.41 ± 0.09 4.11 ± 0.16 1.12 ± 0.10	 NS NS NS NS
Kerckhoffs et al (2003b)	25 (10/15) 18-65y Mild Hyper-chol	2 x 2 weeks Crossover 1 week washout	Orange juice enriched with ß-glucan from oats Orange juice with wheat fibre (control)	Orange juice + ß-glucan: 5.0g/d ß-glucan (mean)	Mean ± SE Total-C HDL-C LDL-C TAG	 5.36 ± 0.13 1.28 ± 0.08 3.50 ± 0.14 1.24 ± 0.12	 5.58 ± 0.13 1.25 ± 0.07 3.77 ± 0.14 1.22 ± 0.09	 P < 0.01 NS P < 0.01 NS
Karmally et al (2005)	152 Hispanic Americans (49/103) 30-70y Mod Hyper-chol	5 week run-in period (NCEP Step 1 diets) then 6 week intervention Parallel	NCEP Step 1 diet + Oat cereal or Corn cereal (control)	90g/d oat cereal:3g/d soluble fibre Corn cereal: 0g/d soluble fibre	Mean ± SD Total-C HDL-C LDL-C TAG	 5.15 ± 0.65 0.93 ± 0.26 3.43 ± 0.56 1.71 ± 0.71	 5.21 ± 0.70 0.97 ± 0.23 3.49 ± 0.58 1.63 ± 0.75	 P = 0.0003 NS P = 0.0007 NS

Hyper-chol- hypercholesterolemia; NS- non significant; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol;TAG- triacylglycerol

Reference	**Subjects** **N (M/F)** **Age Health**	**Study duration & design**	Intervention	**Fibre dose**	**Outcome (mmol/l)**	**Fibre group**	**Control group**	**P**
Chen et al (2006)	110 (44/66) 30-65y Healthy	12 weeks Parallel	Habitual diet + Oat bran cereals or Low fibre (wheat cereal)	144g/d oat cereal: 8g/d ß-glucan	Mean change (95%CI) Total-C HDL-C LDL-C TAG	 -0.06 (-0.23,0.11) -0.01 (-0.06, 0.04) -0.05 (-0.19, 0.09) -0.01 (-0.11, 0.10)	 0 (-0.14, 0.14) 0.04 (-0.02, 0.09) -0.02 (-0.14, 0.10) -0.05 (-0.20, 0.10)	 NS NS NS NS
Naumann et al (2006)	47 (18/29) 18-70y Healthy	3 week run-in period consuming rice starch (placebo) then 5 week intervention Parallel	Oat drink enriched with ß-glucan or Rice starch (placebo)	500mL oat drink: 5g/d ß-glucan	Mean ± SD Total-C HDL-C LDL-C TAG	 5.75 ± 0.58 1.27 ± 0.32 3.67 ± 0.61 1.88 ± 0.95	 5.67 ± 0.66 1.40 ± 0.31 3.54 ± 0.71 1.58 ± 0.57	
Queenan et al (2007)	75 (25/50) 22-65y Hyperchol	6 weeks Parallel	Oat bran concentrate or placebo (dextrose monohydrate) provided as a powder to be mixed with beverages	12g/d Oat bran concentrate: (6g/d ß-glucan)	Mean change (SE) Total-C HDL-C LDL-C TAG	 -0.3 ± 0.1 -0.02 ± 0.02 -0.3 ± 0.1 0.09 ± 0.1	 -0.1 ± 0.08 -0.009 ± 0.02 -0.04 ± 0.08 -0.2 ± 0.1	 NS NS P = 0.026 P = 0.030
Theuwissen et al (2007)	42 (20/22) 18-65y Mild Hyper-chol	3 x 4 week Crossover 2 week washout	Habitual diet + 81 Muesli with wheat fibre (control) ii) Muesli with ß-glucan or iii) Muesli with ß-glucan & plant stanols	100g/d Muesli with ß-glucan: 5g/d ß-glucan. 100g/d Muesli with ß-glucan & plant stanols: 5g/d ß-glucan & 1.5g/d plant stanols	Mean ± SD Total-C HDL-C LDL-C TAG	 6.26 ± 0.96^ 1.45 ± 0.49 4.09 ± 0.91* 1.66 ± 1.36	iii) Muesli ß-glucan & stanols / Control 6.01 ± 0.92 6.49 ± 1.03 1.45 ± 0.52 1.46 ± 0.46 3.89 ± 0.90 4.31 ± 0.96 1.56 ± 0.94 1.52 ± 0.84	ii) Muesli ß-glucan Vs Control ^P = 0.015 *P = 0.013

Hyper-chol- hypercholesterolemia; NS- non significant; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol;TAG- triacylglycerol

Table 6B: Effect of oat intake on lipid outcomes in weight loss studies

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Saltzman et al (2001)	43 (20/23) 18-75y Overweight/ Obese	2 weeks control weight maintenance diet then 6 week hypocaloric diet (- 4.2MJ/d) Parallel	Hypocaloric diet + oats or Hypocaloric diet without the addition of oats (control)	Hypocaloric diet: 45g/d oats/4.2MJ dietary energy	Mean change (SD) Total-C HDL-C LDL-C TAG	 -0.87 ± 0.47 0.09 ± 0.13 -0.6 ± 0.41 -0.36 ± 0.36	 -0.34 ± 0.5 -0.04 ± 0.14 -0.2 ± 0.41 -0.22 ± 0.23	 P < 0.05 NS P < 0.05 NS
Reyna-Villasmil et al (2007)	38 (M) 59.8 y (mean) Hyperchol	8 weeks Parallel	AHA Step II diet + Oat bread or Wheat bread (control)	Oat bread: 6g/d ß-glucan	Mean ± SE Total-C HDL-C LDL-C TAG	 5.05 0.11 1.29 0.05 3.14 0.11 1.24 0.08	 5.27 0.17 1.08 0.06 3.46 0.14 1.35 0.08	 NS P < 0.001 P < 0.04 NS

Hyper-chol- hypercholesterolemia; NS- non significant; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol;TAG- triacylglycerol

Table 7B: Intervention trials investigating the effect of psyllium on cholesterol levels

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Davidson et al (1998)	196 21-80 y Mild Hyper-chol	8 week run-in period (NCEP Step 1 diets) then 24 week intervention Parallel	NCEP Step 1 diet + Randomisation to one of four treatment arms: Control or one of three doses of psyllium provided in food products	81 control ii) psyllium 3.4g/d iii) psyllium 6.8g/d iv) psyllium 10.2g/d	Mean ± SE Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG	3.4g/d 6.15 ± 0.11 1.25 ± 0.04 4.17 ± 0.08 1.63 ± 0.11 6.8g/d 6.27 ± 0.12 1.22 ± 0.04 4.25 ± 0.10 1.73 ± 0.14 10.2g/d 6.14 ± 0.12^ 1.29 ± 0.04 4.17 ± 0.10* 1.51 ± 0.13	6.27 ± 0.11 1.44 ± 0.04 4.39 ± 0.08 1.36 ± 0.11	NS difference found between the 3 treatment groups 10.2g/d Vs control ^P = 0.02 *P = 0.03
Anderson et al (2000)	248 (130/118) 21-70y Hyperchol	8 week run-in period (AHA Step 1 diets) then 26 week intervention Parallel	AHA Step 1 diet + Psyllium or cellulose (control) provided as powders to be mixed with beverages.	Psyllium 10.2g/d	Mean ± SE Total-C HDL-C LDL-C TAG	5.08 ± 0.05 1.29 ± 0.02 3.86 ± 0.04 3.2 ± 2.3	5.98 ± 0.11 1.20 ± 0.03 4.11 ± 0.10 1.51 ± 0.11	P = 0.001 NS P = 0.001 NS
Wolever et al (2002)	62 (34/28) 63 y (mean) Type II DM	24 weeks Parallel	Low fibre breakfast cereal High fibre breakfast cereal or MUFA diet (cereal forbidden)	Low fibre: 23.1g/d total fibre. High fibre: 50.3g/d total fibre 8.5g/d psyllium MUFA: 23.5g/d total fibre	Mean ± SD Total-C HDL-C TAG	5.06 ± 0.14 0.92 ± 0.03 3.16 ± 0.49	Low-fibre MUFA 5.00 ± 0.25 5.88 ± 0.21 1.03 ± 0.07 1.24 ± 0.09 2.59 ± 0.55 1.95 ± 0.18	Diet x time interaction NS 0.003 NS
Sola et al (2007)	28 (M) 61 y (mean) Ischemic heart disease	2 x 8 weeks Crossover Controlled low-fat diet + treatment 8 week washout	Plantago ovata husk (soluble fibre) Plantago ovata seeds (control/insoluble fibre)	10.5g/d P. Ovata husk 10.5g/d P. Ovata seeds	Mean ± SD Total-C HDL-C LDL-C TAG	5.06 ± 0.67 1.15 ± 0.27 3.26 ± 0.67 1.45 ± 0.83	5.09 ± 0.65 1.06 ± 0.23 3.35 ± 0.61 1.50 ± 0.88	NS P = 0.006 NS NS

Type II DM- type 2 diabetes mellitus; Hyper-chol- hypercholesterolemia; NS- non significant; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol;TAG- triacylglycerol

Table 8B: Effect of psyllium supplementation on lipid outcomes in weight loss studies

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Anderson et al (1999a) Metabolic Ward	29 (M) 30-70y Type II DM & mild hyperchol	2 week diet stabalization then 8 weeks treatment Parallel	Psyllium or cellulose (control) provided as powders to be mixed with beverages.	10.2g/d psyllium	Mean % change (SE) Total-C HDL-C LDL-C TAG	 -2.1 ± 2.3 0.6 ± 3.1 -4.7 ± 4.3 6.5 ± 6.8	 6.9 ± 2.4 2.0 2.2 8.3 5.3 13.7 7.3	 P < 0.05 NS NS NS
Anderson et al (1999b) Outpatient setting					Mean % change (SE) Total-C HDL-C LDL-C TAG	 -2.3 ± 2.2 -0.9 ± 3.0 -4.9 ± 2.4 -7.0 ± 13.3	 2.8 ± 2.3 8.8 ± 2.3 2.8 ± 3.4 -0.4 ± 5.3	 NS NS NS NS

Type II DM- type 2 diabetes mellitus; Hyper-chol- hypercholesterolemia; NS- non significant; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol;TAG- triacylglycerol

Table 9B: The effect of pectin on cholesterol levels

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group		P
Schwab et al (2006)	66 (29/37) 30-65y Abnormal glucose metabolism	12 weeks Parallel Nutrition counselling provided	Control Polydextrose (PDX) Sugar beet pectin (SBP) Fibre enrichment consumed as a drink (4 dl/d) with meals	SBP: 16g/d total fibre (76% soluble) PDX: 16g/d total fibre	Mean ± SD Total-C HDL-C LDL-C TAG	 5.54 ± 0.68 1.19 ± 0.25 3.65 ± 0.77 1.60 ± 0.25	Control 5.32 ± 1.03 1.17 ± 0.31 3.28 ± 0.79 1.96 ± 1.46	PDX 5.27 ± 0.82 1.32 ± 0.35 3.29 ± 0.72 1.46 ± 0.71	 NS NS NS NS

NS- non significant; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol;TAG-triacylglycerol

Table 10B: Intervention trials investigating the effect of fibre from barley on cholesterol levels

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group		Control group	P
Behall et al (2004)	25 (7/18) 47 y (mean) Mild hyperchol	2 weeks run-in period (AHA Step 1 diet) then 5 weeks on each treatment Latin-square	AHA Step 1 diet + Control Med ß-glucan High ß-glucan	Control: 0g/d Med: 3g/d ß-glucan High: 6g/d ß-glucan	Mean ± SE Total-C HDL-C LDL-C TAG	Med ß-glucan 5.17 ± 0.13* 1.22 ± 0.06 3.57 ± 0.13* 1.90 ± 0.22	High ß-glucan 5.12 ± 0.33* 1.22 ± 0.06 3.50 ± 0.13* 2.03 ± 0.23	5.44 ± 0.13 1.22 ± 0.06 3.82 ± 0.13 2.02 ± 0.22	NS difference between Med & High groups Med & High Vs Control *P < 0.05
Behall et al (2004)	18 (M) 45 y (mean) Mild hyperchol	2 weeks run-in period (AHA Step 1 diet) then 5 weeks on each treatment Latin-square	AHA Step 1 diet + Control Med ß-glucan High ß-glucan	Control: 0g/d Med: 3g/d ß-glucan High: 6g/d ß-glucan	Mean ± SE Total-C HDL-C LDL-C TAG	Med ß-glucan 5.18 ± 0.20 1.01 ± 0.04 3.28 ± 0.20 1.94 ± 0.21	High ß-glucan 4.85 ± 0.20* 1.04 ± 0.04 3.00 ± 0.20* 1.82 ± 0.21	5.24 ± 0.20 1.06 ± 0.04 3.28 ± 0.21 2.01 ± 0.21	High Vs Control & Med *P <0.05
Keenan et al (2007)	155 (75/80) 55 y (mean) Hyperchol	4 week run-in period (low fat diet) then 6 week intervention 5-arm parallel	Control High molecular weight (HMW) barley ß-glucan (BBG) at 2 doses Low molecular weight (LMW) barley ß-glucan at 2 doses. Provided as breakfast cereal and juice beverage	Control 0g/d BBG HMW 5g/d BBG LMW 5g/d BBG HMW 3g/d BBG LMW 3g/d BBG	Mean ± SD Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG	HMW 5g/d 5.35 ± 0.65 1.35 ± 0.33 3.43 ± 0.30 1.51 ± 0.54* HMW 3g/d 5.58 ± 0.56 1.23 ± 0.29 3.61 ± 0.53 1.72 ± 0.63	LMW 5g/d 5.50 ± 0.53 1.29 ± 0.33 3.49 ± 0.33 1.65 ± 0.71 LMW 3g/d 5.69 ± 0.52 1.32 ± 0.41 3.65 ± 0.39 1.61 ± 0.56	Control 6.01 ± 0.70 1.30 ± 0.36 3.92 ± 0.63 1.79 ± 0.73	Compared to control Total-C & LDL-C in all groups (P < 0.05) NS difference between treatment groups *Compared to control & treatment groups P < 0.05

Hyper-chol- hypercholesterolemia; NS- non significant; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol

Table 11B: Intervention trials investigating the effect of isolated polysaccharides on cholesterol levels

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Konjac-mannan								
Arvill et al (1995)	63 (M) 47 y (mean) Healthy	2 x 4 weeks Crossover 2 week washout	Habitual diet + glucomannan or cornstarch (placebo) provided as capsules to be taken ½ hour before meals.	3.9g/d glucomannan	Mean ± SD Total-C HDL-C LDL-C TAG	 6.51 ± 0.85 1.14 ± 0.26 4.28 ± 0.69 2.37 ± 1.59	 6.72 ± 0.67 1.25 ± 0.39 4.54 ± 0.71 2.88 ± 2.32	 P = 0.0001 NS P 0.007 P = 0.026
Vuskan et al (2000)	11 (5/6) 55 y (mean) Insulin resistance syndrome	8 week run-in period (NCEP Step 2 diet) then 3 week intervention Crossover 2 week washout	NCEP Step 2 diet enriched with glucomannan or wheat (control)	8-13g/d glucomannan	Mean % change (SE) Total-C HDL-C LDL-C TAG	 -19 ± 2.7 1.2 ± 2.2 -29 ± 3.4 10.1 ± 9.9	 -6.3 ± 3.4 -9.6 ± 2.2 -6.6 ± 5.0 12.1 ± 14	 P = 0.0038 NS P = 0.0017 NS
Wood et al (2007)	29 (M) 38 y (mean) Overweight	12 weeks Parallel	Carbohydrate restricted diet + 6 capsules containing glucomannan or maltodextrin (placebo) taken daily before meals	3.0g/d glucomannan	Mean ± SD Total-C HDL-C LDL-C TAG	 4.18 ± 0.63 1.17 ± 0.32 2.61 ± 0.72 0.86 ± 0.39	 4.30 ± 0.92 1.23 ± 0.35 2.72 ± 0.95 0.77 ± 0.35	 NS NS NS NS

NCEP- National Cholesterol Education Program NS- non significant; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol;TAG- triacylglycerol

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Gums								
Blake et al (1997)	11 (M) 44 y (mean) Mod hyperchol	3 x 2 weeks Crossover 4 week washout	Habitual diet + bread products containing guar gum flour or control flour	Guar bread: 17.2g/d NSP (mean) & 13.9g/d guar gum (mean). Control: 16.2g/d NSP	Mean ± SE Total-C HDL-C LDL-C TAG	 5.89 ± 0.15 1.23 ± 0.05 3.81 ± 0.12 1.85 ± 0.25	 6.53 ± 0.16 1.31 ± 0.06 4.31 ± 0.14 1.86 ± 0.32	 $P < 0.001$ NS $P < 0.001$ NS
Maki et al (1999)	154 (102/52) 21-75y Hyperchol	8 week run-in period (NCEP Step 1 diet) then 6 intervention Parallel	NCEP Step 1 diet + Placebo or hydroxypropylmethylcellulose (HPMC) provided as 3 different doses as powder form to be mixed with beverage	HPMC: 2.5g/d 5g/d 7.5g/d	Mean ± SE Total-C HDL-C LDL-C TAG (log^{10}) Total-C HDL-C LDL-C TAG (log^{10}) Total-C HDL-C LDL-C TAG (log^{10})	HPMC 2.5g/d 6.09 ± 0.12 1.20 ± 0.05 4.11 ± 0.10 1.85 HPMC 5g/d 5.63 ± 0.11* 1.19 ± 0.06 3.68 ± 0.10* 1.85 HPMC 7.5g/d 5.76 ± 0.12* 1.28 ± 0.05 3.85 ± 0.09* 1.68	 5.98 0.11 1.27 0.05 4.04 0.09 1.68	*Compared to placebo $P < 0.05$

Hyperchol- hypercholesterolemia; NCEP- National Cholesterol Education Program NS- non significant;Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol;TAG- triacylglycerol

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Arabinogalactan (AG)								
Robinson et al (2001)	20 Age (not reported) Healthy	7d control period followed by 2 x 3 week intervention Crossover No washout	Control: 0g/d AG Followed by AG intervention incorporated into sweetened beverage	AG 15g/d AG 30g/d	Mean ± SE Total-C HDL-C LDL-C TAG ($\log^{10}$) Total-C HDL-C LDL-C TAG ($\log^{10}$)	AG 15g/d 5.09 ± 0.08 1.35 ± 0.05 3.16 ± 0.08 2.03 ± 0.26 AG 30g/d 5.15 ± 0.08 1.26 ± 0.05 3.08 ± 0.08 2.10 ± 0.26		AG had no significant effect on cholesterol levels
Marett et al (2004)	54 29 y (mean) Healthy	24 weeks Parallel	Habitual diet + Rice starch (placebo) Larch AG Tamarack AG provided in foods & beverages	Rice Starch 8.4g/d Larch AG: 8.4g/d Tamarack AG: 8.4g/d	Mean ± SD Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG	Larch AG 4.52 ± 0.79 1.24 ± 0.25 2.55 ± 0.76 1.15 ± 0.71 Tamarack AG 4.86 ± 0.98 1.35 ± 0.29 2.98 ± 0.92 1.18 ± 0.53	Control 4.32 ± 0.92 1.30 ± 0.22 2.55 ± 0.76 1.01 ± 0.55	AG had no significant effect on cholesterol levels
Arabinoxylan (AX)								
Lu et al (2004)	15 (6/9) 60 y (mean) Type II DM	2 x 5 weeks Crossover No washout	Habitual diet + majority of starchy foods replaced with control or AX-rich food products	AX: 14-17g/d NSP	Mean ± SE Total-C HDL-C LDL-C TAG	 5.31 ± 0.23 1.04 ± 0.04 3.32 ± 0.21 1.86 ± 0.29	 5.33 ± 0.24 1.04 ± 0.05 3.35 ± 0.26 2.06 ± 0.39	 NS NS NS NS
Carob pulp								
Zunft et al (2003)	58 (25/33) 34-70y Hyperchol	6 weeks Parallel	Bread (2 servings) & fruit bar (1 serving) with or without carob pulp	Carob pulp 15g/d	Mean ± SD Total-C HDL-C LDL-C TAG[1]	 6.86 ± 0.96 1.46 ± 0.47 4.03 ± 0.75 1.91 (0.99, 3.71)	 7.23 ± 0.96 1.48 ± 0.34 4.47 ± 0.78 1.59 (1.16, 2.20)	 P=0.001 NS P=0.010 NS NS

[1] Values given as geometric mean and geometric SD

Hyperchol- hypercholesterolemia, Type II DM- type 2 diabetes mellitus; NS- non significant;Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol

Table 12B: Intervention trials investigating the effect of fibre from wheat on cholesterol levels

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Stasse-Wolthius et al (1980)	62 (40/22) 18-28 Healthy	2.5 weeks run-in (low-fibre diet) then 5 week intervention 4-arm Parallel	Controlled diet: All foodstuffs provided. Low-fibre High-fibre (fruit & vegetables) Citrus Pectin Wheat bran	Low fibre: 15g/d total fibre High-fibre: 41g/d total fibre Citrus Pectin: 24g/d total fibre; 9g/d citrus pectin Wheat bran: 38g/d bran	Mean change (SD) Total-C HDL-C Total-C HDL-C Total-C HDL-C	High-fibre -0.17± 0.63* 0.01 ± 0.15 Citrus Pectin -0.34 ± 0.34* 0.02 ± 0.18 Wheat bran 0.34 ± 0.41^ 0.07 ± 0.16	0.10 ± 0.34 0.01 ± 0.12	*Compared to control P < 0.05 ^Compared to high-fibre & citrus pectin P < 0.05
Jenkins et al (1999a) Metabolic Study	24 (16/8) 57y (mean) Hyperchol	3 x 4 weeks Crossover 2 week washout	Identical metabolic diets + low-wheat fibre bread (control) or high-wheat fibre bread at 2 particle sizes (PS) (medium or ultra-fine)	Low-fibre: 6g/d total fibre Medium (PS): 25g/d total fibre Ultra-fine (PS): 25g/d total fibre	Mean ± SE Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG	Medium PS 5.88 ± 0.17 1.01 ± 0.06 4.02 ± 0.12 2.01 ± 0.17* Ultra-fine PS 5.95 ± 0.16 1.03 ± 0.07 4.07 0.11 2.06 ± 0.20*	5.92 ± 0.19 0.99 ± 0.05 3.91 0.16 2.41 ± 0.21	*Compared to control P < 0.005
Jenkins et al (1999b) *Ad libitum* study	24 (12/12) 36y (mean) Normolipidemic	3 x 2 weeks Crossover 2 week washout	Habitual diet + low-wheat fibre breakfast cereal (control) or high-wheat fibre cereal at 2 particle sizes (PS) (coarse or medium)	Low-fibre: 2.4g/d total fibre Coarse: 21.5g/d total fibre Medium: 21.5g/d total fibre	Mean ± SE Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG	Coarse PS 4.85 ± 0.18 1.20 ± 0.07 2.99 ± 0.16 1.45 ± 0.16 Medium PS 4.78 ± 0.18 1.20 ± 0.06 2.97 ± 0.16 1.36 ± 0.16	4.80 ± 0.19 1.21 ± 0.06 2.97 ± 0.17 1.37 ± 0.17	PS had no significant effect on cholesterol levels

Hyperchol- hypercholesterolemia, Type II DM- type 2 diabetes mellitus; NS- non significant;Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Jenkins et al (2002)	23 (16/7) 63y (mean) Type II DM	2 x 12 weeks Crossover 8 week washout	Habitual diet + Low-wheat fibre or High-wheat fibre provided as cereals & breads	Low-fibre: Additional 4g/d total fibre High-fibre: Additional 19g/d cereal fibre	Mean ± SE Total-C HDL-C LDL-C TAG	 4.97 ± 0.17 1.23 ± 0.05 3.00 ± 0.15 1.63 ± 0.20	 4.87 ± 0.15 1.17 ± 0.03 2.99 ± 0.14 1.53 ± 0.18	 NS NS NS NS
Lampe et al (1991)	34 (18/16) 27y (mean) Healthy	6 x 3 weeks Crossover	Six controlled formula diets supplemented with Low-fibre Wheat bran (WB) Vegetable fibre (VF) Sugar beet fibre (SBF)	Low-fibre: 0g/d total fibre WB: 10g/d total fibre WB: 30g/d total fibre VF: 10g/d total fibre VF: 30g/d total fibre SBF: 30g/d total fibre	Mean change (SE)[1] Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG	WB: 30g/d -0.05 ± 0.10 -0.06 ± 0.03 0.06 ± 0.08 -0.12 ± 0.06 VF: 30g/d -0.24 ± 0.10** -0.03 ± 0.03 -0.07 ± 0.08 -0.30 ± 0.06 SBF: 30g/d -0.70 ± 0.16** -0.09 ± 0.03 -0.46 ± 0.14 -0.27 ± 0.08	-0.13 ± 0.10 -0.06 ± 0.03 -0.02 ± 0.08 -0.12 ± 0.06	Soluble fibre (VF & SBF) proved more effective in ↓ serum lipids (Total-C & LDL-C) than insoluble fibre (WB) **Changes significantly greater compared to WB

[1]Owing to the number of diets and the inappropriateness of making all possible comparisons, only a few comparisons between diets on changes in serum lipids were made.

Type II DM- type 2 diabetes mellitus; NS- non significant;Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol

Table 13B: Intervention trials investigating the effect of fibre supplement mixtures on cholesterol levels

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Aller et al (2003)	53 (19/34) 18-70 y Healthy	12 weeks Parallel	81 diets controlled diets: High-fibre Low-fibre	High fibre: 4.11g/d soluble fibre; 25.08g/d insoluble fibre Low-fibre: 1.97g/d soluble fibre; 8.13g/d insoluble fibre	Mean ± SD Total-C HDL-C LDL-C TAG	 4.9 ± 0.9 1.41 ± 0.4 3.1 ± 0.8 1.02 ± 0.3	 5.0 ± 0.9 1.76 ± 0.3 2.9 ± 0.9 1.27 ± 0.8	 $P < 0.05$ NS $P < 0.05$ NS
Davidson et al (1998)	85 (59/26) 21-75 y Hyperchol	8 week run-in period (AHA Step 1 diet) then 12 week intervention 4-arm parallel	AHA Step 1 diet + control or gum □rabic & pectin mixture (4:1 ratio) provided in apple juice (240ml/d)	Control: 0g/d Mixture: 5g/d Mixture: 9g/d Mixture: 15g/d	Mean ± SE Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG	5g/d 6.46 ± 0.15 1.46 ± 0.10 4.31 ± 0.14 1.78 0.15 9g/d 6.38 ± 0.17 1.47 ± 0.07 4.19 ± 0.16 2.22 ± 0.20 15g/d 6.66 ± 0.20 1.21 ± 0.07 4.42 ± 0.14 2.23 ± 0.20	6.88 ± 0.26 1.55 ± 0.08 4.58 ± 0.25 1.81 ± 0.17	NS differences between any groups
Knopp et al (1999)	125 (104/21) 18-70 y Mild hyperchol	9 week run-in period (NCEP Step 1 diet) followed by 15 week intervention	NCEP Step 1 diet + Placebo or fibre mixture (guar gum, pectin, soy fibre, pea fibre & corn bran) provided as powder to be mixed with beverage	Fibre mixture: 20g/d	Mean change (SD) Total-C HDL-C LDL-C TAG	 -0.44 ± 0.45 -0.02 ± 0.14 -0.41 ± 0.36 0.01 ± 0.43	 -0.03 ± 0.47 -0.02 ± 0.16 0.00 ± 0.41 -0.03 ± 0.50	 $P < 0.001$ NS $P < 0.001$ NS

Hyperchol- hypercholesterolemia NCEP- National Cholesterol Education Program; AHA-American Heart Association; NS- non significant; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Knopp et al (1999) Extension phase	85 26-69y	36 weeks	All subjects received fibre mixture.	Fibre mixture: 20g/d	Mean change (SD) from baseline Total-C LDL-C	Fibre throughout -0.30 ± 0.68 -0.43 ± 0.50	Placebo to fibre -0.23 ± 0.71 -0.32 ± 0.64	Reductions smaller for those in placebo/fibre
Solum et al (1987)	60 (F) 30-60y Overweight	12 weeks Parallel	Calorie restricted diet (1200kcal/d) with fibre tablet mixture (cereal & citrus fruit) or placebo taken with water	Fibre mixture: 6g/d	Mean (95% CI) Total-C TAG	 5.6 (4.7, 6.4) 1.15 (0.9, 1.4)	 5.7 (4.1, 6.5) 1.18 (0.93, 1.41)	 NS NS

NS- non significant;Total-C- total cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol

Table 14B: Intervention trials investigating the effect of legumes on cholesterol levels

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Cobiac et al (1990)	20 (M) 29-65y Mild hyperchol	81 x 4 weeks Crossover	Substitution of one daily meal with canned spaghetti (control) or baked beans	440g/d baked beans: 19.9g/d NSP	Mean ± SE Total-C HDL-C LDL-C TAG	 6.29 0.20 1.22 0.05 4.61 0.19 1.26 0.08	 6.32 0.15 1.26 0.05 4.63 0.12 1.25 0.08	 NS NS NS NS
Fruhbeck et al (1997)	40 (M) 18-21 y Mild-Mod hyperchol	4 weeks Parallel	Controlled low-fat diet (20% total energy as fat) + control flour (group A) cooked field bean flour (groups B & C) or raw field bean flour (group D) to be mixed with soups, yoghurt and cereal.	90g/d of each type of flour	Adjusted Mean (analysis of covariance) Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG	Group B 5.7^ 1.17* 3.87 1.43 Group C 5.35* 1.17* 3.67* 1.11* Group D 5.28* 1.18* 3.65* 1.01*	Group A 5.81 1.02 4.03 1.67	*Compared to Group A P < 0.001 ^Compared to Group A P < 0.05
Pittaway et al (2006)	47 (19/28) 53y (mean) Healthy	81 x 5 weeks Crossover	Chickpea-supplemented diet or wheat-supplemented diet (control).	140g/d chickpeas	Mean (95% CI) Total-C HDL-C LDL-C TAG	5.75 (5.40, 6.11) 1.39 (1.27, 1.51) 3.71 (3.41, 4.01) 1.46 (1.15, 1.76)	5.98 (5.62, 6.63) 1.41 (1.29, 1.53) 3.89 (3.58, 4.20) 1.5 (1.28, 1.72)	P < 0.05 NS P < 0.05 NS

Hyperchol- hypercholesterolemia; NS- non significant;Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group		P
Anderson et al (1990)	24 (M) 64y (mean) Hyperchol	81 weeks Parallel	7d control period containing no beans followed by one of three bean diets.	A: 120g/d beans (single dose) B: 120g/d beans (divided dose) C: 162g/d beans (divided dose)	Mean ± SE Total-C HDL-C LDL-C TAG	Group A Group B Group C 7.03 ± 0.50 6.41 ± 0.30 7.09 ± 0.53 0.96 ± 0.05 1.05 ± 0.09 0.98 ± 0.11 5.12 ± 0.47 4.40 ± 0.31 4.73 ± 0.54 2.18 ± 0.24 2.18 ± 0.35* 2.92 ± 0.49		* P < 0.05
Insoluble Legumes								
Stephen et al (1995)	9 (M) 19-38 y Healthy	81 x 3 weeks Crossover	Diet low in NSP + same diet with lentils incorporated into baked products	130g/d lentils: 11.8g/d NSP	Mean ± SE (range) Total-C HDL-C LDL-C TAG	Lentil period 5.1 0.2 (4.1-5.9) 1.4 0.1 (1.0-2.0) 3.2 0.2 (2.4-3.9) 1.28 0.14 (0.57-1.98)	Control period 5.2 0.2 (4.1-5.8) 1.4 0.1 (1.0-2.1) 3.2 0.1 (2.6-3.8) 1.16 0.11 (0.57-1.75)	NS NS NS NS

Hyperchol- hypercholesterolemia; NS- non significant;Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol

Table 15B: Intervention trials investigating the effect of resistant starch on cholesterol levels

Reference	**Subjects N (M/F) Age Health**	**Study duration & design**	**Intervention**	**Fibre dose**	**Outcome (mmol/l)**	**Fibre group**	**Control group**		**P**
Heijnen et al (1996)	57 (27/33) 24y (mean) Healthy	81 x 3 weeks Latin-square	Habitual diet + supplements containing glucose (control) raw high-amylose cornstarch (RS_2) or retrograded high-amylose cornstarch (RS_3)	RS_2: 30g/d RS_3: 30g/d	Mean ± SE Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG	RS_2 4.61 ± 0.13 1.45 ± 0.05 2.71 ± 0.10 0.98 ± 0.05 RS_3 4.61 ± 0.13 1.45 ± 0.04 2.69 ± 0.10 1.03 ± 0.08	4.69 ± 0.14 1.47 ± 0.04 2.72 ± 0.11 1.09 ± 0.07		NS difference between groups
Noakes et al (1996)	23 (10/13) 51y (mean) Hyper-TAG	81 x 4 weeks Crossover No washout period	High-amylose diet (33% resistant starch) Diet high in oat bran Low-amylose diet	16.5g/d high-amylose (women) 24.4g/d high-amylose (men)	Mean ± SD Total-C HDL-C LDL-C TAG	High-amylose 6.06 ± 0.71 0.91 ± 0.21 3.77 ± 0.74 3.05 ± 0.87	Oat-bran 5.94 0.81 0.92 0.20 3.80 0.83 2.72 0.76*	Low-amylose 6.12 0.86 0.93 0.23 3.74 0.86 3.23 1.10	*P<0.02

NS- non significant;Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol

Table 16B: Intervention trials investigating the effect of oligosaccharides and inulin on cholesterol levels

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Luo et al (1996)	12 (M) 24y (mean) Healthy	2 x 4 weeks Crossover 2 week washout	FOS or sucrose incorporated into cookies eaten as snacks	20g/d FOS	Mean ± SE Total-C HDL-C TAG	 3.96 ± 0.22 0.97 ± 0.05 0.83 ± 0.16	 3.91 ± 0.17 1.05 ± 0.06 0.72 ± 0.05	 NS NS NS
Pedersen et al (1997)	64 (F) 20-36 y Healthy	81 x 4 weeks Crossover No washout period	Usual spreads replaced with low-fat inulin or control spread	14g/d Inulin	Mean ± SD Total-C HDL-C LDL-C TAG	 4.24 ± 0.75 1.38 ± 0.30 2.38 ± 0.67 0.97 ± 0.39	 4.25 ± 0.63 1.37 ± 0.30 2.39 ± 0.56 0.98 ± 0.42	 NS NS NS NS
Davidson et al (1998)	21 30-75 y Mod hyperchol	2 x 6 weeks Crossover 6 week washout	NCEP Step 1 diet + food products with or without inulin	18g/d Inulin	Mean ± SE Total-C HDL-C LDL-C TAG	 6.07 ± 0.17 1.35 ± 0.07 3.98 ± 0.12 1.61 ± 0.08	 6.28 ± 0.12 1.39 ± 0.07 4.10 ± 0.10 1.70 ± 0.17	 P < 0.05 NS P < 0.05 NS
Schaafsma et al (1998)	30 (M) 48y (mean) Healthy	2 x 3 weeks Crossover 1 week washout	Test milk containing FOS or a reference product (control milk) consumed daily with main meals	9.4g/d FOS	Mean Total-C HDL-C LDL-C TAG	 5.17 1.21 3.33 1.52	 5.41 1.23 3.52 1.57 SE of difference between means 0.058 0.026 0.059 0.105	 P < 0.001 NS P < 0.005 NS
Brighenti et al (1999)	12 (M) 23y (mean) Healthy	4 weeks Sequential No washout	50g/d breakfast cereal (control) followed by same cereal containing inulin	9g/d Inulin	Mean ± SE Total-C HDL-C LDL-C TAG	 3.89 ± 0.19 1.30 ± 0.08 2.31 ± 0.21 0.61 ± 0.05	 4.10 ± 0.23 1.23 ± 0.06 2.48 ± 0.20 0.84 ± 0.07	 NS NS NS P < 0.05
Jackson et al (1999)	27 52y (mean) Mod hyper-TAG	8 weeks Parallel	Inulin and placebo (maltodextrin) provided as powder to be added to beverages	10g/d Inulin	Mean ± SD Total-C HDL-C LDL-C TAG	 5.90 ± 0.97 1.31 ± 0.33 4.00 ± 0.85 1.29 ± 0.35	 6.46 ± 0.91 1.31 ± 0.39 4.43 ± 1.08 1.59 ± 0.58	 NS NS NS P < 0.05

Hyperchol- hypercholesterolemia NCEP- National Cholesterol Education Program; FOS- fructo-oligosaccharide; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol; NS- non significant

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
van Dokkum et al (1999)	12 (M) 23y (mean) Healthy	4 x 3 weeks Latin Square	Controlled basal diet supplemented with inulin, FOS, GOS or placebo	15g/d Inulin 15g/d FOS 15g/d GOS	Mean ± SD Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG Total-C HDL-C LDL-C TAG	Inulin 4.51 ± 0.56 1.16 ± 0.22 2.81 ± 0.50 1.31 ± 0.58 FOS 4.51 ± 0.62 1.14 ± 0.20 2.82 ± 0.61 1.29 ± 0.51 GOS 4.58 ± 0.78 1.11 ± 0.20 2.87 ± 0.67 1.46 ± 0.66	4.56 ± 0.62 1.14 ± 0.22 2.82 ± 0.51 1.40 ± 0.68	NS differences between any groups
Kruse et al (1999)	8 26-53 y Healthy	8d run-in consuming 'Western' diet (45% energy as fat, 40% carbohydrate) followed by low-fat diet for 64d	Reduced fat diet (30% energy as fat, 55% as carbohydrate) with inulin incorporated into yoghurt	22-34g/d depending on energy needs	Mean ± SD Total-C HDL-C LDL-C TAG	5.0 ± 0.5 1.2 ± 0.2 3.4 ± 0.4 1.2 ± 0.3	5.3 ± 0.8 1.1 ± 0.2 3.6 ± 0.6 1.2 ± 0.2	NS NS NS NS
Causey et al (2000)	12 (M) 27-49 y Mod hyper-TAG	81 x 3 weeks Crossover	Controlled diets (NCEP Step 1 diet) + control ice cream or ice cream containing inulin	20g/d Inulin	Mean ± SD Total-C HDL-C LDL-C TAG	5.73 ± 0.82 0.92 ± 0.20 3.82 ± 0.71 2.75 ± 1.83	5.93 ± 0.96 0.96 ± 0.26 3.90 ± 0.83 3.20 ± 2.19	NS NS NS P = 0.05
Luo et al (2000)	10 (6/4) 57y (mean) Type II DM	2 x 4 weeks Crossover 2 week washout	FOS or placebo provided as powder to be mixed with beverages or yoghurt	20g/d FOS	Mean ± SE Total-C HDL-C LDL-C TAG	5.13 ± 0.27 1.02 ± 0.08 3.85 ± 0.23 1.33 ± 0.16	5.15 ± 0.24 1.01 ± 0.06 3.85 ± 0.20 1.42 ± 0.12	NS NS NS NS

Letexier et al (2003)	8 (4/4) 23-32 y Healthy	81 x 3 wee ks Crossover	High carbohydrate (55% of total energy) plus inulin or placebo (maltodextrin) consumed before breakfast and evening meals	10g/d Inulin	Mean ± SE Total-C HDL-C LDL-C TAG	 4.35 ± 0.30 1.31 ± 0.10 2.90 ± 0.22 0.77 ± 0.08	 4.12 ± 0.32 1.20 ± 0.11 2.77 ± 0.21 0.92 ± 0.10	 NS NS NS $P < 0.05$

Hyperchol- hypercholesterolemia NCEP- National Cholesterol Education Program; FOS- fructo-oligosaccharide; GOS- galacto oligosaccharides; Total-C- total cholesterol; HDL-C- high density lipoprotein cholesterol; LDL- low density lipoprotein cholesterol; TAG- triacylglycerol; NS- non significant.

Table 17B: Intervention studies investigating the effect of dietary fibre on blood pressure

Reference	**Subjects N (M/F) Age Health**	**Study duration & design**	**Intervention**	**Fibre dose**	**Outcome (mmol/l)**	**Fibre group**	**Control group**	**P**
Lu et al (2004)	15 (6/9) 60 y (mean) Type II DM	81 x 5 wee ks Crossover No washout	Habitual diet + majority of starchy foods replaced with control or AX-rich food products	AX: 14-17g/d NSP	Mean ± SE Systolic BP Diastolic BP	 136 ± 4 75 ± 2	 139 ± 5 77 ± 2	 NS NS

Type II DM- type 2 diabetes; AX- Arabinoxylan , NSP- non starch polysaccharide, BP- blood pressure, NS- non significant.

Table 18B: Effect of fibre supplementation on blood pressure in weight loss studies

Reference	Subjects N (M/F) Age Health	Study duration & design	Intervention	Fibre dose	Outcome (mmol/l)	Fibre group	Control group	P
Wood et al (2007)	29 (M) 38 y (mean) Overweight	12 weeks Parallel	Carbohydrate restricted diet + 6 capsules containing glucomannan or maltodextrin (placebo) taken daily before meals	3.0g/d glucomannan	Mean ± SD Systolic BP Diastolic BP	 119.9 ± 7.7 84.3 ± 7.4	 113.7 ± 9.4 77.7 ± 4.6	 P < 0.05 NS
Behall et al (2006)	25 (7/18) 38-53 Healthy	2 week run-in (AHA Step 1 diet) followed by 5 week on each treatment	AHA Step 1 diet + whole grain foods containing ß-glucan from barley	0g/d ß-glucan 3g/d ß-glucan 6g/d ß-glucan	Mean ± SE Systolic BP Diastolic BP Systolic BP Diastolic BP	 3g/d ß-glucan 108.7 ± 2.4 65.8 ± 1.7 6g/d ß-glucan 114.0 ± 2.4 66.1 ± 1.7	 110.2 ± 2.4 65.3 ± 1.7	 NS difference between groups
Schwab et al (2006)	66 (29/37) 30-65y Abnormal glucose metabolism	12 weeks Parallel Nutrition counselling provided	Control Polydextrose (PDX) Sugar beet pectin (SBP) Fibre enrichment consumed as a drink (4 dl/d) with meals	SBP: 16g/d total fibre (76% soluble) PDX: 16g/d total fibre	Mean ± SD Systolic BP Diastolic BP Systolic BP Diastolic BP	 SBP 129 ± 15 80 ± 7 PDX 135 ± 18 84 ± 9	 Control 134 ± 14 81 ± 9	 NS difference between groups

AHA- Amercian heart association; NSP- non starch polysaccharide, BP- blood pressure, NS- non significant.

Appendix C: list of colorectal cancer tables

Table 1C: Prospective studies investigating the association of fibre with colorectal cancer

Table 2C: Randomised controlled trials investigating the association of fibre with colorectal adenoma

Table 3C: Prospective studies investigating the association of fibre with colorectal adenoma

Table 4C: Prospective studies investigating the association of fibre from fruits, vegetables and grains with colorectal adenoma

Table 5C: Prospective studies investigating the association of soluble or insoluble fibre with colorectal adenoma

Table 6C: Prospective studies investigating the association of fibre from fruits, vegetables and grains with colorectal cancer

Table7C: Prospective studies investigating the association of soluble or insoluble fibre with colorectal cancer

Table 1C: Prospective studies investigating the association of fibre with colorectal cancer

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Bingham et al (2003) Prospective cohort EPIC Europe	519,978 men and women 1,065 case of incident CRC 4.5 y follow up	AOAC and Englyst defined dietary fibre by FFQ	g/day Q1 = 12.8 (M) 12.6 (F) Q2 = 18.0 (M) 17.5 (F) Q3 = 22.0 (M) 20.9 (F) Q4 = 26.5 (M) 24.7 (F) Q5 = 35.6 (M) 31.9 (F) Colon Cancer Q1 = 12.8 (M) 12.6 (F) Q2 = 18.0 (M) 17.5 (F) Q3 = 22.0 (M) 20.9 (F) Q4 = 26.5 (M) 24.7 (F) Q5 = 35.6 (M) 31.9 (F)	 1.00 0.94 (0.78-1.13) 0.77 (0.63-0.95) 0.76 (0.61-0.95) 0.75 (0.59-0.95) 1.00 0.95 (0.75-1.19) 0.75 (0.58-0.96) 0.71 (0.55-0.94) 0.72 (0.54-0.97)	 0.005 0.006	Stratified by centre: age, sex, weight, height, non-fat energy, energy from fat.
Bingham et al (2005) Prospective cohort EPIC Europe	519,978 men and women 1,826 case of incident CRC 6.2 y follow up	AOAC and Englyst defined dietary fibre by FFQ	g/day (mean values from 24hr recall calibration) Q1 = 18.2 (M) 15.9 (F) Q2 = 21.0 (M) 17.8 (F) Q3 = 23.2 (M) 19.4 (F) Q4 = 25.6 (M) 21.3 (F) Q5 = 30.1 (M) 24.3 (F) Colon Cancer Q1 = 18.2 (M) 15.9 (F) Q2 = 21.0 (M) 17.8 (F) Q3 = 23.2 (M) 19.4 (F) Q4 = 25.6 (M) 21.3 (F) Q5 = 30.1 (M) 24.3 (F)	 1.00 0.93 (0.80-1.08) 0.82 (0.69-0.97) 0.79 (0.66-0.96) 0.79 (0.63-0.99) 1.00 0.89 (0.74-1.07) 0.72 (0.59-0.89) 0.70 (0.55-0.88) 0.77 (0.58-1.02)	 0.01 0.01	Stratified by centre: age, sex, weight, height, non-fat energy, energy from fat, folate intake, red and processed meat intake, physical activity, alcohol consumption, smoking and education.
Fuchs et al (1999) Prospective cohort NHS USA	88,757 women 787 cases of incident CRC 16 y follow up	AOAC defined total dietary fibre by FFQ	g/day Q1 = 9.8 Q2 = 13.1 Q3 = 15.9 Q4 = 19.1 Q5 = 24.9 Colon cancer Q1 = 9.8	 1.00 0.90 (0.71-1.13) 0.96 (0.75-1.21) 0.93 (0.72-1.19) 0.95 (0.73-1.25) 1.00	 0.59 0.88	Age, smoking, BMI, exercise, aspirin, family history, endoscopy, history of adenoma, red meat, alcohol, folate, methionine, calcium, vitamin D.

			Q2 = 13.1 Q3 = 15.9 Q4 = 19.1 Q5 = 24.9	1.04 (0.78-1.39) 1.26 (0.94-1.68) 1.06 (0.77-1.45) 1.04 (0.74-1.46)		

CRC- colorectal cancer

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Gaard et al (1996) Prospective cohort Norwegian National Health Screen Norway	50,535 young men and women 143 cases of incident colon cancer 11.4 y follow up	AOAC defined total dietary fibre by FFQ	g/day standardized to average caloric intake Men Q1 <13.5 Q2 = 13.6-15.6 Q3 = 15.7-17.8 Q4 >17.9 Women Q1 <8.5 Q2 = 8.6-9.8 Q3 = 9.9-11.2 Q4 >11.3	 Men 1.00 0.85 (0.43-1.37) 0.93 (0.30-1.09) 0.82 (0.46-1.46) Women 1.00 1.73 (0.73-4.13) 2.42 (1.06-5.51) 2.10 (0.90-4.87)	 0.6 0.12	Age, attained age, BMI, energy intake, height, smoking.
Giovannucci et al (1994) Prospective cohort HPFS USA	47,949 men 205 cases of incident colon cancer 6 y follow up	AOAC defined total dietary fibre by FFQ	g/day Q1 = 14.2 Q2 = 18.3 Q3 = 21.7 Q4 = 25.6 Q5 = 32.8	 1.00 0.63 (0.39-1.01) 0.59 (0.36-0.97) 1.19 (0.78-1.82) 1.08 (0.68-1.70)	 0.12	Age, total energy, previous polyps, previous endoscopic screening, parental history of colorectal cancer, total pack-years of cigarette smoking, aspirin use, and intake of red meat, methionine and alcohol
Heilbrun et al (1989) Nested case-control study Japan-Hawaii Cancer Study USA	102 male cases of colon cancer 361 male controls 16 y follow up in cohort	AOAC defined total dietary fibre by 24 h recall	g/day Q1 >14.80 Q2 = 13.10-14.79 Q3 = 10.40-13.09 Q4 = 7.50-10.39 Q5 <7.50	 1.00 (ref) 0.89 0.86 0.77 1.40	 0.35	Age
Higginbotham et al (2004) Prospective cohort	38,451 women 174 cases of incident CRC 7.9 y follow up	AOAC defined total dietary fibre by FFQ	g/day Q1 <12.5 Q2 12.5<17.0 Q3 17.0<20.0 Q4 20.0<23.1	 1.00 0.99 (0.61-1.62) 0.57 (0.32-1.00) 0.96 (0.58-1.59)	 0.5	Age, BMI, history of oral contraceptive use, postmenopausal hormone use, family history of CRC, smoking, alcohol use, physical activity, NSAID use, total energy, energy-adjusted total fat, energy-adjusted folate, energy-

Women's Health Study USA			Q5 >23.1	0.79 (0.45-1.38)		adjusted calcium, and energy-adjusted vitamin D

CRC- colorectal cancer; NSAID- non-steroidal anti-inflammatory drugs

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Lin et al (2005) Prospective cohort WHS USA	36,976 women 223 cases of incident CRC 10 y follow up	AOAC defined total dietary fibre by FFQ	g/day Q1 = 12 Q2 = 16 Q3 = 18 Q4 = 21 Q5 = 26	 1.00 0.90 (0.59-1.38) 0.62 (0.39-0.98) 0.84 (0.54-1.31) 0.75 (0.47-1.18)	0.11	Age, treatment assignment, BMI, family history of CRC, history of colon polyps, physical activity, smoking status, baseline aspirin use, red meat intake, alcohol consumption, total energy intake, menopausal status, baseline post-menopausal HT use, folate intake and multivitamin use
Mai et al (2003) Prospective cohort Breast Cancer Detection Demonstration Project Follow-up Study USA	45,491 women 487 cases of incident CRC 8.5 y follow up	AOAC defined total dietary fibre by FFQ	g/1000kcal /day Q1 = 4.9 Q2 = 7.2 Q3 = 8.8 Q4 = 10.7 Q5 = 14.8	 1.00 0.90 (0.67-1.19) 0.67 (0.49-0.91) 1.00 (0.76-1.33) 0.94 (0.70-1.26)	Not stated	Non-steroidal anti-inflammatory drugs, smoking, alcohol, calcium, vitamin D, red meat, height, BMI, education
McCullough et al (2003) Prospective cohort Cancer Prevention Study II Nutrition Cohort Study USA	62,609 men 70,554 women 298 male and 210 female cases of incident CRC 5 y follow up	AOAC defined total dietary fibre by FFQ	g/day Men Q1 <9.3 Q2 9.3-11.3 Q3 11.4-13.5 Q4 13.6-16.6 Q5 >16.6 Women Q1 <8.0 Q2 8.0-9.8 Q3 9.9-11.7 Q4 11.8-14.4 Q5 >14.4	 Men 1.00 0.63 (0.44-0.92) 0.64 (0.43-0.96) 0.84 (0.55-1.28) 1.01 (0.62-1.65) Women 1.00 1.41 (0.90-2.19) 1.04 (0.62-1.75) 1.79 (1.07-2.99) 1.09 (0.58-2.05)	 0.594 0.65	Age, exercise METs, aspirin, smoking, family history of colorectal cancer, BMI, education, energy, multivitamin use, total calcium, red meat intake, HRT use, dietary folate

CRC- colorectal cancer

Reference	**Subject population**	**Measure of exposure**	**Fiber intake/level**	**Adjusted Relative Risk or Odds Ratio**	**P trend**	**Factors adjusted for in analysis**
Michels et al (2005) Prospective cohort Nurses' Health Study & Health Professionals Follow-up Study USA	76,947 women & 47,279 men 1596 cases of incident CRC 1.8 million person-years follow up	AOAC defined total dietary fibre by FFQ	g/1,000 kcal/day at baseline Men Q1 = 6.5 Q2 = 8.6 Q3 = 10.1 Q4 = 11.9 Q5 = 16.1 Women Q1 = 6.5 Q2 = 8.4 Q3 = 9.8 Q4 = 11.4 Q5 = 14.9 Colon cancer Men Q1 <8.0 Q2 = 8.0-10.0 Q3 = 10.0-12.0 Q4 = 12.0-14.0 Q5 >14.0 Women Q1 <8.0 Q2 = 8.0-10.0 Q3 = 10.0-12.0 Q4 = 12.0-14.0 Q5 >14.0	Men 1.00 0.79 (0.61-1.01) 0.71 (0.54-0.93) 0.85 (0.65-1.12) 0.79 (0.59-1.07) Women 1.00 1.01 (0.81-1.26) 1.11 (0.89-1.38) 1.17 (0.93-1.46) 0.90 (0.70-1.17) Men 1.00 0.85 (0.63-1.15) 0.78 (0.56-1.09) 0.94 (0.65-1.36) 0.85 (0.56-1.30)	0.36 0.57 0.76 0.63	Age, time period, family history of CRC, history of colonoscopy, height, BMI, physical activity, regular aspirin use, duration of aspirin use, pack-yrs of early-onset smoking, multivitamin supplement use, fat energy, non-fat energy, alcohol consumption, dietary folate, red meat consumption, processed meat, glycemic load, calcium, methionine, menopausal status and postmenopausal hormone use

				Women 1.00 1.18 (0.91-1.53) 1.24 (0.93-1.64) 1.18 (0.86-1.63) 0.95 (0.65-1.39)		

CRC- colorectal cancer; FFQ- food frequency questionnaire

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Nomura et al (2007) Prospective cohort Multiethnic Cohort Study USA	85,903 men 105,108 women 1,138 male and 972 female cases of incident CRC 7 y follow up	AOAC defined total dietary fibre by FFQ	g/1,000 kcal/day Men Q1 = 6.1 Q2 = 8.4 Q3 = 10.3 Q4 = 12.5 Q5 = 16.5 Women Q1 = 7.5 Q2 = 10.0 Q3 = 12.1 Q4 = 14.5 Q5 = 18.6 Colon cancer Men Q1 = 6.1 Q2 = 8.4 Q3 = 10.3 Q4 = 12.5 Q5 = 16.5 Women Q1 = 7.5 Q2 = 10.0 Q3 = 12.1 Q4 = 14.5 Q5 = 18.6	 Men 1.00 0.75 (0.62;0.91) 0.73 (0.60;0.89) 0.77 (0.62;0.96) 0.62 (0.48;0.79) Women 1.00 1.07 (0.86;1.34) 0.84 (0.66;1.07) 0.97 (0.76;1.24) 0.88 (0.67;1.14) Men 1.00 0.76 (0.60-0.96) 0.78 (0.61-0.99) 0.88 (0.69-1.14) 0.64 (0.48-0.86) Women 1.00 1.16 (0.90-1.50) 0.88 (0.67-1.16) 1.02 (0.77-1.34) 0.92 (0.68-1.25)	 0.002 0.245 0.031 0.361	Ethnicity, time since study entry, age, family history of colorectal cancer, history of colorectal polyp, pack-years of cigarette smoking, BMI, hours of vigorous activity, aspirin use, multivitamin use, and replacement hormone use (women)

CRC- colorectal cancer ; FFQ- food frequency questionnaire

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Otani et al (2006) Prospective cohort Japan Public Health Center Study Japan	78,326 men and women 522 cases of incident CRC 5.8 y follow up	AOAC defined total dietary fibre by FFQ	g/day Men Q1 = 6.4 Q2 = 9.1 Q3 = 11.2 Q4 = 13.6 Q5 = 18.7 Women Q1 = 8.3 Q2 = 11.2 Q3 = 13.3 Q4 = 15.6 Q5 = 20.0 Colon cancer Men Q1 = 6.4 Q2 = 9.1 Q3 = 11.2 Q4 = 13.6 Q5 = 18.7 Women Q1 = 8.3 Q2 = 11.2 Q3 = 13.3 Q4 = 15.6 Q5 = 20.0	 Men 1.00 0.90 (0.63-1.3) 0.70 (0.47-1.1) 0.88 (0.58-1.3) 0.85 (0.53-1.4) Women 1.00 0.61 (0.35-1.0) 0.62 (0.36-1.1) 0.77 (0.44-1.3) 0.58 (0.31-1.10) Men 1.00 0.84 (0.55-1.3) 0.63 (0.38-1.0) 0.77 (0.46-1.3) 0.80 (0.45-1.4) Women 1.00 0.67 (0.36-1.3) 0.60 (0.31-1.2) 0.80 (0.42-1.5) 0.48 (0.23-1.0)	 0.48 0.21 0.39 0.12	Age, alcohol, smoking, BMI, physical exercise, folate, calcium, vitamin D, red meat intake, family history of CRC, study areas
Park et al (2005) 13 Pooled prospective cohort studies Europe and North America	725,628 men and women 8081 cases of incident CRC 6-20 y follow up (7,328,414 py)	AOAC and Englyst defined total dietary fibre by FFQ	g/day <10 10-<15 15-<20 20-<25 25-<30 ≥30 Colon cancer <10	 1.18 (1.05-1.31) 1.00 (ref) 1.02 (0.95-1.10) 1.01 (0.92-1.10) 0.99 (0.87-1.12) 1.00 (0.85-1.17) 1.17 (1.03-1.34)	 0.68 0.17	Age, BMI, height, education, physical activity, family history of colorectal cancer, HRT use, oral contraceptive use, NSAID use, multivitamin use, smoking, alcohol intake, folate intake, red meat intake, milk intake and total energy

			10-<15 15-<20 20-<25 25-<30 ≥30	1.00 (ref) 1.04 (0.95-1.13) 1.03 (0.93-1.15) 1.08 (0.93-1.25) 1.04 (0.86-1.26)		

CRC- colorectal cancer ; FFQ- food frequency questionnaire

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Pietinen et al (1999) Prospective cohort Alpha Tocopherol Beta Carotene (ATBC) trial Finland	29,133 male smokers 185 cases of incident colon cancer 8 y follow up	Englyst defined total dietary fibre by FFQ	g/day Q1 = 16 Q2 = 22.2 Q3 = 26.9 Q4 = 34.1	 1.00 1.0 (0.7-1.6) 1.0 (0.7-1.5) 1.0 (0.6-1.5)	 0.79	Smoking years, BMI, alcohol, education, physical activity at work, and calcium intake
Schatzkin et al (2007) Prospective cohort NIH-AARP USA	291,988 men 197,623 women 2974 cases of incident CRC 5 y follow up	AOAC defined total dietary fibre by FFQ	g/1,000 kcal/day Q1 = 6.6 Q2 = 8.6 Q3 = 10.3 Q4 = 12.3 Q5 = 15.9 Colon cancer Q1 = 6.6 Q2 = 8.6 Q3 = 10.3 Q4 = 12.3 Q5 = 15.9	 1.00 0.92 (0.82-1.03) 0.93 (0.82-1.06) 0.90 (0.78-1.04) 0.99 (0.85-1.15) 1.00 0.90 (0.79-1.03) 0.93 (0.80-1.08) 0.87 (0.74-1.02) 0.96 (0.80-1.15)	 0.96 0.77	Sex, physical activity, smoking, menopausal HRT use, and intakes of red meat, dietary calcium, dietary folate, and total energy
Sellers et al (1998) Prospective cohort Iowa Women's Heath Study USA	35,216 women 241 cases of incident colon cancer 10 y follow up	AOAC defined total dietary fibre by FFQ	g/day Without family history T1 <16.17 T2 = 16.18-22.59 T3 >22.60 With family history T1 <16.17 T2 = 16.18-22.59 T3 >22.60	 1.0 0.8 (0.5-1.1) 0.8 (0.5-1.2) 1.0 1.2 (0.7-2.3) 1.2 (0.6-2.6)	 0.3 0.6	Age, total energy, history of rectal colon polyps
Steinmetz KA 1994 Prospective cohort Iowa Women's Heath Study	35216 women 212 cases of incident colon cancer	AOAC defined total dietary fibre by FFQ	g/day Q1 <14.5 Q2 = 14.5-18.9 Q3 = 19.0-24.7 Q4 >24.7	 1.00 1.14 (0.79-1.65) 0.95 (0.63-1.43) 0.80 (0.49-1.31)		Age, energy

USA	5 y follow up					

CRC- colorectal cancer ; FFQ- food frequency questionnaire

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Terry et al (2001) Prospective cohort Swedish Mammography Cohort Sweden	61 463 women 460 cases of incident CRC 9.6 y follow up	AOAC defined total dietary fibre by FFQ	g/day standardized to average caloric intake Q1 = 12.3 Q2 = 15.6 Q3 = 18.1 Q4 = 21.8	 1.00 0.96 (0.73-1.28) 1.05 (0.79-1.40) 0.96 (0.70-1.33)	 0.98	Age, BMI, educational level, intake of energy, and quartiles of alcohol, red meat, total fat, folic acid, vitamin D, vitamin C, and calcium
Wakai et al (2007) Prospective cohort Japan Multi-Centered Study Japan	43,115 men and women 443 cases of incident CRC 7.6 y follow up	AOAC defined total dietary fibre by FFQ	g/day Men Q1 = 6.7 Q2 = 9.4 Q3 = 11.3 Q4 = 13.4 Women Q1 = 7.4 Q2 = 9.8 Q3 = 11.5 Q4 = 13.4 Colon cancer Men Q1 = 6.7 Q2 = 9.4 Q3 = 11.3 Q4 = 13.4 Women Q1 = 7.4 Q2 = 9.8 Q3 = 11.5 Q4 = 13.4	 Men 1.00 1.12 (0.77-1.62) 0.62 (0.40-0.96) 0.69 (0.43-1.11) Women 1.00 0.73 (0.47-1.14) 0.84 (0.54-1.33) 0.75 (0.46-1.25) Men 1.00 1.06 (0.66-1.69) 0.43 (0.24-0.76) 0.52 (0.28-0.96) Women 1.00 0.72 (0.44-1.18) 0.71 (0.42-1.20) 0.64 (0.36-1.13)	 0.023 0.41 0.004 0.15	Age, sex, area, educational level, fam hist of CRC, alcohol consumption, smoking, BMI, daily walking habits, exercise, sedentary work, beef intake, pork intake, energy intake, and energy-adjusted intakes of folate, calcium, and vitamin D
Willett et al (1990) Prospective cohort NHS USA	88,751 women 150 cases of incident CRC 6 y follow up	AOAC defined total dietary fibre by FFQ	g/day standardized to average caloric intake Q1 <11.6 Q2 = 11.6-14.3 Q3 = 14.4-17.2 Q4 = 17.3-21.1	 1.00 0.74 (0.43-1.28) 1.16 (0.72-1.88) 0.69 (0.40-1.17)	 0.7	Age and energy

			Q5 >21.3	0.90 (0.54-1.49)		

CRC- colorectal cancer ; FFQ- food frequency questionnaire

Table 2C: Randomised controlled trials investigating the association of fibre with colorectal adenoma

Reference	Subject population and Design	Time period	Intervention	No. with ≥1 recurrent adenoma/total no. (%)	Adjusted Odds Ratio	P trend	Factors adjusted for in analysis
Alberts et al (2000) Wheat Bran Fiber Trial	1429 (1303 completed) men and women with previous adenoma parallel	34 months	2 g/day Wheat Bran Fibre 12.5 g/day Wheat Bran fibre	299/584 (51.2) 338/719 (47.0)	0.88 (0.70-1.11)	0.28	Randomization scheme
Bonithon-Kopp et al (2000) European Cancer Prevention Organisation (ECP) Intervention Study	665 (552 completed) men and women with previous adenoma parallel	36 months	placebo 3.5 g/day ispaghula husk	36/178 (20.2) 58/198 (29.3)	1.67 (1.01-2.76)	0.042	Age, sex, adenoma history, and number and location of adenomas inclusion

Table 3C: Prospective studies investigating the association of fibre with colorectal adenoma

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Fuchs et al (1999) Prospective cohort Nurses Health Study USA	27,530 women with sigmoidoscopy 1012 cases of adenoma 16 y follow up	AOAC defined total dietary fibre by FFQ	g/day Q1 = 9.8 Q2 = 13.1 Q3 = 15.9 Q4 = 19.1 Q5 = 24.9	1.00 0.98 (0.79-1.21) 1.07 (0.86-1.33) 0.95 (0.76-1.20) 0.91 (0.71-1.16)	0.36	Age, smoking, BMI, exercise, aspirin, family history, endoscopy, history of adenoma, red meat, alcohol, folate, methionine, calcium, vitamin D
Giovannucci et al (1992) Prospective cohort HPFS USA	7284 men with colonoscopy 170 cases of colorectal adenoma	AOAC defined total dietary fibre by FFQ	g/day Q1 <16.6 Q2 = 16.6-20.0 Q3 = 20.1-23.5 Q4 = 23.6-28.3 Q5 >28.3	1.00 1.04 (0.67;1.61) 0.75 (0.47;1.20) 0.64 (0.40;1.01) 0.36 (0.22;0.60)	<0.001	Age, total energy intake, and family history of colon cancer
Jacobs et al (2002) Prospective cohort Wheat Bran Fiber Trial; baseline analysis USA	1304 Men and women 638 cases of recurrent colorectal adenoma 3 y follow up colonoscopy	AOAC defined total dietary fibre by FFQ	g/day Q1 = 10.1 Q2 = 15.3 Q3 = 20.0 Q4 = 27.7	1.00 0.79 (0.56;1.12) 0.76 (0.54;1.08) 0.83 (0.57;1.19)	0.31	History of polyps prior to baseline colonoscopy, age at randomization, sex, number of colonoscopies, aspirin use, total calcium intake at baseline, and number of baseline adenomas
Jacobs et al (2002) Prospective cohort Wheat Bran Fiber Trial; analysis by adherence to intervention USA	1208 men and women 575 cases of recurrent colorectal adenoma 3 y follow up colonoscopy	AOAC defined total dietary fibre by FFQ	g/day Q1 = 4.9-17.8 Q2 = 17.9-23.7 Q3 = 23.8-30.3 Q4 = 30.4-66.3	1.00 0.87 (0.62;1.23) 0.80 (0.56;1.14) 0.98 (0.68;1.42)	0.82	History of polyps prior to baseline colonoscopy, age at randomization, gender, number of colonscopies, total calcium intake at baseline, and number of baseline adenomas

FFQ- food frequency questionnaire

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Peters et al (2003) Nested case-control study PLCO Cancer Screening Trial, screening arm USA	3591 cases with ≥1 polyp 33971 controls	AOAC defined total dietary fibre by FFQ	g/day Q1 <15.4 Q2 = 15.4-19.7 Q3 = 19.8-24.2 Q4 = 24.3-30.5 Q5 >30.6	 1.00 0.91 (0.81-1.01) 0.85 (0.76-0.96) 0.79 (0.69-0.90) 0.73 (0.62-0.86)	 0.002	Age, sex, centre, energy intake, ethnicity, education, smoking, alcohol use, use of aspirin and ibuprofen separately, physical activity, BMI, red meat intake, calcium intake, and folate intake
Platz et al (1997) Prospective cohort HPFS USA	16,448 men 1017 cases of adenomatous polyps of the distal colon 8 y follow up	AOAC defined total dietary fibre by FFQ	g/day Q1 = 11.6 Q2 = 16.1 Q3 = 19.7 Q4 = 24.2 Q5 = 32.2	 1.00 0.89 (0.67-1.17) 0.97 (0.72-1.30) 0.86 (0.62-1.21) 0.88 (0.59-1.31)	 0.1	Age at endoscopy, history of endoscopy prior to 1986, family history of CRC, total daily energy intake BMI, pack-years smoked, daily alcohol consumption, multivitamin use, physical activity, regular aspirin use, and intake of red meat, folate, and methionine
Robertson et al (2005) Prospective cohort Pooling of the Antioxidant Polyp Prevention Study and Calcium Polyp Prevention Study USA	1520 men and women 540 cases of colorectal adenoma recurrence 4 yr follow up colonoscopy	AOAC defined total dietary fibre by FFQ	g/day standardized to 2,000 kcal/day diet Q1 = 7.92 Q2 not given Q3 not given Q4 = 25.75	 1.00 1.10 (0.91, 1.33) 0.90 (0.74, 1.10) 0.85 (0.69-1.05)	 0.07	Age, sex, clinical center, treatment category, study, and duration of observation

FFQ- food frequency questionnaire; CRC- colorectal cancer

Table 4C: Prospective studies investigating the association of fibre from fruits, vegetables and grains with colorectal adenoma

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Giovannucci et al (1992) Prospective cohort Health Professions Follow up Study USA	7284 men with colonoscopy 170 cases of colorectal adenoma	AOAC defined dietary fibre by FFQ	g/day Fibre from Fruits Q1 <1.9 Q2 = 1.9-3.2 Q3 = 3.3-4.8 Q4 = 4.9-7.1 Q5 >7.1 Fibre from Vegetables Q1 <3.7 Q2 = 3.7-5.1 Q3 = 5.2-6.8 Q4 = 6.9-9.3 Q5 >9.3 Fibre from Grains Q1 <2.8 Q2 = 2.8-4.6 Q3 = 4.8-7.0 Q4 = 7.1-10.5 Q5 >10.6	 1.00 0.69 (0.43-1.10) 0.67 (0.42-1.08) 0.63 (0.41-0.97) 0.53 (0.28-1.02) 1.00 0.99 (0.64-1.53) 0.76 (0.47-1.23) 0.65 (0.39-1.08) 0.53 (0.30-0.91) 1.00 0.79 (0.50-1.23) 0.78 (0.49-1.23) 0.73 (0.46-1.17) 0.44 (0.26-0.76)	 0.02 0.003 <0.001	Age, total energy intake, and family history of colon cancer
Jacobs et al (2002) Prospective cohort Wheat Bran Fiber Trial; baseline analysis USA	1304 Men and women 638 cases of recurrent colorectal adenoma 3 y follow up colonoscopy	AOAC defined dietary fibre by FFQ	g/day Fibre from Fruits Q1 = 1.5 Q2 = 3.7 Q3 = 6.2 Q4 = 11.5 Fibre from Vegetables Q1 = 1.5 Q2 = 2.7 Q3 = 3.4 Q4 = 6.8	 1.00 0.89 (0.63-1.25) 0.86 (0.60-1.21) 0.92 (0.64-1.32) 1.00 0.98 (0.70-1.38) 0.86 (0.60-1.20) 1.34 (0.94-1.91)	 0.62 0.21	History of polyps prior to baseline colonoscopy, age at randomization, sex, number of colonoscopies, aspirin use, total calcium intake at baseline, and number of baseline adenomas

			Fibre from Grains Q1 = 1.4 Q2 = 2.8 Q3 = 4.4 Q4 = 8.8	 1.00 0.92 (0.65-1.29) 0.88 (0.62-1.24) 0.84 (0.59-1.19)	 0.31	

FFQ- food frequency questionnaire

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Platz et al (1997) Prospective cohort Health Professions Follow up Study USA	16,448 men 1017 cases of adenomatous polyps of the distal colon 8 y follow up	AOAC defined dietary fibre by FFQ	g/day Fibre from Fruits Q1 = 1.3 Q2 = 2.5 Q3 = 3.9 Q4 = 5.4 Q5 = 8.4 Fibre from Vegetables Q1 = 3.2 Q2 = 4.7 Q3 = 6.1 Q4 = 7.9 Q5 = 11.5 Fibre from Grains Q1 = 2.1 Q2 = 3.7 Q3 = 5.2 Q4 = 7.1 Q5 = 10.6	 1.00 0.94 (0.72-1.24) 1.06 (0.81-1.39) 0.73 (0.54-0.98) 0.81 (0.59-1.11) 1.00 0.95 (0.72-1.26) 1.14 (0.86-1.50) 1.07 (0.80-1.43) 0.93 (0.67-1.30) 1.00 1.12 (0.85-1.48) 1.11 (0.83-1.49) 1.31 (0.97-1.78) 1.20 (0.86-1.66)	 0.03 0.33 0.76	Age at endoscopy, history of endoscopy prior to 1986, family history of CRC, total daily energy intake BMI, pack-years smoked, daily alcohol consumption, multivitamin use, physical activity, regular aspirin use, and intake of red meat, folate, and methionine

FFQ- food frequency questionnaire; CRC- colorectal cancer

Table 5C: Prospective studies investigating the association of soluble or insoluble fibre with colorectal adenoma

Reference	Subject population	Measure of exposure	Fiber intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Platz et al (1997) Prospective cohort Health Professions Follow up Study USA	16,448 men 1017 cases of adenomatous polyps of the distal colon 8 y follow up	AOAC defined dietary fibre by FFQ	g/day Insoluble fibre Q1 = 8.5 Q2 = 12 Q3 = 14.9 Q4 = 18.5 Q5 = 25.0 Soluble fibre Q1 = 3.4 Q2 = 4.7 Q3 = 5.8 Q4 = 7.1 Q5 = 9.4	 1.00 1.02 (0.77-1.35) 1.08 (0.80-1.46) 1.24 (0.90-1.73) 1.14 (0.77-1.69) 1.00 0.91 (0.69-1.19) 1.01 (0.76-1.35) 0.78 (0.56-1.08) 0.69 (0.46-1.03)	 0.59 0.007	Age at endoscopy, history of endoscopy prior to 1986, family history of CRC, total daily energy intake BMI, pack-years smoked, daily alcohol consumption, multivitamin use, physical activity, regular aspirin use, and intake of red meat, folate, and methionine

FFQ- food frequency questionnaire; CRC- colorectal cancer

Table 6C: Prospective studies investigating the association of fibre from fruits, vegetables and grains with colorectal cancer

Reference	Subject population	Measure of exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Bingham et al (2003) Prospective cohort EPIC Europe	519,978 men and women 1,065 case of incident CRC 4.5 y follow up	AOAC and Englyst defined dietary fibre by FFQ	g/day Fibre from Fruits Q1 = 2.21 Q2 = 3.41 Q3 = 4.29 Q4 = 5.36 Q5 = 7.76 Fibre from Vegetables Q1 = 2.83 Q2 = 3.77 Q3 = 4.42 Q4 = 5.11 Q5 = 6.48 Fibre from Grains Q1 = 4.72 Q2 = 6.61 Q3 = 7.93 Q4 = 9.35 Q5 = 12.05	 1.00 0.69 (0.57-0.85) 0.76 (0.63-0.92) 0.82 (0.66-0.99) 0.78 (0.64-0.97) 1.00 0.94 (0.77-1.15) 0.95 (0.77-1.16) 1.00 (0.81-1.24) 0.88 (0.70-1.11) 1.00 0.89 (0.74-1.08) 0.85 (0.69-1.03) 0.88 (0.71-1.08) 0.78 (0.62-0.98)	 0.17 0.52 0.06	Stratified by centre: age, sex, weight, height, non-fat energy, energy from fat
Bingham et al (2005) Prospective cohort EPIC Europe	519,978 men and women 1,826 case of incident CRC 6.2 y follow up	AOAC and Englyst defined dietary fibre by FFQ	g/day Fibre from Fruits Q1 = 2.7 (M) 2.8 (F) Q2 = 3.1 (M) 3.4 (F) Q3 = 3.8 (M) 3.9 (F) Q4 = 4.3 (M) 4.4 (F) Q5 = 5.3 (M) 5.4 (F) Fibre from Vegetables Q1 = 2.7 (M) 2.8 (F) Q2 = 3.1 (M) 3.4 (F) Q3 = 3.8 (M) 3.9 (F) Q4 = 4.3 (M) 4.4 (F) Q5 = 5.3 (M) 5.4 (F) Fibre from Grains Q1 = 6.6 (M) 4.9 (F)	 1.00 0.75 (0.64-0.89) 0.78 (0.67-0.92) 0.90 (0.76-1.06) 0.81 (0.68-0.97) 1.00 0.99 (0.84-1.17) 0.97 (0.82-1.16) 0.96 (0.80-1.16) 0.94 (0.76-1.16) 1.00	 0.42 0.52 0.44	Stratified by centre: age, sex, weight, height, non-fat energy, energy from fat, folate intake, red and processed meat intake, physical activity, alcohol consumption, smoking and education.

			Q2 = 8.1 (M) 5.9 (F) Q3 = 9.5 (M) 6.8 (F) Q4 = 10.5 (M) 7.5 (F) Q5 = 13.1 (M) 9.2 (F)	1.02 (0.87-1.20) 0.94 (0.79-1.11) 0.98 (0.82-1.17) 0.93 (0.76-1.15)		

FFQ- food frequency questionnaire; CRC- colorectal cancer

Reference	Subject population	Measure of exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Fuchs et al (1999) Prospective cohort Nurses Health Study USA	88,757 women 787 cases of incident CRC 16 y follow up	AOAC defined dietary fibre by FFQ	g/day Fibre from Fruits Q1 = 0.8 Q2 = 1.9 Q3 = 3.1 Q4 = 4.5 Q5 = 7.2 Fibre from Vegetables Q1 = 2.7 Q2 = 4.0 Q3 = 5.3 Q4 = 6.8 Q5 = 10.0 Fibre from Grains Q1 = 1.0 Q2 = 1.8 Q3 = 2.5 Q4 = 3.3 Q5 = 4.8	 1.00 0.94 (0.74-1.18) 1.03 (0.82-1.29) 0.88 (0.69-1.12) 0.86 (0.67-1.10) 1.00 0.98 (0.78-1.23) 0.98 (0.78-1.25) 1.13 (0.89-1.43) 1.35 (1.05-1.72) 1.00 0.90 (0.71-1.13) 0.95 (0.75-1.19) 0.99 (0.79-1.24) 1.00 (0.79-1.27)	 0.16 0.004 0.69	Age, smoking, BMI, exercise, aspirin, family history, endoscopy, history of adenoma, red meat, alcohol, folate, methionine, calcium, vitamin D.
Giovannucci et al (1994) Prospective cohort Health Professions Follow up Study USA	47,949 men 205 cases of incident colon cancer 6 y follow up	AOAC defined dietary fibre by FFQ	g/day Fibre from Fruits Q1 = 1.2 Q2 = 2.6 Q3 = 4.1 Q4 = 5.8 Q5 = 9.2 Fibre from Vegetables Q1 = 2.8 Q2 = 4.5 Q3 = 6.0 Q4 = 7.9 Q5 = 11.7 Fibre from Grains Q1 = 2.3 Q2 = 4.4	 1.00 1.6 (1.01-2.55) 2.03 (1.29-3.20) 1.61 (0.98-2.81) 1.66 (0.98-2.81) 1.00 1.13 (0.74-1.73) 1.26 (0.82-1.94) 0.86 (0.52-1.40) 1.17 (0.72-1.90) 1.00 1.27 (0.83-1.96)	 0.08 0.91 0.16	Age, total energy, previous polyps, previous endoscopic screening, parental history of colorectal cancer, total pack-years of cigarette smoking, aspirin use, and intake of red meat, methionine and alcohol

			Q3 = 6.6 Q4 = 9.4 Q5 = 15.3	1.22 (0.77-1.93) 1.63 (1.04-2.57) 1.28 (0.78-2.09)		

FFQ- food frequency questionnaire; CRC- colorectal cancer

Reference	**Subject population**	**Measure of exposure**	**Fibre intake/level**	**Adjusted Relative Risk or Odds Ratio**	**P trend**	**Factors adjusted for in analysis**
Lin et al (2005) Prospective cohort WHS USA	36,976 women 223 cases of incident CRC 10 y follow up	AOAC defined dietary fibre by FFQ	g/day Fibre from Fruits Q1 = 2.5 Q2 = 3.5 Q3 = 4.2 Q4 = 4.9 Q5 = 6.0 Fibre from Vegetables Q1 = 5.9 Q2 = 6.4 Q3 = 6.8 Q4 = 7.3 Q5 = 8.0 Fibre from Grains Q1 = 3.1 Q2 = 3.9 Q3 = 4.4 Q4 = 5.0 Q5 = 6.1	 1.00 0.78 (0.51-1.19) 0.95 (0.63-1.43) 0.67 (0.44-1.04) 1.0 (0.67-1.49) 1.00 0.90 (0.57-1.41) 1.16 (0.75-1.78) 1.46 (0.97-2.20) 1.00 (0.65-1.56) 1.00 1.0 (0.67-1.49) 0.56 (0.35-0.90) 0.95 (0.63-1.42) 0.97 (0.66-1.42)	 0.65 0.66 0.66	Age, treatment assignment, BMI, family history of CRC, history of colon polyps, physical activity, smoking status, baseline aspirin use, red meat intake, alcohol consumption, total energy intake, menopausal status, baseline post-menopausal HT use, folate intake and multivitamin use.

CRC- colorectal cancer; FFQ- food frequency questionnaire

Reference	Subject population	Measure of exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Michels et al (2005) Prospective cohort Nurses' Health Study & Health Professionals Follow-up Study USA	76,947 women & 47,279 men 1596 cases of incident CRC 1.8 million person-years follow up	AOAC defined dietary fibre by FFQ	g/1,000 kcal/day at baseline			Age, time period, family history of CRC, history of colonoscopy, height, BMI , physical activity, regular aspirin use, duration of aspirin use, pack-yrs of early-onset smoking, multivitamin supplement use, fat energy, non-fat energy, alcohol consumption, dietary folate, red meat consumption, processed meat, glycemic load, calcium, methionine, menopausal status and postmenopausal hormone use
			Fibre from Fruits			
			Men	Men		
			Q1 = 1.4	1.00	0.62	
			Q2 = 2.8	1.02 (0.79-1.33)		
			Q3 = 4.1	0.91 (0.70-1.19)		
			Q4 = 5.6	1.08 (0.82-1.41)		
			Q5 = 9.3	0.92 (0.68-1.13)		
			Women	Women		
			Q1 = 1.4	1.00	0.20	
			Q2 = 2.5	0.94 (0.75-1.16)		
			Q3 = 3.5	1.05 (0.84-1.31)		
			Q4 = 4.7	0.85 (0.67-1.07)		
			Q5 = 7.3	0.88 (0.68-1.13)		
			Fibre from Vegetables			
			Men	Men		
			Q1 = 3.6	1.00	0.57	
			Q2 = 5.3	1.04 (0.82 -1.32)		
			Q3 = 6.6	0.84 (0.65-1.08)		
			Q4 = 8.3	0.93 (0.72-1.20)		
			Q5 = 12.2	1.09 (0.83-1.42)		
			Women	Women		
			Q1 = 3.6	1.00	0.11	
			Q2 = 5.0	1.12 (0.90-1.39)		
			Q3 = 6.0	1.07 (0.85-1.34)		
			Q4 = 7.2	1.26 (1.01-1.59)		
			Q5 = 10.0	1.20 (0.94-1.56)		
			Fibre from Grains			
			Men	Men		
			Q1 = 2.8	1.00	0.19	
			Q2 = 4.3	0.81(0.63-1.04)		
			Q3 = 5.6	0.98 (0.76-1.25)		
			Q4 = 7.3	0.89 (0.69-1.16)		
			Q5 = 11.45	0.79 (0.60-1.05)		
			Women	Women		

			Q1 = 2.3 Q2 = 3.3 Q3 = 4.1 Q4 = 5.2 Q5 = 8.0	1.00 0.81 (0.66-1.00) 0.88 (0.71-1.08) 0.86 (0.69-1.07) 0.89 (0.71-1.12)	0.63	

CRC- colorectal cancer; FFQ- food frequency questionnaire

Reference	Subject population	Measure of exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Nomura et al (2007) Prospective cohort Multiethnic Cohort Study USA	85,903 men 105,108 women 1,138 male and 972 female cases of incident CRC 7 y follow up	AOAC defined dietary fibre by FFQ	g/1,000 kcal/day Fibre from Fruit Men Q1 = 0.9 Q2 = 2.5 Q3 = 4.3 Q4 = 6.9 Q5 = 12.6 Women Q1 = 1.2 Q2 = 3.0 Q3 = 5.0 Q4 = 7.8 Q5 = 14.0 Fibre from Vegetables Men Q1 = 3 Q2 = 5.1 Q3 = 7.2 Q4 = 10.4 Q5 = 18.4 Women Q1 = 3.0 Q2 = 5.0 Q3 = 7.0 Q4 = 10.0 Q5 = 17.2 Fibre from Grains Men Q1 = 2.8 Q2 = 4.7 Q3 = 6.7 Q4 = 9.5 Q5 = 15.6 Women Q1 = 2.4	 Men 1.00 0.86 (0.71-1.05) 0.76 (0.62-0.93) 0.78 (0.63-0.96) 0.78 (0.63-0.97) Women 1.00 0.84 (0.66-1.05) 0.81 (0.64-1.02) 1.01 (0.80-1.27) 0.82 (0.64-1.05) Men 1.00 0.90 (0.74-1.08) 0.83 (0.69-1.01) 0.91 (0.75-1.10) 0.78 (0.62-0.97) Women 1.00 0.91 (0.74-1.14) 0.85 (0.68-1.05) 0.92 (0.74-1.14) 0.95 (0.75-1.20) Men 1.00 0.84 (0.69-1.02) 0.86 (0.70-1.05) 0.92 (0.75-1.13) 0.86 (0.69-1.07) Women 1.00	 0.076 0.479 0.052 0.767 0.479 0.675	Ethnicity, time since study entry, age. Family history of colorectal cancer, history of colorectal polyp, pack-years of cigarette smoking, BMI, hours of vigorous activity, aspirin use, multivitamin use, and replacement hormone use (women)

			Q2 = 4.2 Q3 = 6.0 Q4 = 8.5 Q5 = 14.0	1.06 (0.84-1.33) 1.17 (0.93-1.46) 1.02 (0.80-1.28) 1.0 (0.78-1.27)		

CRC- colorectal cancer; FFQ- food frequency questionnaire

Reference	Subject population	Measure of exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Schatzkin et al (2007) Prospective cohort NIH-AARP USA	291,988 men 197,623 women 2974 cases of incident CRC 5 y follow up	AOAC defined dietary fibre by FFQ	g/1,000 kcal/day Fibre from fruit Q1 = 0.5 Q2 = 1.2 Q3 = 2.0 Q4 = 2.9 Q5 = 4.8 Fibre from Vegetables Q1 = 1.7 Q2 = 2.5 Q3 = 3.2 Q4 = 4.2 Q5 = 6.0 Fibre from Grains Q1 = 1.7 Q2 = 2.5 Q3 = 3.2 Q4 = 4.0 Q5 = 5.7	 1.00 0.95 (0.85-1.06) 0.91 (0.81-1.03) 0.90 (0.80-1.02) 1.08 (0.95-1.23) 1.00 0.91 (0.81-1.02) 0.93 (0.83-1.04) 0.92 (0.81-1.03) 1.01 (0.89-1.15) 1.00 1.03 (0.92, 1.15) 0.94 (0.83, 1.05) 0.94 (0.83, 1.06) 0.86 (0.76, 0.98)	 0.14 0.7 0.01	Sex, physical activity, smoking, menopausal HRT use, and intakes of red meat, dietary calcium, dietary folate, and total energy
Terry et al (2001) Prospective cohort Swedish Mammography Cohort Sweden	61 463 women 460 cases of incident CRC 9.6 y follow up	AOAC defined dietary fibre by FFQ	g/day standardized to average caloric intake Fibre from Fruits Q1 = 0.8 Q2 = 2.0 Q3 = 3.1 Q4 = 5.2 Fibre from Vegetables Q1 = 0.6 Q2 = 1.0 Q3 = 1.5 Q4 = 2.5 Fibre from Grains Q1 = 5.4 Q2 = 8.3 Q3 = 10.4	 1.00 0.92 (0.70-1.20) 0.97 (0.72-1.31) 0.97 (0.69-1.38) 1.00 0.89 (0.68-1.18) 1.08 (0.81-1.44) 1.17 (0.85-1.61) 1.00 0.80 (0.60;1.07) 1.20 (0.93;1.56)	 0.93 0.22 0.82	Age, BMI, educational level, intake of energy, and quartiles of alcohol, red meat, total fat, folic acid, vitamin D, vitamin C, and calcium

			Q4 = 13.6	0.91 (0.69;1.20)		

CRC- colorectal cancer; FFQ- food frequency questionnaire

Reference	Subject population	Measure of exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Wakai et al (2007) Prospective cohort Japan Multi-Centered Study Japan	43,115 men and women 443 cases of incident CRC 7.6 y follow up	AOAC defined dietary fibre by FFQ	g/day Fibre from Fruit Q1 = 0.4 Q2 = 1.0 Q3 = 1.7 Q4 = 2.2 Fibre from Vegetables Q1 = 2.0 Q2 = 3.1 Q3 = 4.0 Q4 = 5.1	 1.00 1.05 (0.78-1.40) 1.23 (0.92-1.64) 1.06 (0.78-1.43) 1.00 0.81 (0.60-1.08) 0.86 (0.64-1.16) 0.89 (0.65-1.24)	 0.55 0.65	Age, sex, area, educational level, family history of CRC, alcohol consumption, smoking, BMI, daily walking habits, exercise, sedentary work, beef intake, pork intake, energy intake, and energy-adjusted intakes of folate, calcium, and vitamin D
Willett et al (1990) Prospective cohort Nurses Health Study USA	88,751 women 150 cases of incident CRC 6 y follow up	AOAC defined dietary fibre by FFQ	g/day standardized to average caloric intake Fibre from Fruit Q1 <0.8 Q2 = 0.8-1.6 Q3 = 1.7-2.6 Q4 = 2.7-4.0 Q5 >4.1 Fibre from Vegetables Q1 <3.8 Q2 = 3.8-5.1 Q3 = 5.2-6.8 Q4 = 6.9-9.3 Q5 >9.4 Fibre from Grains Q1 <2.8 Q2 = 2.8-3.9 Q3 = 4.0-5.2 Q4 = 5.3-7.0 Q5 >7.1	 1.00 0.94 (0.57-1.55) 0.87 (0.53-1.44) 0.81 (0.49-1.34) 0.62 (0.37-1.05) 1.00 1.02 (0.61-1.71) 1.03 (0.62-1.72) 0.78 (0.43-1.34) 1.07 (0.65-1.76) 1.00 0.72 (0.43-1.21) 0.58 (0.34-1.00) 1.04 (0.65-1.64) 0.74 (0.43-1.21)	 0.12 0.87 0.62	Age and energy

FFQ- food frequency questionnaire; CRC- colorectal cancer

Table 7C: Prospective studies investigating the association of soluble or insoluble fibre with colorectal cancer

Reference	Subject population	Measure of exposure	Fibre intake/level	Adjusted Relative Risk or Odds Ratio	P trend	Factors adjusted for in analysis
Pietinen et al (1999) Prospective cohort Alpha Tocopherol Beta Carotene (ATBC) trial Finland	29,133 male smokers 185 cases of incident colon cancer 8 y follow up	Englyst defined dietary fibre by FFQ	g/day Insoluble fibre Q1 = 12.2 Q2 = 17.2 Q3 = 21.0 Q4 = 27.1 Soluble fibre Q1 = 3.7 Q2 = 5.0 Q3 = 5.9 Q4 = 7.3	 1.0 1.2 (0.8-1.8) 1.1 (0.7-1.6) 1.0 (0.6-1.5) 1.0 1.0 (0.7-1.6) 1.0 (0.6-1.5) 1.1 (0.7-1.6)	 0.73 0.91	Smoking years, BMI, alcohol, education, physical activity at work, and calcium intake
Wakai et al (2007) Prospective cohort Japan Multi-Centered Study Japan	43,115 men and women 443 cases of incident CRC 7.6 y follow up	AOAC defined dietary fibre by FFQ	g/day Insoluble fibre Q1 = 5.3 Q2 = 7.0 Q3 = 8.2 Q4 = 9.6 Soluble fibre Q1 = 1.2 Q2 = 1.7 Q3 = 2.1 Q4 = 2.6	 1.00 1.06 (0.80-1.40) 0.77 (0.56-1.05) 0.77 (0.55-1.08) 1.00 0.85 (0.64-1.14) 0.76 (0.55-1.04) 0.67 (0.47-0.95)	 0.041 0.022	Age, sex, area, educational level, family history of CRC, alcohol consumption, smoking, BMI, daily walking habits, exercise, sedentary work, beef intake, pork intake, energy intake, and energy-adjusted intakes of folate, calcium, and vitamin D

FFQ- food frequency questionnaire; CRC- colorectal cancer

Appendix D: Colonic Function

Table 1D: Observational studies investigating the association of 'dietary fibre' and colonic function

Table 2D: Intervention trials investigating the effect of fibre from grain, vegetable or isolated polysaccharide intake on colonic function

Table 3D: Intervention trials investigating the effect of resistant starch and colonic function

Table 4D: Intervention trials investigating the effect of oligosaccharides and colonic function

Table 5D: Intervention trials investigating the effect of mixed diets

Table 1D: Observational studies investigating the association of 'dietary fibre' and colonic function

Reference	Subjects N (M / F)	Duration of study	Duration of faecal collection	Dietary assessment	Fibre intake (mean ± SD g/d)	Faecal wt (mean ± SD g/d)	Correlation Coefficients	Comments
Birkett et al (1997)	53 (16 Men / 37 Women) 18-67 years Mean 29 ± 13 years	7d	3d	7d weighed	Total NSP: 14 ± 7 Insol: 8 ± 5 Sol: 6 ± 2 RS: 5 ± 2	Mean 127 ± 70 Range 41-340	NSP r= 0.49 AOAC fibre r=0.54 NSP and RS r= 0.44	Faecal weight related to NSP intake, but not starch or RS alone. Individuals consuming more NSP had faster transit times
Davies et al (1986)	51 17 (10 men / 7 women) in each of omnivores, vegetarians and vegans 35, 34 and 31 years (mean)	7d	7d	7d weighed	Total DF (Southgate)	Omnivores 153 ± 79 Range 54-415 Vegetarians 168 ± 56 Range 81-265 Vegans 225 ± 91 Range 129-499	Total fibre r= 0.96 Cereal fibre r= 0.93 vegetable fibre r= 0.87 Fruit fibre r=0.78	Dietary Fibre correlated with faecal weight, especially cereal fibre (see correlation coefficients) Dietary Fibre significantly increased mean transit time decreased, stool frequency increased and the stools became softer.
Cummings et al (1992)	220 healthy UK adults		weeks		NSP quantified	Median daily stool weight 106 104 men 99 women	NSP r=0.84	NSP content showed a significant correlation between fibre intake and mean daily stool weight (r=0.84)

Insol: Insoluble; Sol: Soluble; RS: resistant starch; NSP: non-starch polysaccharide

Table 2D: Intervention trials investigating the effect of fibre from grain, vegetable or isolated polysaccharide intake on colonic function

Year	**Subjects**	**Fibre source**	**Duration of study**	**Dose (g/d)**	**How given**	**Diets**	**Duration of faecal collection**	**Faecal weight**	**Increase g/g fibre**	**Comments**
Grains										
(i) Wheat fibre										
Vuksan (1999)	24 (12 men/ 12 women) 21-60 years Mean 31 ± 2y	Wheat supplement – Fibrotein (Fibrotein is produced by amylolytic digestion of wheat in making ethanol as fuel)	14 d periods Crossover design	21 fibrotein, 21 AACC wheat bran (positive control) 1.7 low-fibre control supplement consisting of crushed corn flakes (Negative control)	Flake form, on cereal or yogurt	Usual diets	4d	Control: 165.6 ± 16 (SE) +Wheat: 216.7 ± 19 +Fibrotein: 239.5 ± 19	Wheat 2.4 Fibrotein 3.5	The test supplement and the positive control (wheat bran) increased faecal bulk significantly compare to negative control (P≤0.01)
(ii) Rye										
Grasten (2000)	17 (9 women/ 8 men) 28-51 years Mean 40.6y	Rye	4 wk periods Crossover design	13.5 increase in DF	Rye bread, versus wheat bread	Usual diets replaced with rye or wheat breads	5d	Females Control: 151 ± 63 (SD) +Fibre: 203 ± 58 Males: Control: 198 ± 61 (SD) +Fibre: 335 ± 921	F: 3.9 M: 10.19 Both: 6.8	Faecal weight was significantly greater during rye bread period than wheat bread period in both women and men (*P* < 0.05) Mean intestinal transit time significantly shorter during rye bread period in men (P<0.05)
McIntosh (2003)	28 (Men) 40-65years	Rye vs Wheat	4 wk periods Crossover design	Low fibre 19 Rye 32 Wheat 32	Incorporated into a variety of grain products	Usual diets	Not given "collected end of periods"	Con: 203 ± 18 (SEM) + Rye 278 ± 16 + Wheat 257 ± 21	Rye: 5.8 Wheat: 4.2	Both high-fibre rye and wheat foods increased faecal output by 33–36% (*P* = 0.004)

(iii) Barley										
Bird et al (2008)	18 (10 men / 8 women) 31-66 years Mean 55.9±2.0y	Barley vs wheat	4 wk periods Crossover design	low fibre 21.4, wheat 32.4, barley 44.6	Incorporated into a variety of grain products	Usual diets	48h	Control: 150 ± 19 (SEM) + Wheat 187 ± 25 + Barley 200 ± 22	Wheat: 3.4 Barley: 2.3	High amylose barley variety (Himalaya 292, novel hull-less) - more RS than normal barley Faecal output greater for Himalaya 292 than refined cereal diets ($p<0.05$) 33% higher faecal weight 91% higher butyrate excretion
Li (2003)	10 (Women) Mean 20.4 ± 1.3y	Barley	4 wk periods Crossover design	9.4 increase	Incorporated into foods	Meals provided	4 wk	Control: 95 ± 26 (SD) +Fibre 140 ± 24	4.8	Barley intake significantly increased stool volume compared to control ($p<0.05$).
Lupton et al (1993)	22 adults 20-64 years	Barley Bran flour vs cellulose	5 d control 7 d test Crossover design	20 cellulose, 30 barley bran flour (21 fibre)	NCEP Step 1 diet	NCEP Step 1 diet	5d	Control: 150.7 ± 12 (SD) +Fibre: 147.5 ± 1.2 Control: 123.6 ± 8 (SD) +Fibre: 172.2 ± 12	Cellulose: 0.2 Barley bran: 2.3	Significant increase in faecal weight ($p=0.0001$) The group that consumed barley bran flour significantly decreased transit time by 8.02 hours from baseline
(iv) Various fibre types										
Cherbut et al (1997)	9 adults 24-48 years	Potato Fibre, Maize fibre	1 month periods Crossover design	15 DF (22g source)		Control 15g sucrose. Subjects given ingredients to prepare food at home	7d	Potato Control: 79.3 ± 9.7 (SEM) Range 44-115 +Fibre: 115.7 ± 9.1 Range 59-141 Maize Control: 72.7 ± 7.4 Range 23-93 +Fibre:	Potato: 2.4 Maize 2.4	Increase in faecal weight compared to control ($p=0.011$) Significant increase in faecal weight ($p=0.007$)

								108.4 ± 5.4 Range 89-142		
Castaglia-Delavand et al (1998)	9 (Men) Mean age 21.5y	Sugar beet fibre Chicory inulin	28 d periods Crossover design	50		Controlled diets	8d	Control: 129 +sugar beet fibre: 202 Chicory inulin: 204 Pooled SEM =16	1.5	Increase in faecal weight with sugar beet fibre (p<0.05) Increase in faecal weight with chicory inulin (p<0.01)

Dahl et al (2005)	26 adults (7 men, 19 women) 18-60 years	Flax fiber (14 subjects) vs psyllium (12 subjects)	3 wk control 2 wk test Parallel design	Flax: 15 DF intended - 9.0 taken Psyllium: 15 DF intended - 10.4 g taken		Usual diets, but assigned breakfasts	3 wk control, 2 wk test	Flax Control: 162.1 ± 89.1 (SD) +Fibre: 188.6 ± 101.6 Psyllium Control: 124.9 ± 92.0 (SD) +Fibre: 175.3 ± 138.7	Flax: 2.9 Psyllium: 4.8	Significant increase in faecal weight Flax ($p<0.05$) Psyllium ($P<0.005$)
Jenkins (2000)	25 (13 men/ 12 women) 22-57 years Mean 37 ± 2y	Cocoa bran	2 wk periods Plus 2 week washout Crossover design	19.4	Incorporated into breakfast cereal and low fibre breakfast cereal	Usual diets	4d	Control: 135 ± 10 (SE) +Fibre: 191 ± 16	2.9	Included 19 subjects who had had AACC wheat bran (+ve control) 1-2 y before Mean faecal output was significantly higher for cocoa-bran than for low-fibre cereal ($P<.001$) but faecal weight was not significantly different ($p=0.21$)
Johnson et al (2006)	38 (Men) 24-64 years Mean 41 ± 2y	Lupin kernel	28 d periods Crossover design	22.2 increase in DF	Lupin fibre (LK fibre in various foods)	Usual diets + products provided	3d	Control: 172 ± 11 (SE) + lupin Fibre: 208 ± 14	1.6	Significant increase in faecal output ($P=0.02$) Significant increase in butyrate concentration by 16% ($p=0.006$) 40% Increase in butyrate output ($p=0.002$)

Spiller et al (2003)	13 (7 Men / 6 women) 27-65 years	Sun-dried raisins	3 wk periods Crossover design	8.4 (60-80g/kg given as DF in raisins)		Usual diets	4d	Control: 132 ± 68 (SD) +Fibre: 177 ± 78	4.1	Exact fibre content of raisins not given - raisins given as food hence contained other components Intestinal transit time decreased from 42 h on the baseline diet to 28 h on sun-dried raisins ($P<0{\cdot}05$). sun-dried raisins increased faecal wet weight ($P<0{\cdot}05$), Increase in butyrate excretion (p=0.02)

(v)Isolated polysaccharides										
Chen (2006)	8 (1Man/ 7women) 21-54 years Mean 35 ± 5y	Konjac glucomannan	3 wk periods Crossover design	4.5	In water 3 x 1.5g/d	Diets provided 7d menu of low fibre Chinese food.	7d	Control: 132 ± 26.5 (SE) +Fibre: 171.8 ± 29.3	8.8	Significantly increased faecal weight (p<0.05)
Chaplin et al (2000)	16 (6men / 10 women) 22-36 years	Ispaghula (psyllium)	12 wks 2 wk pre-treatment 8 wk treatment 2 wk post-treatment	3.5 fybogel (2.94 NSP)		Usual diets	One 24h stool collection each week for 8 wks	Pre-treatment: 121 Range 93-153 +End treatment: 147 Range 116-183	8.8	Not continuous collection Difference in faecal weight not significant (p>0.05)
Daly et al (1993)	18 (Men) 18-34 years	Xanthan gum	10 d periods Crossover design	15 DF		Not given	10d	Control: 190.3 ± 13.6 (SE) +Fibre: 242.8 ± 15.8	3.5	Significant increases in faecal weight (*P* < 0.001) Increased SCFA production

										(p=0.049)
Robinson et al (2001)	22 (11 men / 11 women)	Arabingalactan (LAREX from Larch tree) (AG)	3 wk periods Crossover design	15 or 30 AG		Usual diet AG powder in drinks	5d	Control: 136.9 ± 7.8 (SE) +15g AG: 130.1 ± 7.8 +30g AG: 126.9 ± 7.8	15g: 0.5 30g: 0.3	No effect on stool weight (p=0.37) No significant changes in SCFA Total SCFA (p=0.41) Butryate (p=0.42) Proprionate (p=0.31)

Table 3D: Intervention trials investigating the effect of resistant starch and colonic function

Reference	Subjects	Duration of study	Fibre source	Dose (g/d)	How given	Diets	Duration of faecal collection	Faecal weight (g)	Increase g/g fibre	Comments
Behall et al (2002)	24 (Men) 28-58 years Mean 41y	14 wk periods 4 wks controlled Crossover design	High amylose cornstarch	RS intake: Control 1 Test 30	Added to baked products	Usual 10wk, controlled 4 wk of each period	7d	Control: 246 ± 14.5 (SE) +RS: 269.4 ± 14.5	0.8	Study investigated mineral balances, with resistant starch on colonic function. No significant relationships or p values relating to colonic function reported.
Grubben et al (2001)	24 (13Men / 11women) 25-75 years Patients with adenomas removed	4 wk periods, after 4wk maltodextrin for all Crossover design	Hylon VII	RS_2: 45g	Powder 3 x 15g/d	Usual	2d	2 day weights Control: 303 ± 43 (SE) +RS: 331 ± 43 vs control Control: 316 ± 30 Change -36 ± 41 (280)	0.3	Adenoma patients, not healthy controls; usual diet had higher fibre than representative Australian population. No significant increase in faecal weight (p=0.235)
Jenkins et al (1998)	24 (12men / 12 women) 22-53 years Mean 33 ± 2y	2 wk periods Crossover Design	RS_2, RS_3 or wheat bran (positive control)	Wheat bran: 30 (TDF) RS_2: 30 (TDF) 21.5 (RS) RS_3: 30 (TDF) 27.9 (RS)	In cereals and muffins	Usual	4d	Control: 163 ± 23 (SE) +Wheat bran: 258 ± 22 +RS2: 187 ± 24 +RS3 182 ± 23	Wheat bran: 3.2 TDF RS_2: 1.1 RS_3: 0.7	The wheat bran supplement increased faecal bulk compared with the low-fibre control (p<0.001) with the mean for both resistant starches also being greater than the low-fibre control (p=0.013).

Muir et al (2004)	20 (11 men / 9 women) Mean 42 ± 2y	3 wk periods	Hi-maize with and without wheat bran	19.8 RS 11.6/11.2g DF from WB	In foods provided	Other foods provided	5d	Control: 131 ± 64 (SD) +Wheat bran: 161 ± 67 +WB+RS: 204 ± 84	WB: 2.6 RS: 2.2	Significant increase in faecal weight (p<0.001) for wheat bran plus RS diet.

TDF: total dietary fibre; RS: resistant starch

Table 4D: Intervention trials investigating the effect of oligosaccharides and colonic function

Reference	Subjects	Fibre source	Duration of study	Dose	How given	Diets	Duration of faecal collection	Faecal weight (g)	Increase g/g fibre	Results/Comments
Alles et al (1999)	40 (22 men / 18 women) 3 groups mean ages: 37.8 ± 17.6 years 36.5 ± 17.6 years 42.9 ± 14.8 years	Trans-galacto-oligosaccharides (Elix'or)	3 wk periods Parallel design Placebo, low, or high doses	7.5g or 15g TOS	In fruit juice	Controlled - 21 menus for 3 wk	21d	Control: 147 ± 11 (SE) +Placebo: 139 ± 14 Control: 113 ± 12 +7.5g TOS: 127 ± 14 Control: 146 ± 22 +15g TOS: 142 ± 18	7.5gTOS: 1.9 15g TOS: -0.3	Author reported that TOS did not significantly affect bowel habits, stool composition or the concentration of SCFA. No P values reported
Bouhnik et al (2007)	12 (6 men / 6 women) Mean 69 ± 2y Elderly	Short chain Fructo-oligosaccharides (sc-FOS)	2 wk periods, crossover design	8g	2 x 4g doses, one each breakfast and dinner	Usual	2d	Control: 155.4 ± 20.9 (SE) +FOS: 137.7 ± 17.3	-2.2	Faecal bifidobacteria counts significantly increased during sc-FOS period (p<0.05) Faecal weight decreased No change in transit time, no p value reported

Brighenti et al (1999)	12 (men) Mean 23.3 ± 0.5 years	FOS/Inulin mixture (Fibruline)	4 wk periods All control first, test second	9g	In breakfast cereal	Usual	3d Subjects weighed own stools	Control: 159.3 ± 17.6 (SE) +FOS: 155.6 ± 13.8	-0.4	No significant change in SCFA No significant change in faecal weight. no p values given
Causey et al (2000)	12 (Men) 27-49 years	Inulin	3 wk each diet Cross over design with no washout period	20g	In ice cream	Controlled diet, rotating menu	5d	Control: 150.3 ± 54.0 (SD) +Inulin: 164.3 ± 56.8	0.72	Transit time did not differ significantly (p=0.33) but decreased in inulin phase. No significant change in SCFA (Total SCFA p=0.13, butyrate p= 0.12, propionate p=0.14) No significant change in faecal weight (P=0.20)
Chen et al (2001)	7 (Men) Mean 75.2 ± 4.0 years Constipated elderly (age 60+) men	Isomalto-oligosaccharide (IO)	4 wk periods Control first Test second	10g active component	In afternoon dessert	Constant (nursing home)	5d	Control: 47.7 ± 81.1 (SE) +isomalto-oligosacc: 81.1 ± 1.5	3.7	Faecal weight increased significantly with IO supplement. p values not reported Significantly increased faecal proprionate concentration ($p<0.05$) but not butyrate concentration (p value not reported).
Den Hond et al (2000)	6 (1 man / 5 women) 20-49 years Mean 28.5 ± 11.1 years	Inulin (Raftilene)	1 wk periods 1 wk washout	15g	Combined with meals	Usual, but constant advised	3d	Control: 91 ± 107 (SE) +Inulin: 113 ± 22	1.5	Significant increase in stool frequency with inulin (p=0.02) but not faecal weight (p=0.28)
Molis et al (1996)	6 (3 men / 3 women) 20-27 years	FOS (Actilight)	Control 6d Test 11d Crossover design With 1 week washout	20.1g FOS	Powder with meals	Controlled diet	2d	Control: 210 ± 12.6 (SE) +FOS: 222 ± 29.7	0.6	No significant difference in faecal weight No p values reported

Scholtens et al (2006)	12 (6 men/ 6 women) 18-35 years	FOS (Raftilene) or maltodextrin (Control)	2 wk periods, crossover design	25-30g dependent on body weight	As powder in sachets	Usual	3d	Control: 174 ± 19.3 (SE) +FOS: 225 ± 19.3	1-7-2.0	Not stated how many subjects on each dose - hence range of effect 1.9-2.0 g/g (divided by 25 and by 30) Total stool output was higher in the FOS period, (p=0.097) Increased acetate production and decreased butyrate production.
Sairanen et al (2007)	66 (22 men/ 44 women) 3 groups mean ages: 41.3 (22-59)y 37.0 (22-54)y 41.4 (23-60)y	Inulin (Raftilene)	3 wk periods Parallel design Control Probiotic Probiotic + inulin	12g	In milk	Usual	5d	5d results Control: 829 ± 385 (SD) +Milk: 935 ± 432 Control: 735 ± 428 (SD) +Probiotic: 781 ± 441 Control: 746 ± 372 (SD) +Probiotic+inulin: 861 ± 340	1.9	Results given per 5 days; inulin is with probiotic, not alone No significant increase in faecal weight (p=0.566)
Ten Bruggencate (2006)	34 (Men) 29 for faecal data 18-55 years	FOS (Raftilose)	2 wk periods - 1 week between, crossover Design	20g FOS	In lemonade: dose divided into 3 portions, morning, afternoon, evening	Usual	24h	Control: 203.7 ± 28.3 (SE) +FOS: 268.0 ± 29.4	3.2	n=29 for faecal data. 24h collection only

Table 5D: Intervention trials investigating the effect of mixed diets

Reference	Subjects	Duration of study	Fibre source	Dose (g/d)	Diets	Duration of faecal collection	Faecal weight	Increase g/g fibre	Comments
Haack et al (1998)	9 (Men) Mean 22 ± 1y	28d periods, in order of increasing fibre	Mixed diets: low, medium and high fibre	Low 15.7 Medium 30.2 High 41.8	Provided Mixed fruit, veg, grains and legumes	18d	Low 109 ± 15 (SEM) Medium Fibre 156 ± 12 High Fibre 195 ± 17	Med 3.2 High 3.3	Increase faecal weight (no P value reported)
Hovey et al (2003)	12 (4 men/ 8 women) 31 years mean	7d periods	Mixed diets	Average DF intake 83.4	Usual then mixed diet of wholegrains - linseeds, sunflower, sesame, wheat grains, beans, chickpeas prepared, whole or ground.	3d	Usual 125 ± 46 (SD) Range 40-184 Whole grain 258 ± 123.2 Range 106-562 Ground grain 170.5 ± 63 Range 42-288	Whole 1.6 Ground 0.5	Consumption of intact seeds compared to ground seed significantly increased faecal weight (p=0.005)
Jenkins et al (2001)	10 (8 men / 2 women) 24-60 years Mean 38 ± 4y	14d periods Crossover	Mixed diets: high starch high vegetable	Control 25.1 High starch 45.4 High vegetable 149.6	Provided Starch diet: grains, legumes, bread etc + some fruit and veg. Veg diet: only fruit and veg, no grains or legumes	3d	Control 172 ± 28 (SEM) High starch 279 ± 27 High vegetable 906 ± 130	High starch 5.3 High vegetable 5.9	Significant increase in faecal weight (P=0.000).

Nagengast et al (1993)	22 12 (6 men/ 6 women) on test 10 (5 men / 5 women) on high fibre usual	4wk low, 10wk test	Test mixed diet high in cereals, fruit and vegetables vs usual low fibre control vs usual high fibre	Low fibre usual 20.3 High test 34.6 High fibre usual 31.1	Usual (7d diary)	3d	Low usual 106 ± 12 (SEM) Test high fibre 156 ± 11 High fibre usual initial 174 ± 22 final 163 ± 18	3.5 (addition of mixed fibre)	Increased faecal weight ($p<0.05$) No effect on transit time

Appendix E: Prebiotic Studies

Table 1E: Relevant studies with oligosaccharides attempting to confirm a prebiotic effect

Table 2E: Studies with prebiotics in infants

Table 1E: Relevant studies with oligosaccharides attempting to confirm a prebiotic effect

Reference	Subjects	Substrate	Dose	Duration	Results
Lactulose					
Ballongue et al (1997)	12 humans	Lactulose	2 x 10g/d	4 weeks	Bifidobacteria, streptococci and lactobacilli significantly increased (P < 0.01 for all) compared to placebo whilst bacteroides, clostridia, coliforms and eubacteria significantly decreased (P < 0.01 for all)
Bouhnik et al (2004a)	65 volunteers	Lactulose	a) 20 g/day then b) (10–30 g/day) then c) (10–30 g/day)	4w a) 1 week + b) 1 week + c) 2 weeks	An increase in faecal bifidobacteria counts (P = 0.04) and beta-galactosidase activity (P < 0.001) was observed
Bouhnik et al (2004b)	16 healthy volunteers	Lactulose	5g/d	6w	Lactulose ingestion led to a significant increase in faecal bifidobacteria counts when compared to placebo (P = 0.03)
Terada et al (1992)	8 humans	Lactulose	3g/d	14d	Bifidobacteria significantly increased (P<0.001) while clostridia incl. *Cl.perfringens* (P<0.05), bacteroides (P<0.01), streptococci (P<0.05) and Enterobacteriaceae decreased (P<0.05 at 7d, not significant at 14d)
Tuohy et al (2002)	30 adults	Lactulose	10g/d	3w	Significantly increased bifidobacteria on Raffinose-Bifidobacterium agar (P=0.03). Non significant increase on Beerens' agar.
Fructo-oligosaccharides (FOS)					
Bouhnik et al (1996)	20 adults	FOS	12.5g/d	12d	Significant increase in bifidobacteria (P < 0.01) by about 10 times was demonstrated on selective agars
Bouhnik et al (1999)	40 adults	FOS	0, 2.5, 5, 10 and 20g/d	7d	Selective agars showed that bifidobacteria were most increased by 10g (P = 0.02) and 20g (P =0.01) doses of FOS and increases at these doses where significantly higher compared to 2.5g and placebo (P < 0.05). The optimum dose of oligofructose was found to be 10g/d
Bouhnik et al (2007)	12 elderly persons	scFOS	8g/d	4w	Bifidobacterial counts were significantly increased (P < 0.05)
Buddington et al (1996)	12 adults	Neosugar	4g/d (in controlled diet)	25d	Significant increase in anaerobes (P<0.0003), and

					bifidobacteria (P < 0.03) and non significant increase in enterobacteria.
de Preter et al (2008)	19 adults	FOS enriched inulin	10g/d	4w	Total faecal bifidobacteria increased significantly after intake of FOS ensriched inulin (p < 0.001) i

Gibson et al (1995)	8 adults	FOS and inulin	15g/d (in controlled diet)	15d	FOS and inulin both significantly increased bifidobacteria ($P<0.01$ and $P=0.0002$ respectively). FOS significantly reduced bacteroides ($P<0.01$), clostridia ($P<0.05$) and fusobacteria ($P<0.01$).
Guigoz et al (2002)	19 elderly persons	FOS	8g/d	3w	Increase in faecal bifidobacteria of approximately 2.8 log cfu/g of faeces compared to baseline ($P < 0.001$)
Harmsen et al (2002)	14 adult volunteers	Inulin	9g/d	2w	Quantification of all bacteria, bifidobacteria, the *Eubacterium rectale–Clostridium coccoides* (Erec) group, *Bacteroides*, and eubacteria were counted with FISH probes. A significant increase in bifidobacteria ($P < 0.05$) and a significant decrease in Erec group was observed ($P < 0.05$).
Hidaka et al (1986)	23 Senile adults	Neosugar	8g/d	14d	Significantly increased bifidobacteria ($P<0.01$)
Hidaka et al (1986)	2 adults	Neosugar	8g/d	2 months	Increase in bifidobacteria, Reduction in SCFA and Putrefaction [DN: Only 2 subjects]
Kleesen et al (1997)	10 senile adults	Inulin	20g/d, then 40g/d	8d, then 11d	Significant increase in bifidobacteria ($P<0.05$). For 40g/d, significant reduction in enterococci ($P<0.01$) and non-significant decreases in bacteroides and enterobacteria
Kolida et al (2007)	30 adults	Inulin	5 and 8g/d	2w	Bifidobacterial levels increased significantly upon ingestion of both the low ($P < 0.05$) and high inulin dose ($P = 0.05$) compared to placebo.
Kruse et al (1999)	8 persons	Inulin	up to 34g/d (based on individual energy requirements)	2 months	FISH revealed a significant increase in bifidobacteria from 9.8 to 11.0 $\log_{10}$ cells/g dry faeces. The effect lasted for the whole 2 months period that the volunteers received the prebiotic. [DN Paper states "significant increase", but no p-value given. However, graph with error bars indicates statistical significance]
Kleesen et al (2007)	45 adult volunteers	Jerusalem artichoke or chicory inulin in snack bars	7.7g/d then 15.4g/d	7d then 14d	Significant increase in bifidobacteria ($p<0.05$) and significant reductions in *Bacteroides/Prevotella* ($P<0.05$) i and the *Clostridium histolyticum/C. lituseburense* group ($p<0.05$)
Menne et al (2000)	8 persons	Chicory inulin hydrolysate	8g/d	2w	Selective agars showed anincrease in faecal bifidobacteria ($P < 0.01$).
Mitsouka et al (1987)	23 adults	FOS	8g/d	2 weeks	Increase in faecal bifidobacteria by about 10x

					(P<0.005) and decrease in stool pH
Rao (2001)	8 young volunteers	FOS	5g/d	3w	By means of selective agars, an increase in faecal bifidobacteria was observed (P < 0.001)

Tuohy et al (2001a)	10 adults	HP-inulin	8g/d	2w	A small but statistically significant increase in bifidobacteria after 7 days ($P<0.05$) and non significant increase after 14 days
Tuohy et al (2001b)	31 adults	Biscuits containing FOS and partially hydrolysed guar gum (PHGG)	6.6g FOS 3.4g PHGG	3w	FISH revealed a significant increase in faecal bifidobacteria compared to placebo ($P = 2.5 \times 10^{-5}$)
Williams et al (1994)	10 adults	Neosugar	4g/d	14d	Significantly increased bifidobacteria ($P < 0.05$)
Galacto-oligosaccharides (GOS)					
Bouhnik et al (1997)	8 adults	Trans-GOS	10g/d	21d	Significantly increased bifidobacteria ($P < 0.05$), significant reduction in breath H_2 ($P < 0.01$)
Depeint et al (2008)	30 adults	Trans-GOS (BiMuno)	7.5	7d	Significant increase in bifidobacteria compared to pre-treatment ($P < 0.05$)
Ito et al (1990)	12 men	Trans-GOS (Oligomate)	0, 2.5, 5 then 10g/d	1 week for each dose	Bifidobacteria increased with dose. For 10g/d, significant increase in bifidobacteria ($P < 0.001$) and lactobacilli ($P < 0.05$)
Ito et al (1993)	12 men	Trans-GOS	15g/d	6d	Significant increase in bifidobacteria ($P < 0.01$) and lactobacilli ($P < 0.05$), significantly lower bacteroides ($P < 0.05$). Significant decrease in indole ($P < 0.01$), p-cresol ($P < 0.05$), NH_3 ($P < 0.01$), propionate ($P < 0.05$), valerate ($P < 0.05$), isovalerate ($P < 0.01$) and isobutyrate ($P < 0.01$).
Tanaka et al (1983)	5 men	Trans-GOS	3g/d, then 10g/d	1 week for each dose	Non-significant increase in bifidobacteria and significant decrease in bacteroides ($P < 0.05$).
Teuri et al (1998)	6 adults	Trans-GOS	15g/d	14d	Significant increase in total bacterial count on media for lactic acid bacteria ($P=0.03$). No change in bifidobacteria.

Table 2E: Studies with prebiotics in infants

Reference	Test oligosaccharide	Study design	Dose	Evidence of prebiotic efficacy
Bakker-Zierikzee et al (2006)	GOS & FOS; *Bifidobacterium animalis*	3 groups of 19 healthy, formula fed infants, 63 breast fed (ref. group) randomised, double blind parallel, from birth to 16 wk	6g/l prebiotic/formula; 6×10^{10} viable *B. animalis*/l formula; standard formula	Similar metabolic activity of the flora in GOS/FOS group as breast fed (#), *B. animalis* group similar to standard formula (#)
Ben et al (2004)	GOS	69 healthy term infants fed GOS, parallel study, 59 fed formula, 124 mixed; 6 month intervention	2.4g/l prebiotic/formula; formula; mixed (breast fed & prebiotic formula)	Significant increases in bifidobacteria, lactobacilli & stool frequency in prebiotic and mixed groups (all $P<0.05$) but not the standard formula group ($P\geq0.05$)
Boehm et al (2002)	GOS & FOS	19 Preterm infants on prebiotic, 19 maltodextrin placebo, 12 fortified breast milk parallel study, 28d intervention	10g/L prebiotic/formula (90% GOS)	Significantly higher bifidobacteria compared with placebo group ($P=0.0008$); significantly higher stool frequency as compared with placebo ($P=0.0079$)
Costalos et al (2008)	GOS & long chain FOS	Healthy bottle fed infants, randomised, double blind, parallel followed up to 6 wk of age	4g/l prebiotic/formula or standard formula (no prebiotic)	Significant decrease in clostridia (FISH) (#), trend of increased bifidobacteria ($P=0.2$) and *E. coli* ($P=0.3$), higher stool frequency and softer stools compared with control group
Haarman & Knol (2006) Haarman & Knol (2005)	GOS & FOS	2 groups of 10 healthy, formula fed infants 28-90d age, parallel study	8g/l prebiotic/formula (90% GOS); breast fed control group	Real time PCR analysis, similar flora composition between formula and breast fed infants ($P\geq0.05$ for most lactobacillus strains)
Kim et al (2007)	Native inulin	14, 12, 6 wk formula fed healthy infants, 6 wk intervention (3 wk inulin, 3 wk without)	0.25g/kg/d native inulin	Inulin significantly increased lactobacilli and bifidobacteria (both $P<0.05$), stool frequency not affected (#)
Mihatsch et al (2006)	GOS & FOS	20 preterm infants on enteral nutrition, assigned into 2 groups, placebo controlled, double blind, 14d supplementation	10g/l prebiotic/formula or standard formula	Significant reduction in gastrointestinal transit time ($P=0.037$) and trend towards higher stool frequency ($P=0.059$); well tolerated

Moro et al (2005)	GOS & FOS	Healthy formula fed infants, 28d feeding period	8g/l prebiotic/formula; maltodextrin control	Significantly higher bifidobacteria with prebiotic compared with control ($P<0.001$)
Savino et al (2006)	GOS & FOS	199 formula fed infants with colic, 96 prebiotic, aged >4 months, 103 standard formula parallel randomised, 2 wk	8g/l prebiotic/formula (90% GOS), formula & simethicone (6mg/kg)	Significant reduction in colic episodes (as diagnosed by ≥3 episodes of full-forced crying lasting ≥3 hrs on ≥3d per week) after 7 and 14d as compared to standard formula ($P<0.0001$ at both time points)
Scholtens et al (2006)	GOS & FOS	35 formula fed infants in weaning, aged 4-6 months, double blind, randomised, 6 wk supplementation	4.5g/d prebiotic in weaning food or weaning food (no prebiotic)	Significant increase in bifidobacteria % (FISH) with prebiotic compared with control ($P=0.026$)
Ziegler et al (2007)	GOS & polydextrose, lactulose	226 healthy formula fed term infants, assigned to treatment grps of 76 parallel design, followed up to 120d age	4g/l or 8g/l prebiotic/formula	Normal growth and stool characteristics similar to breast fed ($P\geq0.005$)

7. Reference section

All references assessed in the HNR report are listed in the following section

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