Systematic review of the role of oat intake on gastrointestinal health
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Supplemental Appendix I: Full search strategy per database for the systematic review for oat and gastrointestinal health

Overview databases & results.

Table 2. The total number of articles per database with last searched in April 29, 2021 with 2883 duplicate records removed

	Before deduplication	After deduplication
EMBASE	2524	
Medline Ovid	2197	
Cochrane CENTRAL	454	
Web of Science	2837	
Google scholar	200	
Total	8212	5329

Overview of the search strategy per database

Embase.com

('oat'/de OR 'oat bran'/de OR 'beta glucan'/de OR 'whole grain'/de OR ('avena sativa' OR oat OR oats OR oatmeal* OR oatcake* OR porridge* OR muesli OR granola OR b-glucan* OR β-glucan* OR beta-glucan* OR beta-dextroglucan* OR 'whole grain*' OR wholegrain*):ab,ti,kw) AND (('gut microbiome'/exp OR 'intestine flora'/exp OR 'feces microflora'/de OR 'bacterial count'/de OR 'dysbiosis'/de OR 'Bacteroidaceae'/exp OR (('GI disease'/de OR 'GI tract'/exp OR 'GI symptom'/de) AND ('microflora'/de OR 'microbiome'/exp OR 'microbial consortium'/de OR 'microbial diversity'/de)) OR ('gut microbi*' OR dysbios* OR dys-symbios* OR dysbacterios* OR disbacterios* OR ((enteric OR 'alimentary tract' OR bowel OR digestive OR intestin* OR gastro-intestin* OR gastrointestin* OR gut OR colon* OR fecal) NEAR/3 (flora OR microflora* OR micro-flora* OR microbi* OR microbe* OR bacteri* OR microorganism* OR micro-organism*))):ab,ti,kw) OR ('GI tract'/exp OR 'GI motility'/exp OR 'intestine function'/exp OR 'GI disease'/de OR 'GI symptom'/exp OR 'digestive system inflammation'/exp OR 'enteropathy'/exp OR 'stomach disease'/exp OR 'bloating'/de OR 'abdominal pain'/exp OR 'intestine function disorder'/exp OR 'celiac disease'/de OR 'inflammatory bowel disease'/exp OR 'ulcerative colitis'/de OR (gastroenteropath* OR gastro-enteropath* OR enteropath* OR Crohn* OR colitis OR 'irritable colon' OR coeliac OR ((gastrointestin* OR gastro-intestin* OR intestin* OR bowel OR colon OR colorectal OR digestive OR gut OR GI OR celiac OR coeliac) NEAR/3 (disease* OR disorder* OR cancer* OR carcino* OR tumor* OR tumour* OR infection* OR syndrome* OR regulation* OR function* OR wellbeing OR well-being OR health OR miscomfort*)) OR ((intestinal OR GI OR GI OR gastric) NEAR/3 (tract* OR motilit* OR empt*)) OR digestion OR bloating OR dyspep* OR ((abdomen OR abdominal) NEAR/3 (pain)) OR diarrh* OR constipat* OR obstipat*):ab,ti,kw)) NOT ([animals]/lim NOT [humans]/lim) NOT ([Conference Abstract]/lim OR [Letter]/lim OR [Note]/lim OR [Editorial]/lim)

Medline (Ovid)

(Avena/ OR exp beta-Glucans/ OR Whole Grains/ OR (avena sativa OR oat OR oats OR oatmeal* OR oatcake* OR porridge* OR muesli OR granola OR b-glucan* OR beta-glucan* OR beta-dextroglucan* OR whole grain* OR wholegrain*).ab,ti,kw.) AND ((GI Microbiome/ OR exp

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Microbiota/ OR exp GI Tract/mi OR exp Intestinal Mucosa/ OR exp Feces/ch, mi OR Bacterial Load/ OR Dysbiosis/ OR exp Bacteroidaceae/ OR (gut microbi* OR dysbios* OR dys-symbios* OR dysbacterios* OR disbacterios* OR ((enteric OR alimentary tract OR bowel OR digestive OR intestin* OR gastro-intestin* OR gastrointestin* OR gut OR colon* OR fecal) ADJ3 (flora OR microflora* OR micro-flora* OR microbi* OR microbe* OR bacteri* OR microorganism* OR micro-organism*))).ab,ti,kw.) OR (GI tract/ or intestines/ or exp intestine, large/ or exp intestine, small/ or exp lower GI tract/ or exp upper GI tract/ OR exp GI Motility/ OR exp GI Diseases/ OR stomach disease/ OR Dyspepsia/ OR constipation/ OR diarrhea/ OR flatulence/ OR abdominal pain/ OR celiac disease/ OR exp Inflammatory Bowel Diseases/ OR Colitis, Ulcerative/ OR (gastroenteropath* OR gastro-enteropath* OR enteropath* OR Crohn* OR colitis OR irritable colon OR coeliaky OR ((gastrointestin* OR gastro-intestin* OR intestin* OR bowel OR colon OR colorectal OR digestive OR gut OR GI OR celiac OR coeliac) ADJ3 (disease* OR disorder* OR cancer* OR carcino* OR tumor* OR tumour* OR infection* OR syndrome* OR regulation* OR function* OR wellbeing OR well-being OR health OR miscomfort*)) OR ((intestinal OR GI OR GI OR gastric) ADJ3 (tract* OR motilit* OR empt*)) OR digestion OR bloating OR dyspep* OR ((abdomen OR abdominal) ADJ3 (pain)) OR diarrh* OR constipat* OR obstipat*).ab,ti,kw.)) NOT (exp animals/ NOT humans/) NOT (letter* OR news OR comment* OR editorial* OR congres* OR abstract* OR book* OR chapter* OR dissertation abstract*).pt.

Cochrane Trials
Cochrane Central Register of Controlled Trials, Issue 5 of 12, May 2020

(('avena sativa' OR oat OR oats OR oatmeal* OR oatcake* OR porridge* OR muesli OR granola OR b-glucan* OR β-glucan* OR beta-glucan* OR beta-dextroglucan* OR whole NEXT grain* OR wholegrain*):ab,ti,kw) AND (((gut NEXT microbi* OR dysbios* OR dys-symbios* OR dysbacterios* OR disbacterios* OR ((enteric OR 'alimentary tract' OR bowel OR digestive OR intestin* OR gastro-intestin* OR gastrointestin* OR gut OR colon* OR fecal) NEAR/3 (flora OR microflora* OR micro-flora* OR microbi* OR microbe* OR bacteri* OR microorganism* OR micro-organism*))):ab,ti,kw) OR ((gastroenteropath* OR gastro-enteropath* OR enteropath* OR stestin* OR bowel OR colon OR colorectal OR digestive OR gut OR GI OR celiac OR coeliac) NEAR/3 (disease* OR disorder* OR cancer* OR carcino* OR tumor* OR tumour* OR infection* OR syndrome* OR regulation* OR function* OR wellbeing OR well-being OR health OR miscomfort*)) OR ((intestinal OR GI OR GI OR gastric) NEAR/3 (tract* OR motilit* OR empt*)) OR digestion OR bloating OR dyspep* OR ((abdomen OR abdominal) NEAR/3 (pain)) OR diarrh* OR constipat* OR obstipat*):ab,ti,kw))

Web of Science

TS=((((("avena sativa" OR oat OR oats OR oatmeal* OR oatcake* OR porridge* OR muesli OR granola OR b-glucan* OR β-glucan* OR beta-glucan* OR beta-dextroglucan* OR "whole grain*" OR wholegrain*)) AND ((("gut microbi*" OR dysbios* OR dys-symbios* OR dysbacterios* OR disbacterios* OR ((enteric OR "alimentary tract" OR bowel OR digestive OR intestin* OR gastro-intestin* OR gastrointestin* OR gut OR colon* OR fecal) NEAR/3 (flora OR microflora* OR micro-flora* OR microbi* OR microbe* OR bacteri* OR microorganism* OR micro-organism*)))) OR ((gastroenteropath* OR gastro-enteropath* OR enteropath* OR Crohn* OR colitis OR "irritable colon" OR coeliaky OR ((gastrointestin* OR gastro-intestin* OR intestin* OR bowel OR colon OR colorectal OR digestive OR gut OR GI OR celiac OR coeliac) NEAR/3 (disease* OR disorder* OR cancer* OR carcino* OR tumor* OR tumour* OR infection* OR syndrome* OR regulation* OR function* OR wellbeing OR well-being OR health OR miscomfort*)) OR ((intestinal OR GI OR GI OR gastric) NEAR/3 (tract* OR motilit* OR empt*)) OR digestion OR bloating OR dyspep* OR ((abdomen OR abdominal) NEAR/3 (pain)) OR diarrh* OR constipat* OR obstipat*)))) NOT ((animal* OR rat OR rats OR mouse OR mice OR murine OR nonhuman* OR primate*) NOT (human* OR patient*))) AND DT=(article)

Google scholar **(first 200 out of 21,600)**

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avena|oat|oats|oatmeal|granola|b-glucan|beta-glucan|"whole grain"|wholegrain|"whole grains"|wholegrains microbiome|microbiota|microflora|bowel|coeliac|celiac|colon|digestive|gut|GI health|Colitis|Crohn|bloating|abdominal -mice -rats

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Supplemental Table 1. Characteristics of randomized controlled trials with oat intake conducted in individuals without gastrointestinal diseases

Lead Author, Publication Year (Supplemental Reference)	Location	Randomization Yes/No	Study design	Sample size	Male, n (%)	Health status/study population	Mean Age (SD), y	Duration (weeks)	Intervention characteristics	Control Characteristics	**The most important findings**
Cicero, 2020(1)	Italy	Yes	Cross-over	83	35 (42.2)	Adults with elevated cholesterol	52.3 (4.4)	8 (2 periods)	3 g oat β-glucan daily	Oat-based isocaloric placebo without β-glucan	The tested products did not exert any significant unfavorable effect on the self-perceived intestinal well-being
Connolly, 2016(2)	England	Yes	Cross-over	32	11 (34.4)	Adults with glucose intolerance or elevated cholesterol	42 (n.a.)	6 (2 periods)	45 g whole grain oat granola breakfast cereal daily	Non-whole grain breakfast ; 45 g/day	No significant changes were detected in fecal SCFAs between intervention and control group. A significant time by treatment interaction was also observed for the relative abundance of fecal *Bifidobacteria* (P = 0.0001), *Lactobacilli* (P = 0.001) and total bacterial count (P = 0.008), which were all elevated after consumption of whole grain oat granola.
Keenan, 1991(3)	United States	Yes	Cross-over	145	No information	Adults with elevated cholesterol	No information	6 (2 periods)	56g oat daily	Wheat cereal	Significant higher self-rating in intestinal gas production and looser stools in oat bran. Significantly higher frequency of constipation in wheat cereal.
Johansson, 1998(4)	Sweden	Yes	Parallel	48	11 (23.0)	Healthy adults	36.5 (11)	3	3g oat fermented in *Lactobacillus plantarum* daily	Pure rose hip drink	Significant increase in short chain fatty acids and growth of *Bifidobacteria* and *Lactobacilli*. During the period of intake the volunteers in the with the lactobacillus group experienced a significant increase in stool volume, a significant decrease in flatulence and slightly softer stools
Martenson, 2005(5)	Sweden	Yes	Parallel	56	24 (42.8)	Healthy adults	55 (9)	8	84g oat based, 84g ropy oat-based daily	84g condensed milk	Significant increase of *Bifidobacterium* after administration of fermented, ropy, oat-based product. No effect was found on the fecal flora for the group eating oat-based product.
Pitkala, 2007(6)	Finland	Yes	Parallel	209	No information	Elderly nursing home residents	84.7	28	Fermented oat drink with l0^{9}CFU daily	Fermented oat drink without viable bacteria	The subjects receiving the *B.longum* product and the *B.*

								Bifidobacterium longum strains or 2) 10^9 CFU/day *Bifidobacterium lactis* Bbl2		*lactis* Bbl2 product had more frequent bowel movements than those receiving placebo.
Berggren, 2003 (7)	Sweden	Yes	Parallel	69	No information	Healthy pediatric population	6mos-3yrs	3	100g of oat fermented with *L. plantarum* daily	100g of oat daily	No significant differences in fecal bacterial counts. No difference in reported intestinal function variables.
Duysburgh, 2021 (8)	Belgium	Yes	Cross-over	34	No information	Adults with elevated cholesterol	18-65	6 (2 periods)	40g cooked old fashioned oats daily	40g cream of rice daily	Significant increase in *Lactobacillus* at end of intervention compared to control. No significant increase in *Bifidobacterium*. No significant difference in plasma SCFAs between intervention vs control.
Ye, 2020 (9)	China	Yes	Parallel	28	13 (46.2)	Adults with elevated cholesterol	47.6 (1.7)	45d	80g oat meal daily	80g refined rice daily	No significant difference in the alpha and beta diversty of the gut microbiota after intervention. There is an observed dominant phylum shift from Bacteroides to Firmicutes with observed significant increase in *Subdoligranulum, Blautia* and *Erysipelatoclostridium* while a decrease *Odoribacter, Aliihoeflea* and *Pelagibacterium* in the oat meal group.
Pino, 2021 (10)	Chile	Yes	Parallel	37	9 (24.3)	Adults with type 2 diabetes	50.9 (5.5)	12	5g oat beta-glucan daily	5g mcellulose daily	There was an observed significant treatment and interaction effect with Firmicutes, Bacteroidetes and Verrucomicrobia decreased in beta-glucan with only Verrucomicrobia showing a significant interaction. The population of *Lactobacillus spp* and *Bifidobacterium* significantly decreased in the beta-glucan group. There was significantly lower butyrate producing bacteria in the beta-glucan group while increased in control.
Hakkola, 2020 (11)	Finland	Yes	Cross-over	13	7 (50.0)	Healthy adults	26.8 (4.2)	24-48hrs (3 periods)	Oat bran concentrate treated with degrading enzyme preparation at 1 or 50 nkat/β-glucanase gdm daily	Oat bran concentrate daily	The perceived wellbeing between the meals were comparable and was not affected by the molecular weight of β glucan. Most common symptoms reported were flatulence and constipation. There were gender difference observed but mainly focused on experienced pain.

GI, gastrointestinal; RCT, randomized controlled trial; SCFA, short chain fatty acid; SD, standard deviation

Supplemental Table 2: Characteristics of non-randomized trials on oat intake conducted in individuals without gastrointestinal diseases

Lead Author, Publication Year (Supplemental Reference)	Location	Randomization Yes/No	Study design	Sample size	Male, n (%)	Health status/study population	Mean Age (SD), y	Duration (weeks)	Intervention characteristics	Control Characteristics	The most important findings
Sturtzel, 2008(12)	Austria	No	Parallel	30	No information	Elderly	85.3 (10.5)	12	18g of oat daily	Usual diet	The usage of laxatives was reduced significantly for those taking oats.
Nilsson, 2008(13)	Sweden	No	Cohort	25	10 (40.0)	Healthy adults	24 (1.3)	12	40g oat bran daily	None	There was significant increase in total carboxylic acids from 8 weeks. Acetic, butyric and propionic and isobutyric acid were significantly increased by week 8.
Valeur, 2015(14)	Norway	No	Cohort	10	2 (10.0)	Health adults	22-49	1	60g oatmeal daily	None	The excretion of SCFA did change significantly following the intake of oat.
Paruzynski, 2019(15)	United States	No	Cohort	33	18 (55.0)	Healthy pediatric population	7-12	2	42.5g instant oatmeal daily	None	No statistical difference in consistency and stool frequency. Increased dietary fiber consumption was noted.
Valle-Jones, 1995(16)	United Kingdom	No	Cohort	50	18 (36.0)	Elderly	70.3 (7)	12	80.8g oat bran daily	None	Improved bowel frequency, stool consistency and less pain in defecation.
Kajs, 1997(17)	United States	No	Cohort	37	No information	Healthy adults	No information	48hr	110g oats daily	Sorbitol	Low producers of methane reported significant increase in bloating and flatulence compared to basal diet
Li, 2017(18)	China	No	Cohort	26	22-35 yrs old	Healthy adults	No information	3	Oat	Rice and Wheat	Changes in staple carbohydrate food altered gut microbial community. Oat favored the growth of *Bifidobacterium*.

GI, gastrointestinal; RCT, randomized controlled trial; SCFA, short chain fatty acid; SD, standard deviation

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Supplemental Table 3: Characteristics of randomized controlled trials with oat intake conducted in individuals with celiac disease and ulcerative colitis.

Lead Author, Publication Year (Supplemental Reference)	Location	Randomization Yes/No	Study design	Sample size	Male, n (%)	Health status/study population	Mean Age (SD), y	Duration (weeks)	Intervention characteristics	Control Characteristics	Outcome Measures	The most important findings
Hogberg, 2004(19)	Sweden	Yes	Parallel	116	54 (46.5)	Pediatric population, newly diagnosed CeD	6.5 (4.6)	52	25-50g of oat daily	GFD	Small bowel biopsy, IgA AGA, IgG and IgA EMA, IgA TGA, total serum IgA	No significant difference in the gut histopathology. No difference in the IgA EMA titres, TGA positivity between groups. Oats in GFD does not prevent normalization of the gut mucosa or on the serology markers.
Peraaho, 2004(20)	Finland	Yes	Parallel	39	10 (25.6)	Adults with CeD	46.4 (11.7)	52	50g of oats daily	GFD	Small bowel biopsy, EMA, TGA, GSRS	No significant difference in small bowel histopathology. No significant difference in gastrointestinal symptoms except for the increased rating with diarrhea in the oat group. No significant differences in the serological markers.
Lionetti, 2018(21)	Italy	Yes	Cross-over	129	53 (29.9)	Pediatric population with CeD	9.2 (3.51)	60	15g oats daily for 3-6yrs old 25g oats daily for 7-10 years old 40g oats daily for 11-16 years old	GFD	EMA,TGA, anti-avenin antibodies, intestinal permeability test, GSRS	No significance difference in the GSRS results. No direct treatment effect was found significantly different from the clinical, serological and mucosal variables.
Holm, 2006(22)	Finland	Yes	Parallel	32	12 (37.5)	Pediatric population with CeD	11.8 (2.3)	104	45g of oats daily	20g of gluten daily	Small bowel biopsy, EMA, TGA, small bowel mucosal HLA DR expression	Oat containing GFD did not prevent small bowel mucosal recovery in relapsed and newly detected celiac disease. Serum EMA and tTGA decreased overtime with the oat containing GFD
Janatuinen, 1995(23)	Finland	Yes	Parallel	92	24 (26.0)	Adults with CeD	45.07 (11.70)	26 (remission) 52 (newly diagnosed)	50-70g oats daily with GFD	GFD	Small bowel biopsy	There was no worsening in the gut morphology across diet groups.
Tjellstrom, 2014 (24)	Sweden	Yes	Parallel	69	23 (33.0)	Pediatric population with CeD	7.15 (3.70)	52	25-50g oats daily with GFD	GFD	Fecal SCFAs	There was significantly higher acetic acid, butyric acid and total SCFA among pediatric population taking oats after 1 year of treatment.
Sjoberg, 2014(25)	Sweden	Yes	Parallel	28	12 (42.8)	Pediatric population, newly diagnosed CeD	5.06 (4.2)	52	20g (3-43g) of oat daily	GFD	Small bowel biopsy, IgA AGA, IgG and IgA EMA, IgA TGA, total serum IgA, mRNA expression of immune	The immune status of the small intestines of pediatric population with CeD has not normalized after taking oats.

											effector molecules and tight junction proteins	
Hollen, 2006(26)	Sweden	Yes	Parallel	116	54 (46.5)	Pediatric population with CeD	6.5 (4.6)	52	5-40g of oat daily	GFD	Anti-avenin antibodies	There was no significant difference in IgA/IgG anti-avenin antibodies for both groups.
Koskinen, 2009(27)	Finland	Yes	Parallel	23	16 (69.5)	Pediatric population with CeD	12.75 (2.85)	104	45g of oats daily	Gluten challenge but reverted to GFD with oats once relapse is observed	Small bowel biopsy, anti-transglutaminase antibodies, nitric oxide	There was no significant change in the intensity of mucosal IgA deposits in the 2 year trial. All patients had negative anti-TG2 after 2 years. Nitric oxide levels were high in four of the analyzed samples.
Janatuinen, 2000(28)	Finland	Yes	Parallel	92	17 (31.5)	Adults with CeD	45.07 (11.70)	52	50-70g oats daily	GFD	Small bowel biopsy, AGA, anti-reticulin antibodies	There was no significant difference between study groups in terms of the antibodies and IELs.
Kemppainen, 2008 (29)	Finland	Yes	Parallel	32	13 8 (40.6)	Adults with CeD	47 (na)	52	100g intake of unkilned oats daily	100g intake of kilned oats daily	Small bowel biopsy, anti-endomysium antibodies, gastrointestinal symptoms	No significant difference in the histopathology of the small intestine. No significant changes in self-reported gastrointestinal symptoms but with a tendency towards abdominal distension.
Nyman, 2020 (30)	Sweden	Yes	Parallel	130	58 (44.6)	Adults with UC	46.5 (11.6)	24	60g of oat bran (6g beta-glucan) daily	Low fiber wheat products (<0.5g beta-glucan) daily	Clinical and endoscopic relapse, SCFAs, GSRS and subjective health	No significant difference in the relapse rate between the 2 groups. No significant difference in serum and fecal total SCFAs but significantly higher in isobutyric acid in the intervention group and a significant increase (30%) in butyrate after the intervention. There was no significant difference in GSRS between oat vs control and before and after intervention. There was a significant higher diarrhea in oat group, during week 8 and 16 but was eventually similar in week 24.

AGA, anti-gliadin antibodies; CeD, celiac disease; EMA, endomysium antibodies; GFD, gluten free diet; GSRS, gastrointestinal symptom rating scale; HLA DR, human leukocyte antigen-DR isotype; IgA, immunoglobulin A; IgG, immunoglobulin G ; IBD, Inflammatory bowel disease; IEL, intra-epithelial lymphocytes; mRNA, messenger ribonucleic acid; SCFA, short chain fatty acid; TGA, transglutaminase antibodies; UC, ulcerative colitis

Supplemental Table 4. Characteristics of non-randomized trials conducted in individuals with celiac disease and ulcerative colitis.

Lead Author, Publication Year (Supplemental Reference)	Location	Randomization Yes/No	Study design	Sample size	Male, n (%)	Health status/study population	Mean Age (SD), y	Duration (weeks)	Intervention characteristics	Control Characteristics	Outcome Measures	The most important findings
Storsud 2003 a (31)	Sweden	No	Cohort	20	8 (40.0)	Adults with CeD	41 (14)	104	100g rolled oats daily	Gluten free diet	Gastrointestinal symptoms	The symptoms recorded were mild. Flatulence was increased at the start particularly to individuals with baseline low fiber intake.
Hoffenberg, 2000(32)	United States	No	Cohort	10	5 (50.0)	Pediatric population with CeD	6.8 (4)	26	42 g of instant oat daily	None	Small bowel biopsy, TGA	There was significant decrease in intestinal biopsy score, IEL count, tTG titer and number of symptoms.
Storsud, 2003 b (33)	Sweden	No	Cohort	20	8 (40.0)	Adult with CeD	41	104	100g oats daily	None	Small bowel biopsy, gastrointestinal symptoms	No changes were seen in routine histology. No significant changes in the reported gastrointestinal symptoms
Srinivasan, 1996 (34)	Ireland	No	Cohort	10	No information	Adults with CeD	No information	12	50g oats daily	None	Small bowel biopsy, EMA, AGA	All patients remained asymptomatic, no changes in EMA and AGA and no morphological changes in the histology.
Lundin, 2003 (35)	Norway	No	Cohort	19	No information	Adults with CeD	No information	12	50g oats daily	None	Small bowel biopsy, IEL, EMA, AGA, TGA, gastrointestinal symptoms	No mucosal changes after 12 weeks on 16/19. All patients had negative IgA anti tTG and IgA-EMA after the challenge. Introduction of oats led to changes in bowel habits and some abdominal discomfort for several patients.
Dissanyake, 1974 (36)	United Kingdom	No	Cohort	4	No information	Adults with CeD	No information	4	40-60g oats daily	None	Small bowel biopsy	All patients remain symptom free. No difference in histology before after oat challenge.
Baker, 1976 (37)	United Kingdom	No	Cohort	22	15 (68.0)	Adults with CeD	43.4 (13)	26	60g oats daily, 120 g barley (another arm)	None	Gastrointestinal symptoms, xylose test	Three of twelve develop gastrointestinal symptoms from eating oats but remitted after return to GFD.
Sey, 2011 (38)	Canada	No	Cohort	15	2(14.0)	Adults with CeD	57 (9)	12	350g/wk	None	Small bowel biopsy, IEL, TGA, gastrointestinal symptoms	No significant changes in the morphology score, all TGA remains negative and no significant in gastrointestinal symptoms
Cooper, 2012 (39)	United Kingdom	No	Cohort	46	16 (34.0)	Adults with CeD	18-76	52	50g daily	None	Small bowel biopsy, EMA, TGA, immunohistochemistry	In 42/46 participants had histological lesions improved or not changed, 44/46 had negative

												EMA, 44/46 had negative tissue TGA.
Srinavasan, 1999 (40)	Ireland	No	Cohort	30	8 (26.0)	Adults with CeD	18-63	12	50g daily	No information	Immunohistochemistry via lactase expression, EMA, TGA	Lactase expression for CeD patients in remission taking oats was preserved while those who have active celiac disease are negative.
Hardy, 2014 (41)	Australia	No	Cohort	63	15(23.0)	Adults with CeD	48 (10.5)	12	100g oats daily	Wheat, barley and rye	Avenin specific T cell responses	Avenin specific responses were observed in 8% of study participants.
Srinvasan, 2006 (42)	Ireland	No	Cohort	10	No information	Adults with CeD	No information	12	50g oats daily	None	Small bowel biopsy, immunohistochemistry	No histological changes seen in those who underwent oats challenge. The distribution of intestinal HLA-DR expression was not affected by oat exposure.
Emanuel, 2007 (43)	Russia	No	Cohort	35	No information	Pediatric population with CeD	9mos-15	No informati on	Oat	Non-CeD pediatric population	Avenin IgA and IgG	Local Russian and foreign variety induced immune response compared among pediatric population with CeD
Hallert, 2003(44)	Sweden	No	Cohort	22	12 (55.0)	Adults with UC	44	12	60g of oat bran added to usual diet	Usual diet	SCFA	Significant in butyrate concentration after 12 weeks. Oat bran supplement showed no other SCFA profile difference. No relapse of signs and symptoms for UC and no increase in gastrointestinal complaints

AGA, anti-gliadin antibodies; CeD, celiac disease; EMA, endomysium antibodies; GFD, gluten free diet; GSRS, gastrointestinal symptom rating scale; HLA DR, human leukocyte antigen-DR isotype; IgA, immunoglobulin A; IgG, immunoglobulin G ; IBD, Inflammatory bowel disease; IEL, intra-epithelial lymphocytes; mRNA, messenger ribonucleic acid; SCFA, short chain fatty acid; TGA, transglutaminase antibodies; UC, ulcerative colitis

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Supplemental Table 5. Characteristics of observational studies with oat intake conducted in individuals with celiac disease and Crohn's disease.

Lead Author, Publication Year (Supplemental Reference)	Location	Study design	Sample size	Population characteristics	Outcome assessment	The most important findings
Janatuinen, 2002 (45)	Finland	Cohort	63	Adults with CeD	Small bowel biopsy, , AGA, anti-reticulin antibodies	No difference in duodenal biopsy, serological titers and inflammatory cell infiltration between those consuming oats and standard GFD for five years.
Kemppainen, 2007 (46)	Finland	Cohort	42	Adults with CeD	Small bowel biopsy, EMA, small bowel mucosal HLA DR expression	There was no difference in the histologic and histomorphometric analyses of small intestinal biopsies.
Nylund, 2020 (47)	Finland	Cohort	43	Adults with CeD and non-CeD gluten sensitive	Fecal microbiota composition, gut symptoms and SCFAs	The most common symptoms reported were flatulence, bloating and lower abdominal pain and significantly higher among non-CeD gluten sensitive group. Total microbiota profiles were comparable with abundance of *Bifidobacterium* among control compared to CeD and non-CeD gluten sensitive groups. Total SCFAs were comparable across the groups with higher relative abundance of acetate among the control with no significant difference in proportions for propionate and butyrate across the groups.
Tuire, 2012 (48)	Finland	Cross-sectional	177	Adults with CeD	Small bowel biopsy, gastrointestinal symptom rating, EMA, TGA	Consumption of oats was contributing to persistent inflammation of the small intestine.
Tapsas, 2014 (49)	Sweden	Cross-sectional	316	Pediatric population with CeD	Gastrointestinal symptom	Most patients did not report any adverse reaction to long term consumption of oats
Kaukinen, 2013 (50)	Finland	Cross-sectional	106	Adults with CeD	Small bowel biopsy, gastrointestinal symptom rating, EMA, TGA	About 97% of individuals had normal villous structure. No difference in gastrointestinal symptoms. All were negative for the serologic antibodies.
Aaltonen, 2017 (51)	Finland	Cross-sectional	869	Adults with CeD	Gastrointestinal symptom reporting scale, EMA, TGA	No significant difference in gastrointestinal symptoms and serology tests on either groups
Van Kruiningen, 2005 (52)	Belgium	Cross sectional	217	Families with Crohn's disease	Environmental factors that can trigger the onset of CeD	Less frequent consumption of oats were seen among those with Crohn's disease before disease onset.

AGA, anti-gliadin antibodies; CeD, celiac disease; EMA, endomysium antibodies; GFD, gluten free diet; HLA DR, human leukocyte antigen-DR isotype; TGA, transglutaminase antibodies;

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Supplemental Table 6. Characteristics of *in vitro* studies with oat conducted in individuals with celiac disease.

Lead Author, Publication Year (Supplemental Reference)	Location	Study design	Population characteristics	Sample characteristics	Intervention characteristics	Measurements	The most important findings
Picarelli, 2001 (53)	Italy	*In vitro*	Adults with CeD	Duodenal biopsy specimen	Oats	In vitro EMA	No EMAs were detected in any specimen cultured with peptic-tryptic digest of avenin.
Silano, 2014 (54)	Italy	*In vitro*	Pediatric population with CeD	Duodenal biopsy specimen	Oat cultivars	Cell agglutination test, transepithelial resistance	Some oat cultivars are able to activate the Tg2-mediated events in CeD inflammation
Hollen, 2003 (55)	Sweden	*In vitro*	Pediatric population with CeD	Serum	Oat prolamines	AGA, anti-avenin antibodies	Pediatric population with CeD had significantly higher antibodies against avenin compared to control and correlated significantly with levels of antibodies for gliadin
Maglio, 2011 (56)	Italy	*In vitro*	Persons with CeD	Duodenal biopsy specimen	Oat varities	Phosphorylation of extracellular signal-regulated kinase and transepithelial electrical resistance	*Avena genziana* and *Avena potenza* did not induce any related pathogenesis seen in persons with CeD
Comino, 2011 (57)	Spain	*In vitro*	Pediatric population with CeD	Serum	Oat	Tcell proliferation and interferon γ production	There was a direct correlation of the reactivity of monoclonal antibodies to the immunogenicity of different prolamines in CeD patients.
Arentz-Hansen, 2004 (58)	Norway	*In vitro*	Adults with CeD	Duodenal biopsy specimen	Oats	Oats avenin specific and reactive intestinal T cell lines	Some persons with CeD have avenin reactive T cells that can cause mucosal inflammation
Kilmarin, 2003 (59)	Ireland	*In vitro*	Adults with CeD	Duodenal biopsy specimen	Oat flour	Interferon γ and interleukin 2 for immunologic activity	No significant increase in interferon γ and interleukin 2 for CeD mucosa.
Kilmartin, 2006 (60)	Ireland	*In vitro*	Adults with CeD	Duodenal biopsy specimen	Avenins prepared from oats	T cell lines and interleukin 2 and Interferon γ	There is stimulation of T cell lines but no mucosal lesions among individuals with CeD

AGA, anti-gliadin antibodies; CeD, celiac disease; GFD, gluten free diet; EMA, endomysium antibodies

Supplemental Table 7. Characteristics of *in vitro* studies with oat conducted in individuals without gastrointestinal diseases.

Lead Author, Publication Year (Supplemental Reference)	Location	Study design	Population characteristics	Sample characteristics	Intervention characteristics	Measurements	The most important findings
Queenan, 2007 (61)	Canada	*In vitro* study within an RCT	Healthy adults	Fecal sample	Oat fibers, inulin, guar gum	Short chain fatty acids	Oat and inulin produced significantly more total SCFA than guar gum. Acetate was the major contributor followed butyrate.
Van den Abbeele, 2018 (62)	Belgium	*In vitro*	Healthy adults	Fecal sample	Oat products	Microbial metabolic activity, microbial community analysis	Increased *Bifidobacterium* levels, increased production of metabolites such as lactate, acetate and propionate. Decreased production branched-short chain amino acids and ammonium.
Kristek, 2019 (63)	United Kingdom	*In vitro*	Healthy adults	Fecal sample	Oats	Microbial metabolic activity, microbial community analysis	Significantly increased the abundance of Proteobacteria after 10hrs and *Bacteroides* after 24hrs. There was significant increases in short chain fatty acids. The relative abundance of *Bifidobacterium* was significantly increased.
Hughes, 2008 (64)	United Kingdom	*In vitro*	Healthy adults	Fecal sample	Oat and barley	Microbial metabolic activity, microbial community analysis	Oats significantly increased the population of Clostridium subgroup. B-glucan did not display apparent prebiotic potential. The SCFA profile (51 : 32 : 17; acetate : propionate : butyrate) was considered propionate-rich.
Gamage, 2017 (65)	Australia	*In vitro*	Healthy infants	Fecal sample	Cereal products including oats	Microbial metabolic activity, microbial community analysis	There was significant change in abundance upon the addition of oats to Veillonellaceae. Fructose and mannose metabolism showed significantly decreased relative abundance in samples supplemented with oats.
Connolly, 2010 (66)	United Kingdom	*In vitro*	Healthy adults	Fecal sample	Whole grain oats	Microbial metabolic activity, microbial community analysis	Significant changes in the total bacterial population after 24hr incubation for oat flake sized 0.85-1mm. Significant increases in *Bifidobacterium* in the latter stages of fermentation. Fermentation resulted to propionate rich SCFA profile with significant increase in butyrate.
Brahma, 2017 (67)	United States	*In vitro*	Healthy individual	Fecal sample	Oats	Microbial metabolic activity, microbial community analysis	Moisture content of oats affect the initial fermentation and the SCFA production.
Titgemeyer, 1991 (68)	United States	*In vitro*	Heathy adults	Fecal sample	Oats and other fiber sources	Microbial metabolic activity	Oats have lower SCFA production compared citrus pectin, soy fiber, sugarbeet fiber and pea fiber.
Roye, 2019 (69)	Belgium	*In vitro*	Healthy adults	Fecal sample	Oats, wheat, rye an maize bran	Microbial metabolic activity	Oat bran β-glucan content was initially rapidly fermented and has been associated to the high water-holding capacity of the bran which makes it accessible to the microbiota. Incorporation of oat bran in food products can possibly increase the viscosity in the gastro-intestinal tract and reduce the blood glucose peak height after a meal and induce a faster and longer feeling of satiety.

Connolly, 2012 (70)	United Kingdom	*In vitro*	Healthy adults	Fecal sample	Whole grain oat-based cereals	Microbial metabolic activity, microbial community analysis	Significant increase in total SCFA and dominance of acetate. Total bacterial population increased with associated proliferation of *Bifidobacterium.*
Nordlund, 2012 (71)	Finland	*In vitro*	Healthy adults	Fecal samples	Oats, wheat, rye bran	Microbial metabolic activity	Oat samples had high content of water-extractable dietary fiber but the fermentation was slower compared to rye.
Lebet, 1998 (72)	Switzerland	*In vitro*	Healthy adults	Fecal samples	Oat bran, pea hulls, apple pomace, celery cell walls	Microbial metabolic activity	Oat bran fermentation was characterized by fast degradation of mixed linked β glucans and starch.
Kim, 2009 (73)	United States	*In vitro*	Healthy adults	Fecal Samples	Oat flours	Microbial metabolic activity	Acetate, propionate and butyrate were the main SCFA produced with no significant difference among oat lines. The total SCFA was significantly increased compared to negative control.
Pham, 2018 (74)	Switzerland	*In vitro*	Healthy adults	Fecal samples	Oat bran, chicory root, maltodextrin, inulin, xylo-oligosaccharide	Gut barrier integrity, mucus production and immune parameters	Oat bran β-glucan improved the gut barrier integrity application of an apical stressor.
Tsitko, 2019 (75)	Finland	*In vitro*	Health adults	Fecal samples	Oat, linseed, rye	Microbial metabolic activity, microbial community analysis	Oat fibers produced the highest increased of Lactobacillus group and led the largest drop of butyrate-producing bacteria. Oat fibers was seen to have bifidogenic effect.
Hernot, 2008 (76)	United States	*In vitro*	Healthy adults	Fecal samples	Oat, barley, corn, rice, wheat	Microbial metabolic activity	Processing oat increased the total SCFA and mainly due to the acetate production.
Wood, 2002 (77)	Canada	*In vitro*	Healthy adults	Fecal samples	Oat, wheat	Microbial metabolic activity	Total SCFA was greatest with oat β-glucan . Oat bran and oat β-glucan produced the most acetate, propionate and butyrate after 24hr fermentation.
Kedia, 2009 (78)	United Kingdom	*In vitro*	Healthy adults	Fecal samples	Oat bran	Microbial metabolic activity, microbial community analysis	Population of anaerobes decreased with oat brans but increased population of *Bifidobacterium*. Oat based media produced predominately acetate SCFA and high amounts of propionate compared to glucose and fructo-oligosaccharide.
Yang, 2013 (79)	United States	*In vitro*	Healthy and obese adults	Fecal samples	Oat, corn, rice, rye and wheat	Microbial metabolic activity	No difference in SCFAs between the normal weight vs obese group. Acetate dominated the SCFA oat fermentation.
Slade, 1987 (80)	United Kingdom	*In vitro*	Healthy adult	Fecal samples	Oat spelt xylan, larchwood xylan, wheat bran, sugar beet, apple cell wall	Microbial community analysis	*Bacteroides, Fusobacterium, Bifidobacterium, Acidaminococcus, Ruminococcus, Peptococcus, Clostridium*, unidentified gram negative rods and heat resistant rods were found to be able ferment oat spelt xylan. Different bacterial populations grew from different fiber sources.
Dong, 2020 (81)	China	*In vitro*	Healthy adults	Fecal samples	Oat β-glucan	Microbial metabolic activity, microbial community analysis	The oat β-glucan significantly increased the total concentration of SCFAs compared to the blank control with the microwave processed whole grain oat producing the highest concentration. The oat β-glucan had lower relative abundance of *Escherichia-Shigella* and increased in *Klebsiella , Enterococcus* and *Bacteroides* compared to blank controls. *Lactobacillus, Enterococcus , Blautia, Dialister, Bacteroides* and *Bifidobacterium* showed significant changes within the different oat β-glucan. Moreover, the oat β-glucan samples had similar gut microbiota composition but

							had significant differences in *Escherichia-Shigella, Lactobacillus, Enterococcus* and *Dialister.*
Glei, 2021 (82)	Germany	*In vitro*	Healthy adults	Fecal samples	Oat flakes	Microbial metabolic activity	Significant increased (2.6X) in SCFAs particularly butyrate in oat vs control. Oat fermentation supernatants increased the mRNA expression of CAT, SOD2 and GSTP1 and decrease in GPX1 which indicates chemopreventive potential for in colon cancer development.
Akkerman, 2020 (83)	Netherlands	*In vitro*	Healthy infants	Fecal samples	Oat β-glucan	Microbial metabolic activity, microbial community analysis	Increased of *Enterococcus , Bacillus, Escherichia-Shigella* and *Clostridium sesu stricto 1* with the presence of native oat beta-glucan in 2 week old infant fecal slurries. There was increased of *Enterococcus* and *Escherichia-Shigella* in 8 week old infant fecal slurries. There was negligible total SCFAs after 26hrs fermentation compared to control. Lactate, acetate, propionate and butyrate were present with higher production among the 2 week old fecal slurries compared to the 8 week old.
Wang, 2021 (84)	United States	*In vitro*	Healthy adults	Fecal samples	Whole grain oat	Microbial metabolic activity	Feces collected from individuals who had low DH-AVA secretion had weak capacity to metabolize AVA. There was significant presence of *Faecalbacterium* among AVA metabolizers in sequencing results.
Duysburgh, 2021 (8)	Belgium	*In vitro*	Adults with elevated cholesterol	Fecal samples	Pre-cooked oat flour and old fashioned oats	Microbial metabolic activity, microbial community analysis	Luminal levels of *Lactobacillus* and *Bifidobacterium* with supplementation of POF and OFO. At family levels, there was increased in Bifidobateriaceae, Lactobacillaceae with increases in Enterococcaceae, Enterobactriaceae and Prevotellaceae in luminal proximal colon and increases of Akkermansiaceae and Enterobacteriaceae in distal colon. POFconsistently increased Veillonaceae and decreased Bacteroidaceae and Lachnospiraceae. OFO increases Acidaminoccaceae and Prevotellacea while decreasing Bacteroidacea. Both POF and OFO increased acetate, propionate and butyrate compared to control with POF significantly increase butyrate levels relative to OFO.

AVA, aventhramides; DH-AVA, dihydro-AVA; OFO, old fashioned oats; POF, pre-cooked oat flour; SCFA, short chain fatty acid

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Supplemental Table 8. Quality assessment of randomized controlled trials with oat intake using the Risk of Bias tool for RCT.

Lead Author, Publication Year (Supplemental Reference)	Domain 1: Randomization process	Domain 2: Deviations from intended interventions	Domain 3: Missing outcome data	Domain 4: Measurement of the outcome	Domain 5: Selection of the reported result	Overall[1]
Cicero, 2020 (1)	Some concerns	Low	Low	Low	Low	Some concerns
Connolly, 2016 (2)	Some concerns	Low	Low	Low	Low	Some concerns
Hogberg, 2004 (19)	Some concerns	Some concerns	Some Concerns	Low	Low	Some concerns
Holm, 2006 (22)	High	Some concerns	Low	Low	Some concerns	High
Janatuinen, 1995 (23)	Some concerns	Some concerns	Low	Low	Some concerns	Some concerns
Johansson, 1998 (4)	Some concerns	Some concerns	Low	Low	Low	Some concerns
Keenan, 1991 (3)	Some concerns	High	High	Low	Some concerns	High
Lionetti, 2018 (21)	Low	Some concerns	Some Concerns	Low	Low	Some concerns
Martensson, 2005 (5)	Some concerns	Low	Low	Low	Low	Some concerns
Peraaho, 2004 (20)	Low	Some concerns	Low	Low	Some concerns	Some concerns
Hollen, 2006 (26)	Some concerns	Some concerns	Some Concerns	Low	Some concerns	Some concerns
Janatuinen, 2000 (28)	Some concerns	Some concerns	Low	Low	Some concerns	Some concerns
Koskinen, 2009 (27)	High	Some concerns	Low	Low	Some concerns	High
Pitkala, 2007 (6)	Some concerns	Low	Low	Low	Low	Some concerns
Sjoberg, 2014 (25)	Some concerns	Some concerns	Some Concerns	Low	Some concerns	Some concerns
Tjellstrom, 2014 (24)	Some concerns	Some concerns	Some Concerns	Low	Some concerns	Some concerns
Berggren, 2008 (7)	Some concerns	Low	Low	Low	Low	Some concerns
Kemppainen, 2008 (29)	Some concerns	Some concerns	Low	Low	Some concerns	Some concerns
Duysburgh, 2021 (8)	Some concerns	Low	Low	Low	Some concerns	Some concerns
Ye, 2020 (9)	Some concerns	Low	Low	Low	Some concerns	Some concerns
Pino, 2021 (10)	Some concerns	Low	Low	Low	Low	Some concerns
Nyman, 2020 (30)	Some concerns	Low	High	Low	Low	High
Hakkola, 2021 (11)	Some concerns	Low	Low	High	Low	High

[1] Risk of bias rating Low, Some Concerns, High

Supplemental Table 9. Quality assessment of observational studies with oat intake using Newcastle-Ottawa rating scale.

Lead Author, Publication Year (Supplemental Reference)	Selection	Comparison	Outcome	Overall quality
Janatuinen, 2002 (45)	***	*	**	6
Kemppainen, 2007 (46)	***	*	**	6
Aaltonen, 2017 (51)	**	*	**	5
Kaukinen, 2013 (50)	**	*	**	5
Tapsas, 2014 (49)	**	*	**	5
Tuire, 2012 (48)	**	**	**	6
Van Kruiningen, 2005 (52)	**	**	**	6
Nylund, 2020 (47)	***	**	**	7

Supplemental Table 10. Risk of bias assessment of the non-randomized trials with oat intake based on the National Heart Lung and Blood Institute Quality Assessment Tool for Before-After (Pre-Post) Studies.

Lead Author, Publication Year (Supplemental Reference)	1	2	3	4	5	6	7	8	9	10	11	12	Risk of bias (Total score)[1]
Hallert, 2003(44)	Y	Y	Y	N	NR	Y	Y	N	NR	Y	Y	NA	Moderate (8/11)
Nilsson, 2008(13)	Y	Y	Y	N	NR	Y	Y	N	Y	Y	Y	NA	Moderate (8/11)
Valeur, 2015(14)	Y	Y	Y	N	NR	Y	Y	N	Y	Y	N	NA	Moderate (8/11)
Paruzynski, 2019(15)	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	NA	Low (10/11)
Valle-Jones,1995(16)	Y	Y	Y	N	NR	Y	Y	N	NR	Y	N	NA	Moderate (6/11)
Hoffenberg, 2000(32)	Y	Y	Y	N	NR	Y	Y	N	NR	Y	N	NA	Moderate (6/11)
Storsud, 2003(33)	Y	Y	Y	N	NR	Y	Y	N	Y	Y	Y	NA	Moderate (8/11)
Srinivasan, 1996(34)	Y	Y	Y	N	NR	Y	Y	N	NR	Y	N	NA	Moderate (6/11)
Lundin, 2003(35)	Y	Y	Y	N	NR	Y	Y	N	NR	Y	N	NA	Moderate (6/11)
Dissanyake, 1974(36)	Y	Y	Y	N	NR	Y	Y	N	NR	Y	N	NA	Moderate (6/11)
Baker, 1976(37)	Y	Y	Y	N	NR	Y	Y	N	NR	Y	N	NA	Moderate (6/11)
Sey, 2011(38)	Y	Y	Y	N	NR	Y	Y	N	NR	Y	N	NA	Moderate (6/11)
Cooper, 2012(39)	Y	Y	Y	N	NR	Y	Y	Y	NR	Y	N	NA	Moderate (7/11)
Srinivasan, 1999(40)	Y	Y	Y	N	NR	Y	Y	Y	NR	Y	N	NA	Moderate (7/11)
Srinivasan, 2006(42)	Y	Y	Y	N	NR	Y	Y	Y	NR	Y	N	NA	Moderate (7/11)

[1] Risk of bias rating (Low (75-100%), Moderate (25-75%), or High (0-25%))

Supplemental Table 11. Risk of bias assessment of the non-randomized trials with oat intake based on the National Heart Lung and Blood Institute Quality Assessment Tool.

Author, Publication Year (Supplemental Reference)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Risk of bias (Total score)[1]
Kajs, 1997 (17)	NA	NA	NA	Y	NR	NR	NR	NR	NR	Y	Y	NR	Y	NA	Moderate (4/11)
Li, 2017 (18)	NA	NA	NA	Y	NR	NR	NR	NR	NR	Y	Y	NR	Y	NA	Moderate (4/11)
Sturtzel, 2008 (12)	NA	NA	NA	Y	NR	NR	NR	NR	NR	Y	Y	NR	Y	NA	Moderate (4/11)
Hardy, 2014 (41)	NA	NA	NA	Y	Y	NR	NR	NR	NR	Y	Y	NR	Y	NA	Moderate (5/11)
Storsud, 2003 (31)	NA	NA	NA	Y	NR	NR	NR	NR	NR	Y	Y	NR	Y	NA	Moderate (4/11)
Emanuel, 2007 (43)	NA	NA	NA	NR	NR	NR	NR	NR	NR	Y	Y	NR	Y	NA	Moderate (3/11)

[1] Risk of bias rating (Low [75-100%], Moderate [25-75%], or High [0-25%])

Supplemental Table 12. Quality assessment of *in vitro* with oat studies using the Toxicological data Reliability Assessment Tool.

Author, Publication Year (Supplemental Reference)	Test substance identification (4)	Test system characterisation (3)	Study design description (6)	Study results documentation (3)	Plausibility of study design and data (2)	Total	Risk of Bias[1]
Picarelli , 2001 (53)	3	3	5	3	2	16	Reliable w/o restrictions
Silano, 2014 (54)	4	3	6	3	2	18	Reliable w/o restrictions
Hollen, 2003 (55)	4	3	6	3	2	18	Reliable w/o restrictions
Maglio, 2011 (56)	4	3	5	3	2	17	Reliable w/o restrictions
Comino, 2011 (57)	4	3	6	3	2	18	Reliable w/o restrictions
Queenan, 2007 (61)	4	3	5	3	2	17	Reliable w/o restrictions
Van den Abbeele, 2018 (62)	4	3	6	3	2	18	Reliable w/o restrictions
Kristek, 2019 (63)	4	3	5	3	2	17	Reliable w/o restrictions
Hughes, 2008 (64)	4	3	6	3	2	18	Reliable w/o restrictions
Gamage, 2017 (65)	4	3	6	3	2	18	Reliable w/o restrictions
Connolly, 2010 (66)	4	3	5	3	2	17	Reliable w/o restrictions
Brahma, 2017 (67)	4	3	4	2	2	15	Reliable w/o restrictions
Titgemeyer, 1991 (68)	4	3	4	3	2	16	Reliable w/o restrictions
Roye, 2019 (69)	3	3	3	2	2	13	Reliable w/ restrictions
Connolly, 2012 (70)	4	3	4	3	2	16	Reliable w/o restrictions
Nordlund, 2012 (71)	4	3	5	2	2	16	Reliable w/o restrictions
Lebet, 1998 (72)	3	3	3	2	1	12	Reliable w/ restrictions
Kim, 2009 (73)	4	3	5	3	2	17	Reliable w/o restrictions
Pham, 2018 (74)	3	3	5	3	2	16	Reliable w/o restrictions
Tsitko, 2019 (75)	4	3	5	3	2	17	Reliable w/o restrictions
Hernot, 2008 (76)	3	3	4	3	2	15	Reliable w/o restrictions
Wood, 2002 (77)	3	3	6	2	2	16	Reliable w/o restrictions
Yang, 2013 (79)	3	3	5	3	2	16	Reliable w/o restrictions
Kedia, 2009 (78)	3	3	4	2	2	14	Reliable w/ restrictions
Arentz-Hansen, 2004 (58)	2	3	4	2	2	13	Reliable w/ restrictions
Kilmartin, 2003 (59)	3	3	5	3	2	17	Reliable w/o restrictions
Kilmartin, 2006 (60)	3	3	5	3	2	17	Reliable w/o restrictions
Slade, 1987 (80)	2	3	5	2	2	14	Reliable w/ restrictions
Dong, 2020 (81)	3	3	5	3	2	16	Reliable w/o restrictions
Glei, 2020 (82)	3	3	5	3	2	16	Reliable w/o restrictions

Akkerman, 2020 (83)	3	3	5	3	2	16	Reliable w/o restrictions
Wang, 2021 (84)	4	3	5	3	2	17	Reliable w/o restrictions
Duysburugh, 2021 (8)	3	3	6	3	2	17	Reliable w/o restrictions

[1] Total 15-18 means reliable without restrictions; 11-14 means reliable with restrictions; <11 and not all key criteria met means generally unrealiable,

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