



CONGRESO
DE LA
SOCIEDAD CHILENA DE OSTEOLÓGÍA
Y METABOLISMO MINERAL - SCHOMM

Lácteos e inflamación ¿mito o realidad?

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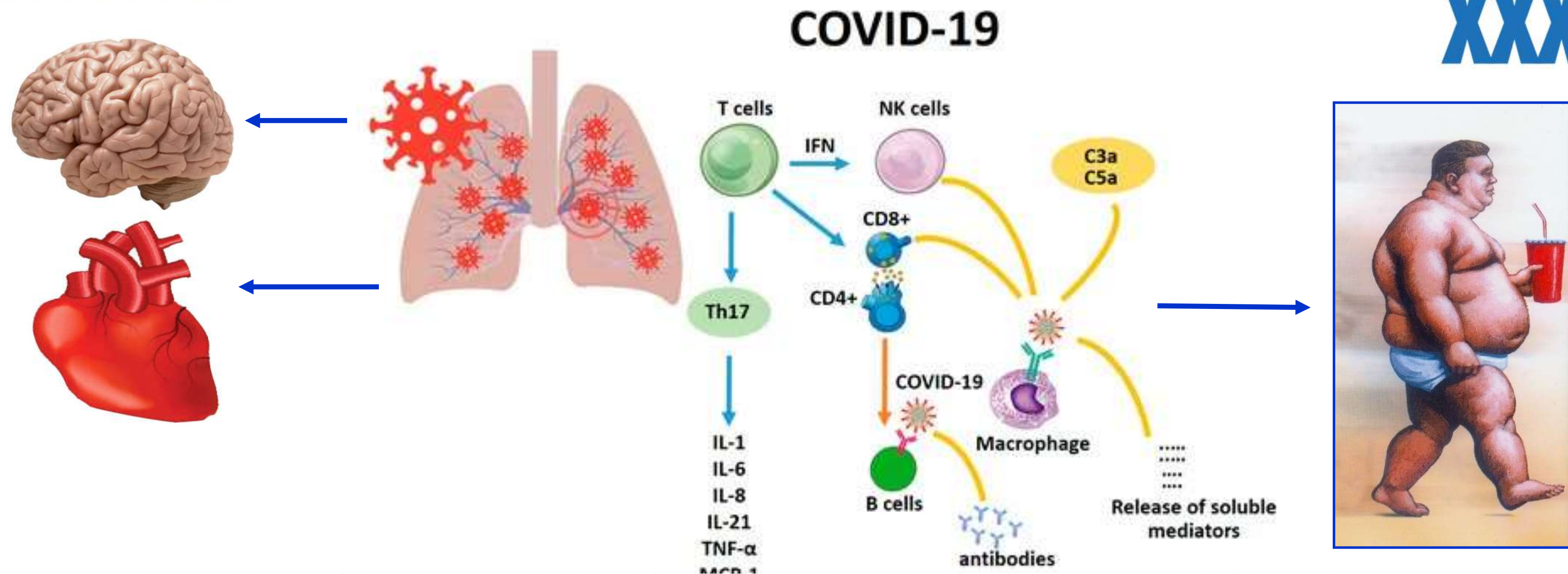
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Conflictos de Interés

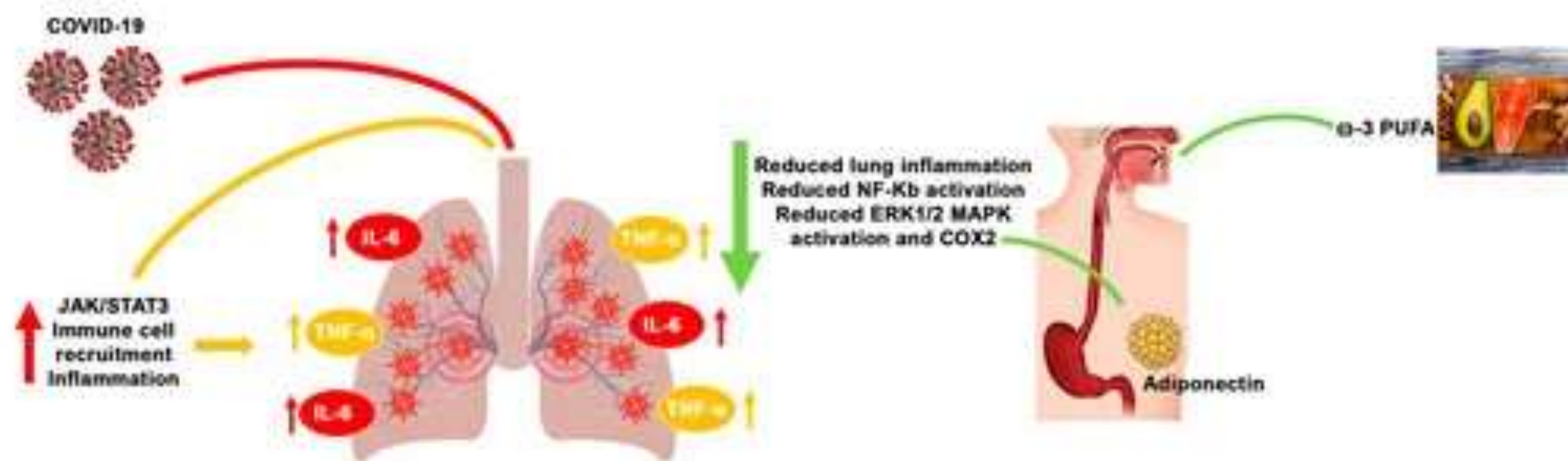
- Proyectos de investigación con fondos gubernamentales
- Proyectos de investigación con fondos privados (fundaciones o empresas)
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Productividad Científica

- 164 artículos científicos
- 21 capítulos de libros
- 24 proyectos de investigación



The hypothesis of diet intervention to improve COVID-19 outcomes



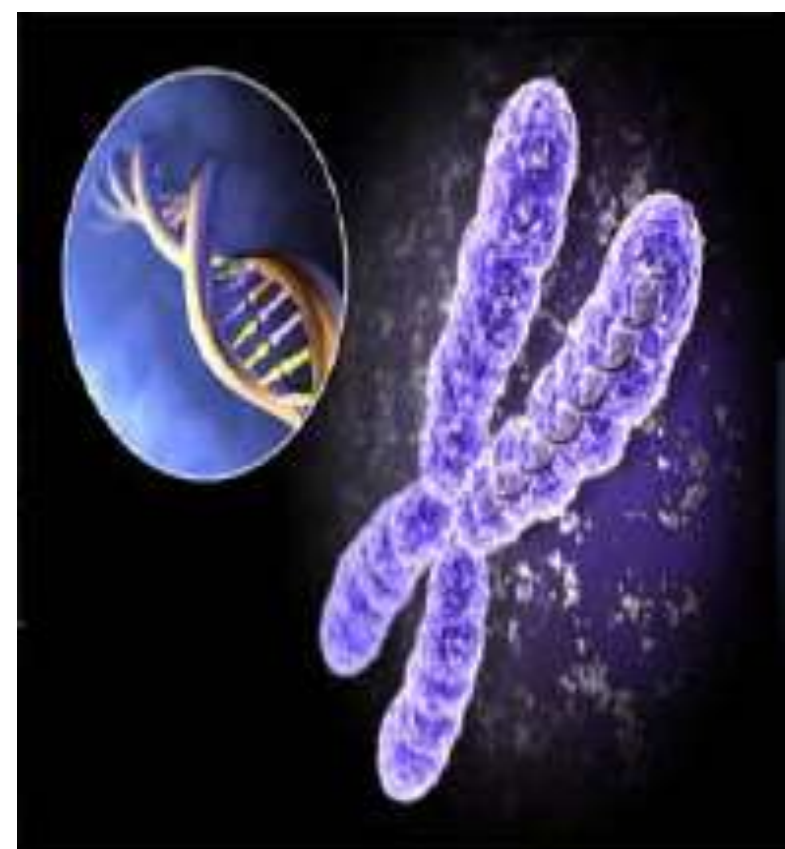
Factores Determinantes de la Salud

Medio Ambiente

Dieta

Genética

Sistema de Salud



LA MODIFICACION CUALITATIVA Y CUANTITATIVA DE CUALQUIERA DE
ESTOS FACTORES PUEDE MODIFICAR EL ESTADO DE SALUD

IMPACTO DE LA MODERNIDAD EN EL FENOTIPO DEL HOMO SAPIENS SAPIENS ¿OBESUS?



Evolución de la Dieta



**Alimentos de una dieta
del paleolítico**

**Alimentos para una
dieta saludable**



**Alimentos de una dieta
occidental moderna**



¿Porque se promueve el consumo de leche?

MAY 2019 • VOLUME 10 • SUPPLEMENT 2

AN
Advances in Nutrition
AN INTERNATIONAL REVIEW JOURNAL

**Role of Milk and Dairy Products in Health and
Prevention of Noncommunicable Chronic
Diseases: A Series of Systematic Reviews**



Supplement Coordinators:

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Published as a Supplement to Advances in Nutrition

- **Alimento nutricionalmente completo**
- **Buena fuente de energía y macronutrientes**
- **Alta calidad proteica**
- **Contenido y biodisponibilidad de Calcio y Fósforo**
- **Fuente menos costosa de proteína, Calcio y Vitamina D**



Dairy products

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Biológica, Univers
Instituto Politécni
Health, Ben-Gurio

ABSTRACT
Inflammation
environment
the immune
inflammatory
review of 52
products. An
significantly
subjects wer
inflammatory
allergic to bovine milk. Stratifying the data by product categories associated both low-fat and high-fat products, as well as fermented products, with an anti-inflammatory activity. Remarkably, the literature is characterized by a large gap in knowledge on bioavailability of bioactive nutrients. Future research should thus better combine food and nutritional sciences to adequately follow the fate of these nutrients along the gastrointestinal and metabolic axes.

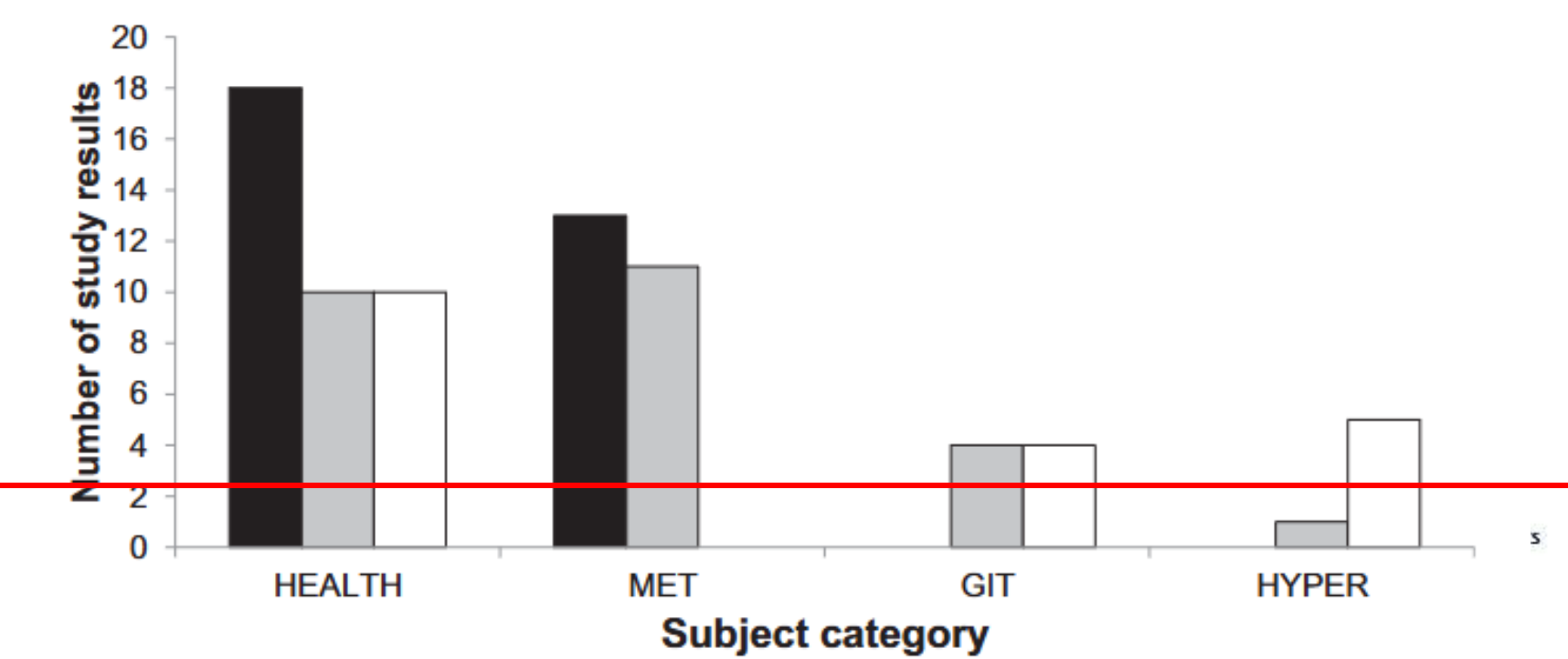


Figure 4. Distribution of the study results labeled as “anti-inflammatory”, “no effect”, and “pro-inflammatory” among the subject categories. Subject categories: HEALTH, healthy subjects; MET, subject with metabolic disorders including obesity; GIT, subjects with gastrointestinal disorders; HYPER, subjects with hypersensitivity, including allergy, to milk products. The color code indicates the direction of change of the inflammatory marker, i.e., significant anti-inflammatory change (black bars), no significant change (grey bars), and significant pro-inflammatory change (white bars).

Se estableció el índice de inflamación (IS) como una nueva herramienta para realizar una evaluación cuantitativa de estudios en humanos que investigan el impacto de los productos lácteos en la inflamación.

La revisión sugiere que los productos lácteos, en particular los fermentados, tienen propiedades antiinflamatorias en personas sin alergia a la leche, en particular en sujetos con trastornos metabólicos.

Dado que la relevancia clínica de los marcadores de inflamación es objeto de debate entre investigadores y autoridades sanitarias, aún queda por aclarar la aplicación de estos hallazgos a las directrices dietéticas.

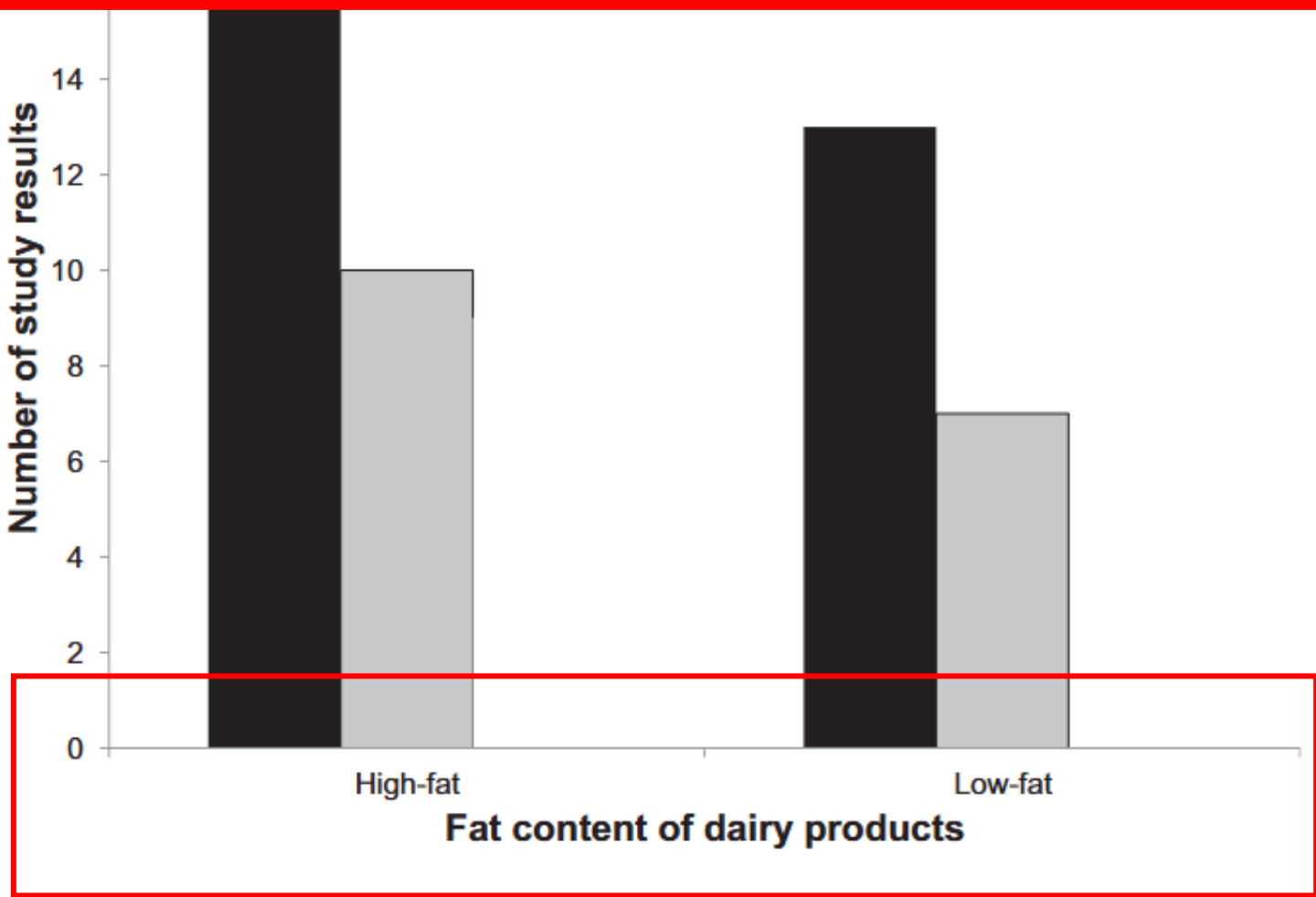


Figure 5. Distribution of the study results labeled as “anti-inflammatory”, “no effect”, and “pro-inflammatory” among the dairy product categories “high-fat” and “low-fat”. The color code indicates the direction of change of the inflammatory marker, i.e., significant anti-inflammatory change (black bars), no significant change (grey bars), and significant pro-inflammatory change (white bars).

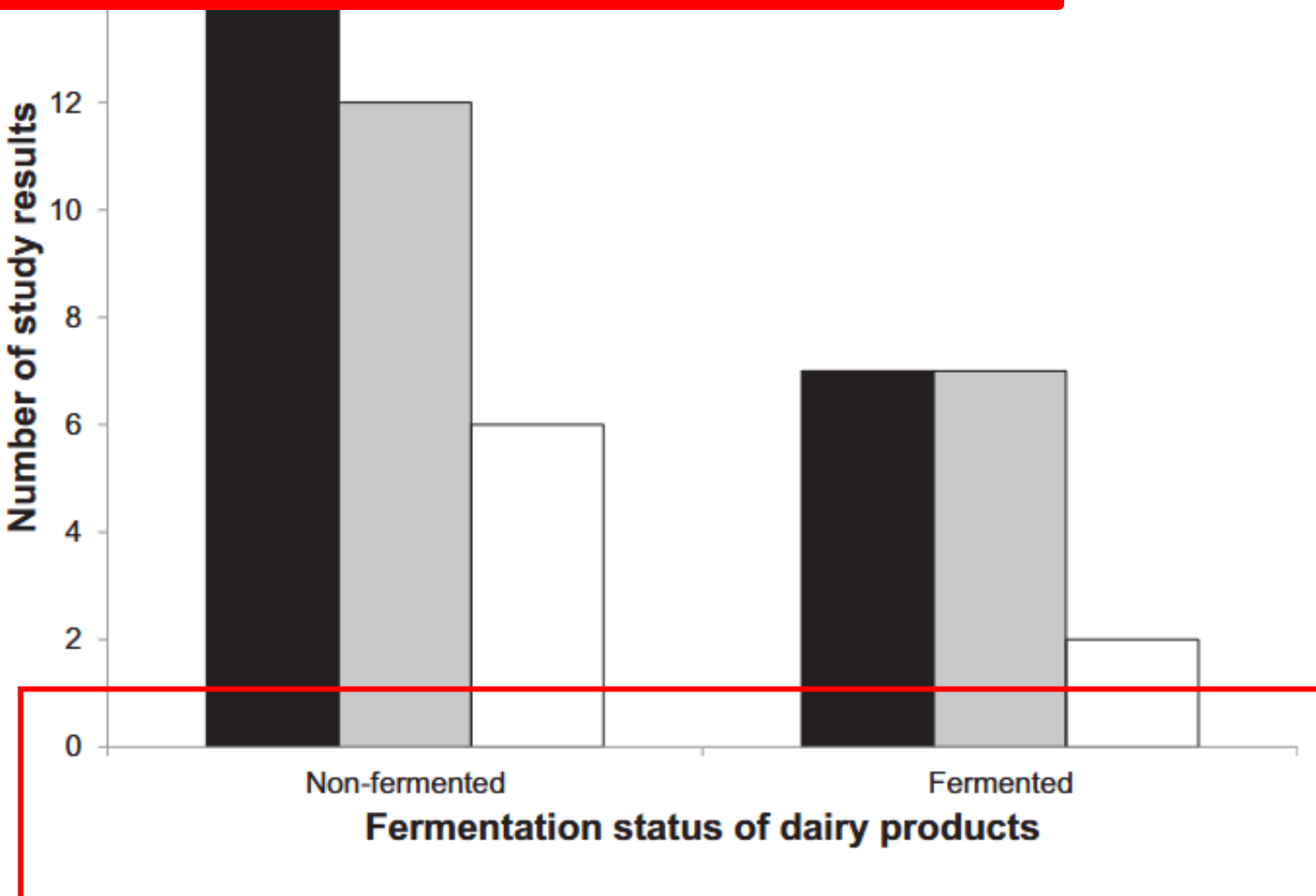


Figure 6. Distribution of the study results labeled as “anti-inflammatory”, “no effect”, and “pro-inflammatory” among the dairy product categories “fermented” and “non-fermented”. The color code indicates the direction of change of the inflammatory marker, i.e., significant anti-inflammatory change (black bars), no significant change (grey bars), and significant pro-inflammatory change (white bars).

Milk and Dairy Product Consumption and Inflammatory Biomarkers: An Updated Systematic Review of Randomized Clinical Trials

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ABSTRACT

Milk and dairy products contribute $\leq 14\%$ of the caloric intake in developed countries. Recent evidence has shown controversial results with regard to the role of dairy products in deleterious processes such as inflammation. The increasing number of studies on the anti- and proinflammatory effects of milk and dairy products in the past 5 y reflects the growing interest in this area of research. The aim of this systematic review was to evaluate the scientific evidence provided in the past 5 y on the effects of milk and dairy products on inflammatory biomarkers provided by randomized clinical trials. The search strategy was conducted in Medline (via PubMed) and Scopus (which includes EMBASE and the Web of Science) databases and included articles from 1 January 2012 to 30 April 2018. The risk of bias was assessed using the Cochrane methodology. The number of study participants, type of study, doses, and the key results are reported. The following primary outcomes were considered for inclusion: circulating concentrations of C-reactive protein, interleukins, cytokines, and vascular adhesion molecules or expression of proinflammatory genes in peripheral blood mononuclear cells; however, the primary outcomes considered were not limited to these. Sixteen studies (15 articles) included in this systematic review reported on healthy individuals and subjects who were overweight or obese and who had metabolic syndrome or type 2 diabetes. The consumption of milk or dairy products did not show a proinflammatory effect in healthy subjects or individuals with metabolic abnormalities. The majority of studies documented a significant anti-inflammatory effect in both healthy and metabolically abnormal subjects, although not all the articles were of high quality. This review was registered on PROSPERO (International Prospective Register of Systematic Reviews) at https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=94535 as CRD42018094535. *Adv Nutr* 2019;10:S239–S250.

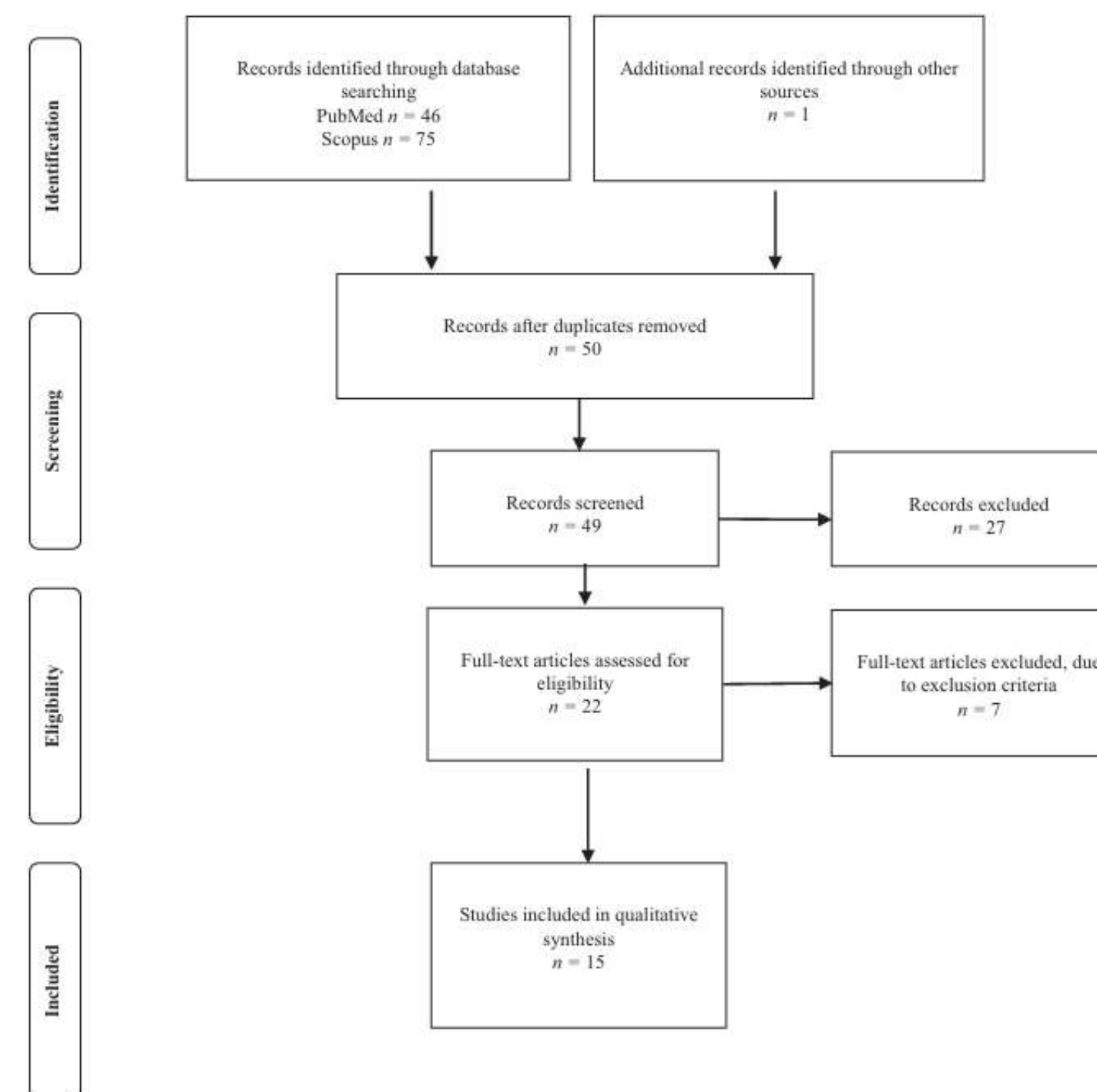


FIGURE 1 PRISMA flow diagram of the literature search process. PRISMA, Preferred Reporting Items for Systematic Review and Meta-Analysis.

En conclusión: El consumo de leche o productos lácteos no mostró un efecto pro inflamatorio en sujetos sanos ni en personas con sobrepeso, obesidad u otras anomalías metabólicas.

Es necesario desarrollar más estudios con diseños mejorados y una mejor presentación de resultados, e incluir la caracterización de los productos lácteos.

REVIEW



The Effects of Dairy Product and Dairy Protein Intake on Inflammation: A Systematic Review of the Literature

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ABSTRACT

Systemic inflammation is associated with obesity and chronic disease risk. Intake of dairy foods is associated with reduced risk of type 2 diabetes and cardiovascular disease; however, the impact of dairy foods on inflammation is not well-established. The objective of this study was to conduct a systematic review to evaluate the effect of dairy product (milk, cheese, and yogurt) and dairy protein consumption on low-grade systemic inflammation in adults without severe inflammatory disorders. A literature search was completed in September 2019 using PubMed and CENTRAL as well as inspection of reference lists from relevant review articles. The search resulted in the identification of 27 randomized controlled trials which were included in this analysis. In the 19 trials which evaluated dairy products, 10 reported no effect of the intervention, while 8 reported a reduction in at least one biomarker of inflammation. All 8 trials that investigated dairy protein intake on markers of inflammation reported no effect of the intervention. The available literature suggests that dairy products and dairy proteins have neutral to beneficial effects on biomarkers of inflammation. Additional clinical studies designed using inflammatory biomarkers as the primary outcome are needed to fully elucidate the effects of dairy intake on inflammation.

ARTICLE HISTORY

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KEYWORDS

Dairy; inflammation; chronic disease; diet; systematic review

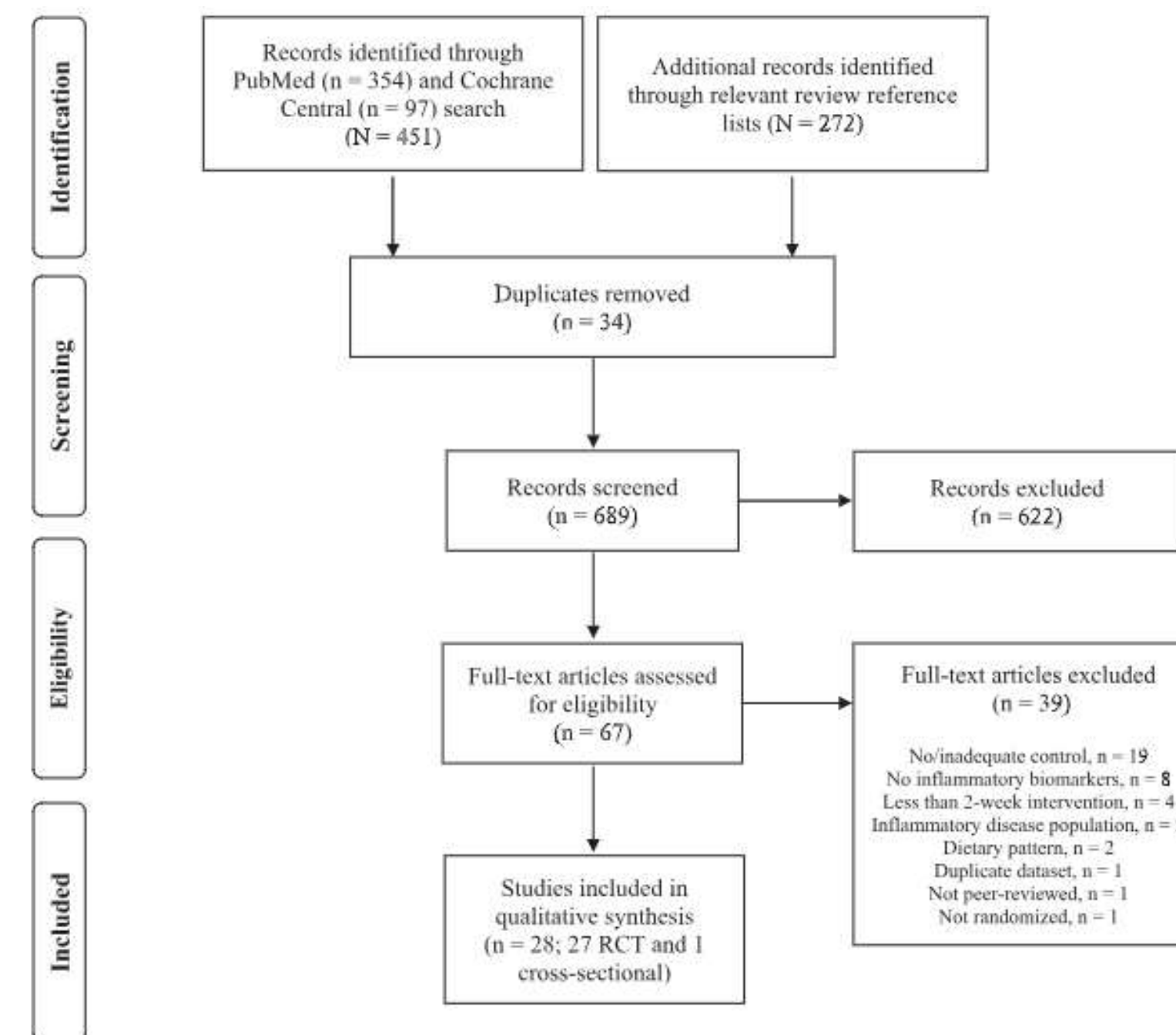


Figure 1. Flow diagram of the literature search and study selection conducted according to the PRISMA guidelines statement (41). Abbreviations: PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; RCT, randomized controlled trials.

La evidencia científica demuestra que el consumo de productos lácteos o proteínas lácteas no afecta negativamente los biomarcadores de inflamación en personas sanas y con sobrepeso u obesidad, y potencialmente tiene efectos beneficiosos.

Los resultados de este estudio respaldan la importancia del consumo de productos lácteos para reducir el riesgo de enfermedades crónicas. Además, se justifica la investigación, específicamente en ensayos con un diseño adecuado y consistente, y su posterior revisión sistemática.

Article

No Associations between Dairy Intake and Markers of Gastrointestinal Inflammation in Healthy Adult Cohort

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Abstract: Dairy products are a good source of essential nutrients and past reviews have shown associations of dairy consumption with decreased systemic inflammation. Links between dairy intake and gastrointestinal (GI) inflammation are under-investigated. Therefore, we examined associations between reported dairy intake and markers of GI inflammation in healthy adults in a cross-sectional observational study, hypothesizing a negative association with yogurt intake, suggesting a protective effect, and no associations with total dairy, fluid milk, and cheese intake. Participants completed 24-h dietary recalls and a food frequency questionnaire (FFQ) to assess recent and habitual intake, respectively. Those who also provided a stool sample ($n = 295$), and plasma sample ($n = 348$) were included in analysis. Inflammation markers from stool, including calprotectin, neopterin, and myeloperoxidase, were measured along with LPS-binding protein (LBP) from plasma. Regression models tested associations between dairy intake variables and inflammation markers with covariates: age, sex, and body mass index (BMI). As yogurt is episodically consumed, we examined differences in inflammation levels between consumers (>0 cup equivalents/day reported in recalls) and non-consumers. We found no significant associations between dairy intake and markers of GI inflammation. In this cohort of healthy adults, dairy intake was not associated with GI inflammation.

- No se encontraron asociaciones significativas entre el consumo de lácteos y los marcadores de inflamación gastrointestinal.
- En esta cohorte de adultos sanos, el consumo de lácteos no se asoció con la inflamación gastrointestinal.

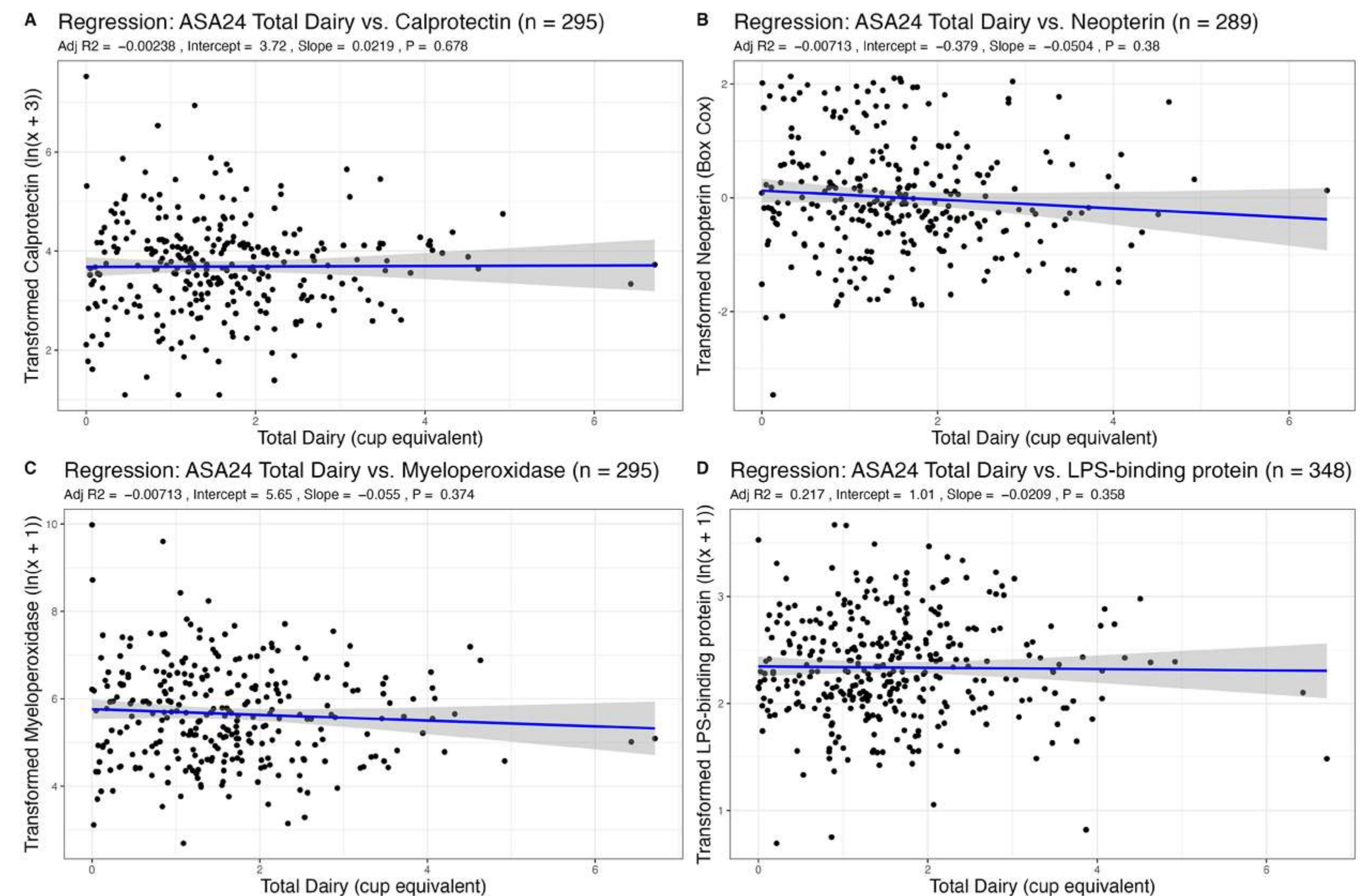


Figure1. Association of recent total dairy intake (cup equivalent per day) with markers of GI inflammation adjusted for sex, age, and BMI.

No hay asociaciones entre la ingesta de lácteos y los marcadores de inflamación gastrointestinal en una cohorte de adultos sanos

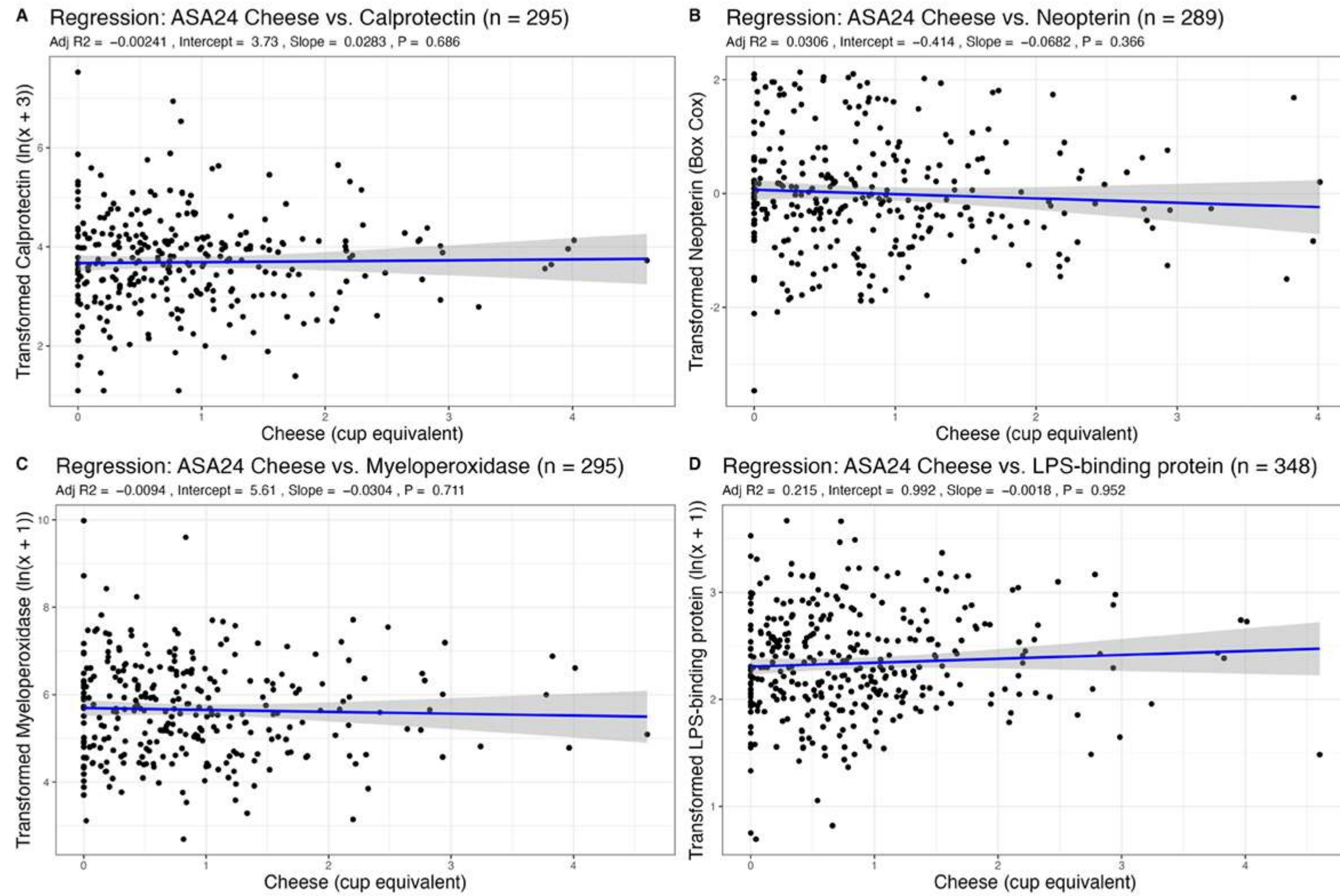


Figure3. Association of recent cheese intake (cup equivalents per day) with markers of GI inflammation after adjustment for sex, age, and BMI.

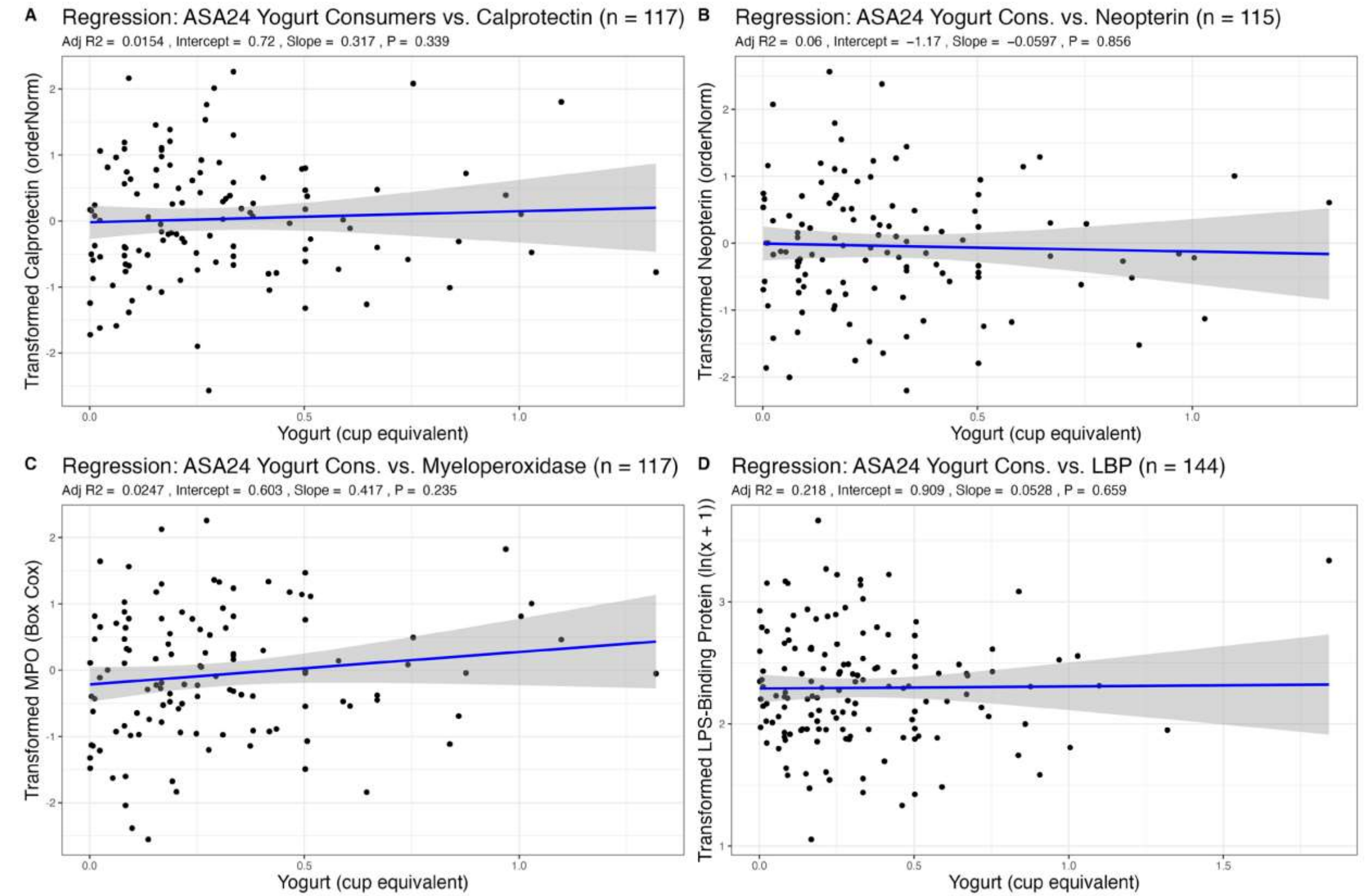


Figure 4. Association of recent yogurt intake (consumers only, >0 cup eq.) with markers of GI inflammation after adjustment for sex, age, and BMI.



Nutritional Immunology

Lower Diet Quality Associated with Subclinical Gastrointestinal Inflammation in Healthy United States Adults

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A B S T R A C T

Background: Higher diet quality has been associated with lower levels of diet and gastrointestinal (GI) inflammation in healthy adult human cohort.**Objectives:** The purpose of this project was to examine the associations between diet quality and subclinical GI inflammation in a healthy adult human cohort.**Methods:** In a cross-sectional observational trial, we examined the associations between diet quality and subclinical GI inflammation in a healthy adult human cohort. The Automated Self-Administered Dietary Assessment Tool (ASA24) was used to assess diet quality, and stool samples were collected to measure calprotectin, neopterin, and myeloperoxidase.**Results:** Recent and habitual fiber intake was inversely associated with calprotectin (P = 0.002, 0.045, 0.001, 0.009, 0.001, 0.004, 0.014, respectively). Habitual soluble fiber intake was also negatively correlated with calprotectin (P = 0.002, 0.045, 0.001, 0.009, 0.001, 0.004, 0.014, respectively). Higher diet quality was positively correlated with neopterin for recent (P = 0.002, 0.045, 0.001, 0.009, 0.001, 0.004, 0.014, respectively) and habitual (P = 0.002, 0.045, 0.001, 0.009, 0.001, 0.004, 0.014, respectively) fiber intake.**Conclusions:** Higher diet quality may be protective against subclinical GI inflammation. This trial was registered at clinicaltrials.gov as NCT04111111.**Keywords:** diet, inflammation, humans, inflammation

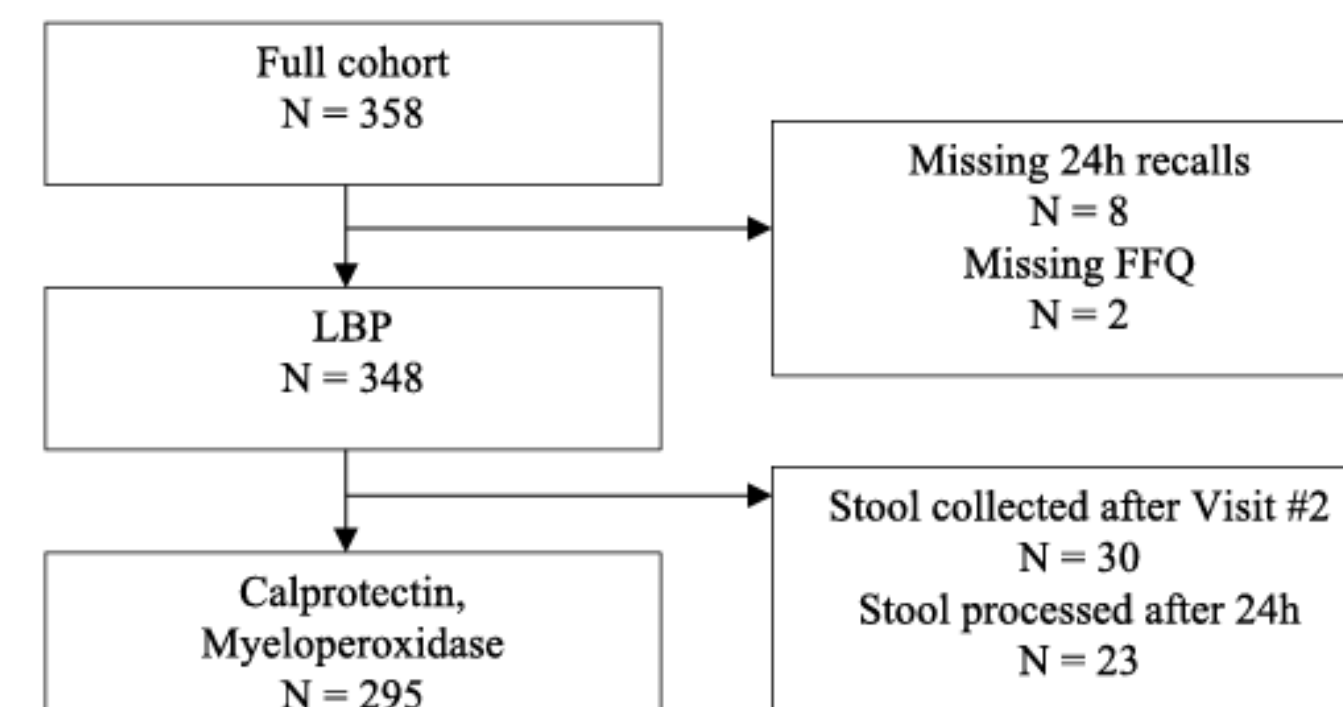
TABLE 1

Associations between fiber intake and GI inflammation and permeability markers adjusted for age, sex, and BMI

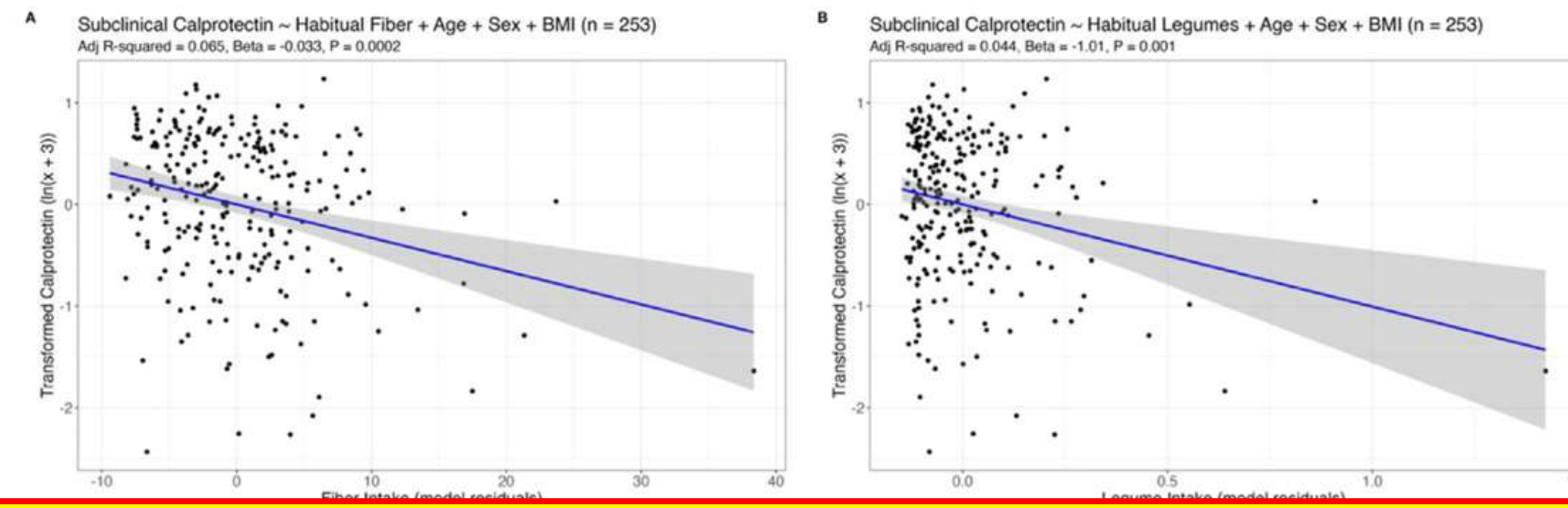
	Data source	Adjusted R ²	Slope	P	Adjusted P
Calprotectin (n = 295)					
Total fiber (g/1000 kcal)	ASA24	0.025	−0.036	0.004 **	0.011 *
Total fiber (g/1000 kcal)	FFQ	0.032	−0.03	0.001 **	0.009 **
Soluble fiber (g/1000 kcal)	FFQ	0.025	−0.09	0.004 **	0.01 *
Myeloperoxidase (n = 295)					
Total fiber (g/1000 kcal)	ASA24	−0.007	−0.013	0.379	0.607
Total fiber (g/1000 kcal)	FFQ	0.009	−0.023	0.02 *	0.073
Soluble fiber (g/1000 kcal)	FFQ	0.0006	−0.065	0.082	0.148
Neopterin (n = 289)					
Total fiber (g/1000 kcal)	ASA24	0.047	−0.032	0.016 *	0.065
Total fiber (g/1000 kcal)	FFQ	0.028	−0.004	0.678	0.872
Soluble fiber (g/1000 kcal)	FFQ	0.017	0.003	0.918	0.918
Total fiber (g/1000 kcal)	ASA24	0.219	0.007	0.193	0.807
Total fiber (g/1000 kcal)	FFQ	0.216	0.003	0.525	0.983
Soluble fiber (g/1000 kcal)	FFQ	0.217	0.013	0.335	0.983

Significant relationships between outcomes and dietary components highlighted in bold ($\alpha = 0.05$). Adjusted *P* values from multiple hypothesis testing correction using Benjamini-Hochberg method are also shown. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Abbreviations: ASA24, Automated Self-Administered 24-hour Dietary Assessment Tool; BMI, body mass index; FFQ, food frequency questionnaire; GI, gastrointestinal.



Una dieta de menor calidad se asocia con inflamación gastrointestinal subclínica en adultos sanos de Estados Unidos

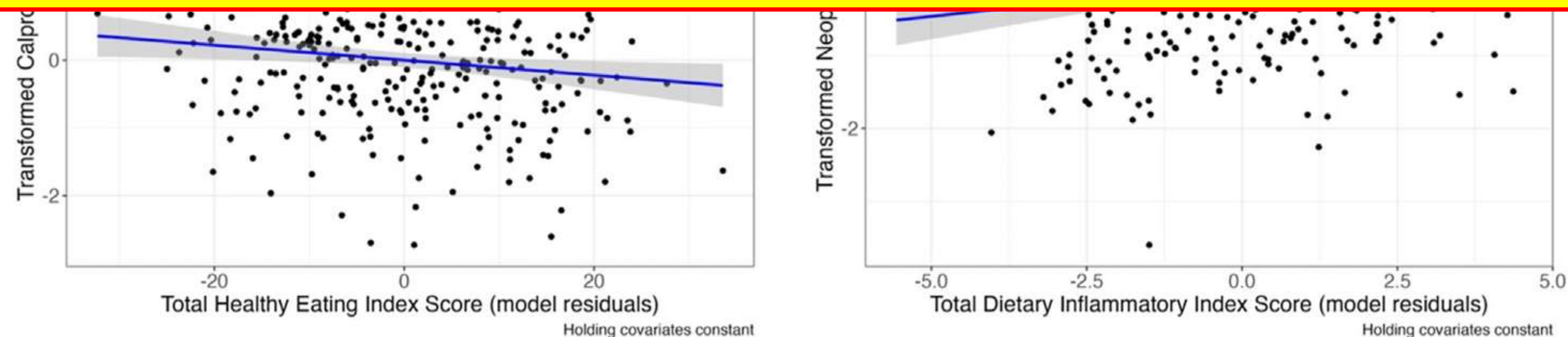


En resumen, se encontró que una mayor calidad de la dieta se asoció con menores concentraciones de marcadores de inflamación gastrointestinal (IG).

Los marcadores de IG no se miden típicamente en poblaciones sanas; por lo tanto, este estudio proporciona información valiosa sobre la distribución de múltiples marcadores de IG en adultos sin afecciones inflamatorias clínicas.

Dado que la dieta puede aliviar y exacerbar las vías inflamatorias en el intestino, es esencial comprender mejor la influencia de la dieta reciente y habitual antes de la aparición de afecciones crónicas.

Las intervenciones futuras podrían buscar evaluar si grupos específicos de alimentos o mejoras en la calidad general de la dieta mejoran diferencialmente la inflamación gastrointestinal, considerando más a fondo cómo los efectos de la dieta pueden diferir en el espectro clínico.





Contents lists available at [ScienceDirect](#)

Immunology Letters

journal homepage: www.elsevier.com/locate/immlet



Dairy starters and fermented dairy products modulate gut mucosal immunity

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ARTICLE INFO

Keywords:

Inflammation
Immune
Probiotic
Dairy starter
Yogurt
Cheese
Lactobacillus
Propionibacterium

ABSTRACT

The gut microbiota plays a crucial role in the regulation of mucosal immunity and of the function of the intestinal barrier. Dysbiosis is accordingly associated with rupture of mucosal immune homeostasis, leading to inflammatory intestinal diseases. In this context, probiotic bacteria, including a new generation of intestinal probiotics, can maintain intestinal homeostasis and promote health. Surprisingly, little is known about the impact of fermented dairy products in this context, while they represent our main source of live and active bacteria. Indeed, they provide, through our daily diet, a high number of bacteria whose effect on mucosal immunity deserves attention. Among bacteria ingested in fermented dairy products, *Streptococcus thermophilus*, *Lactobacillus delbrueckii*, *Lactobacillus helveticus*, *Lactococcus lactis* and *Propionibacterium freudenreichii* are on top, as they are ingested in high concentrations (close to 10^9 per gram of product) in fermented milks or cheeses. This review gives an overview of the potential immunomodulatory effects of these main dairy starters. It further explores studies dealing with fermented dairy products containing these starters, in a context of inflammation.

**Los fermentos lácteos y los productos lácteos
fermentados modulan la inmunidad de la mucosa
intestinal**

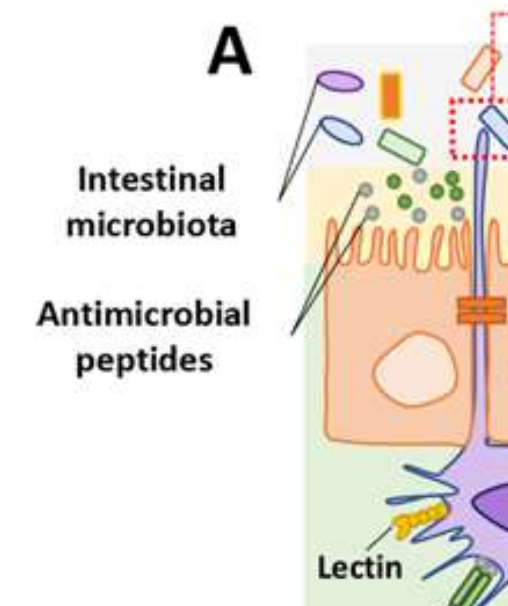
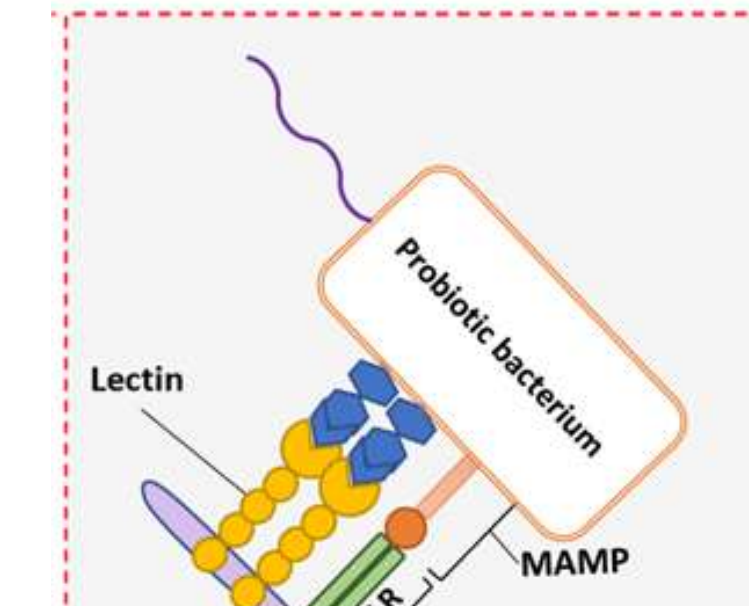


Table 1
Counts of some lactic acid bacteria and ripening flora in fermented dairy products.

Type of fermented milk products at the end of production	Species studied	Count range (log ₁₀ CFU.g ⁻¹ of product)	Reference
Plain yogurt (n = 5)	<i>S. salivarius</i> subsp.	8.20–8.36	[53]
Flavored yogurt (n = 5)	<i>thermophilus</i>	8.34–8.60	
Liquid yogurt (n = 5)	(<i>S. thermophilus</i>)	8.41–8.56	
Fermented milk (n = 5)		8.34–8.59	
Biogarde®3 (n = 5)		8.45–8.53	[87]
Commercial yogurt	<i>S. thermophilus</i>	7.54 ± 0.05-	



- Existe un efecto curativo de las cepas de bacterias lácticas y propionibacterias (solo esas bacterias principalmente).
- Efecto dependiente de la cepa.
- Es fundamental realizar mas investigación clínica y evaluar si las cepas bacterianas esepcificas presentes en lácteos fermentados permiten aliviar síntomas inflamatorios específicos características de la enfermedad inflamatoria intestinal o el síndrome del intestino irritable.

Fig. 2. Schematic view of possible i
The intestinal barrier includes: (i) the i
intestinal epithelial cells (IECs) monol
nological cells that interact together (D
inhibition. **B: Focus on the interacti**
molecular patterns (MAMPs) and pat
positive probiotic bacteria and the
Toll Like Receptors (TLRs), C-type lect
polysaccharide; PG, peptidoglycan; T
tylmuramic acid.

Cantal cheeses (120 d of ripening)	<i>Lactobacillus helveticus</i>		
	Lactococci including	6.5 ± 0.5	[22]
	<i>Lactococcus lactis</i>	6.3 ± 0.6	
	<i>S. thermophilus</i>	6.7 ± 0.3	
	Mesophilic lactobacilli	7.4 ± 0.2	
	Facultative heterofermentative lactobacilli	5.6 ± 0.3	
Manchego cheese (150 d of ripening)	Propionibacteria including		[108]
	<i>P. freudenreichii</i>	~7	
	<i>L. lactis</i> subsp. <i>lactis</i>	~6	
	Commercial lactococci starter		

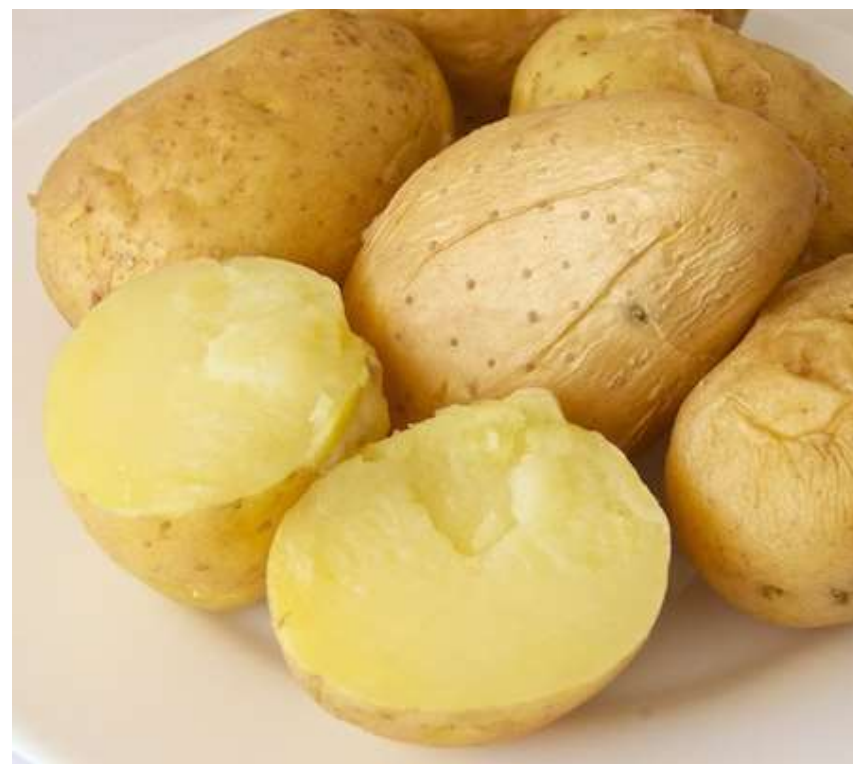
¹CFU, colony forming unit.

² The quantitation of *L. helveticus* was performed by quantitative PCR, which specifically targets the *pheS* gene encoding the α-subunit of the phenylalanine-tRNA synthetase and expressed as log₁₀ copies g⁻¹.

TLR2 CR	DC-SIGN
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e key layers of the intestinal epithelial barrier.
ves as a microbial and biochemical barrier; (iii) the
he lamina propria which contains different immu-
n, brown represents interaction and red represents
bacteria interact with DC via microbe-associated
main surface components (MAMPs) of Gram-
s (PRRs) that recognize probiotic MAMPs include
-SIGN). CR, co-receptors; CPS, cell wall-associated
acceptor; NAG, N-acetylglucosamine; NAM, N-ace-

Por favor, cierre sus ojos e imagine...



100 g = 80 kcal



100 g = 202 kcal



100 g = 315 kcal

↑ 150%

+13.3 gr de lípidos

1 gr de lípido = 9 kcal
13.3 gr lípidos = 121.5 kcal

↑ 294%

+26.1 gr de lípidos

1 gr de lípido = 9 kcal
26.1 gr lípidos = 234.9 kcal

Changes in Diet and Lifestyle and Long-Term Weight Gain in Women and Men

Dariusz Mozaffarian, M.D., Dr.P.H., Tao Hao, M.P.H., Eric B. Rimm, Sc.D.,
Walter C. Willett, M.D., Dr.P.H., and Frank B. Hu, M.D., Ph.D.

ABSTRACT

BACKGROUND

Specific dietary and other lifestyle behaviors may affect the success of the straightforward-sounding strategy “eat less and exercise more” for preventing long-term weight gain.

METHODS

We performed prospective investigations involving three separate cohorts that included 120,877 U.S. women and men who were free of chronic diseases and not obese at baseline, with follow-up periods from 1986 to 2006, 1991 to 2003, and 1986 to 2006. The relationships between changes in lifestyle factors and weight change were evaluated at 4-year intervals, with multivariable adjustments made for age, baseline body-mass index for each period, and all lifestyle factors simultaneously. Cohort-specific and sex-specific results were similar and were pooled with the use of an inverse-variance-weighted meta-analysis.

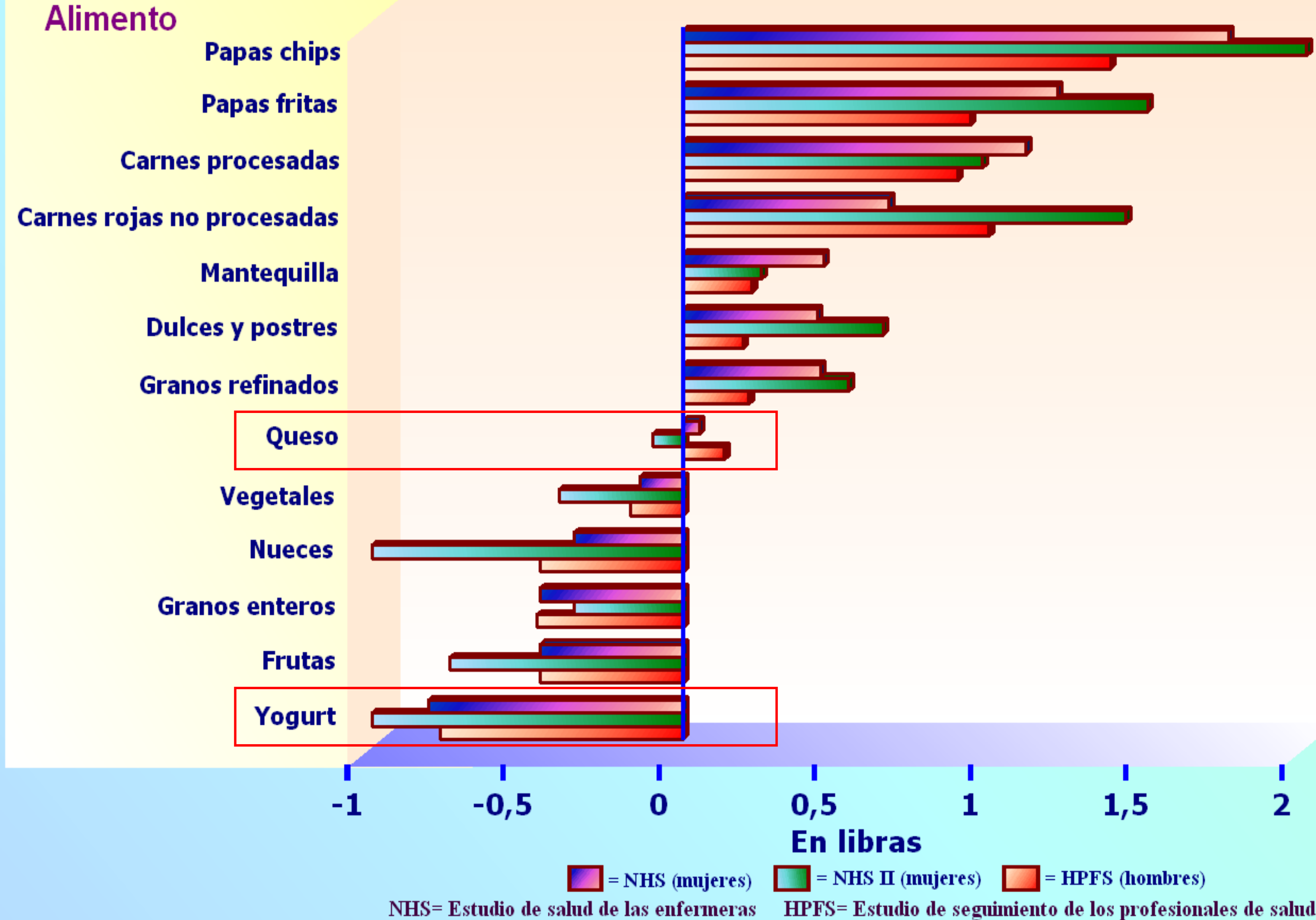
RESULTS

Within each 4-year period, participants gained an average of 3.35 lb (5th to 95th percentile, −4.1 to 12.4). On the basis of increased daily servings of individual dietary components, 4-year weight change was most strongly associated with the intake of potato chips (1.69 lb), potatoes (1.28 lb), sugar-sweetened beverages (1.00 lb), unprocessed red meats (0.95 lb), and processed meats (0.93 lb) and was inversely associated with the intake of vegetables (−0.22 lb), whole grains (−0.37 lb), fruits (−0.49 lb), nuts (−0.57 lb), and yogurt (−0.82 lb) ($P \leq 0.005$ for each comparison). Aggregate dietary changes were associated with substantial differences in weight change (3.93 lb across quintiles of dietary change). Other lifestyle factors were also independently associated with weight change ($P < 0.001$), including physical activity (−1.76 lb across quintiles); alcohol use (0.41 lb per drink per day), smoking (new quitters, 5.17 lb; former smokers, 0.14 lb), sleep (more weight gain with <6 or >8 hours of sleep), and television watching (0.31 lb per hour per day).

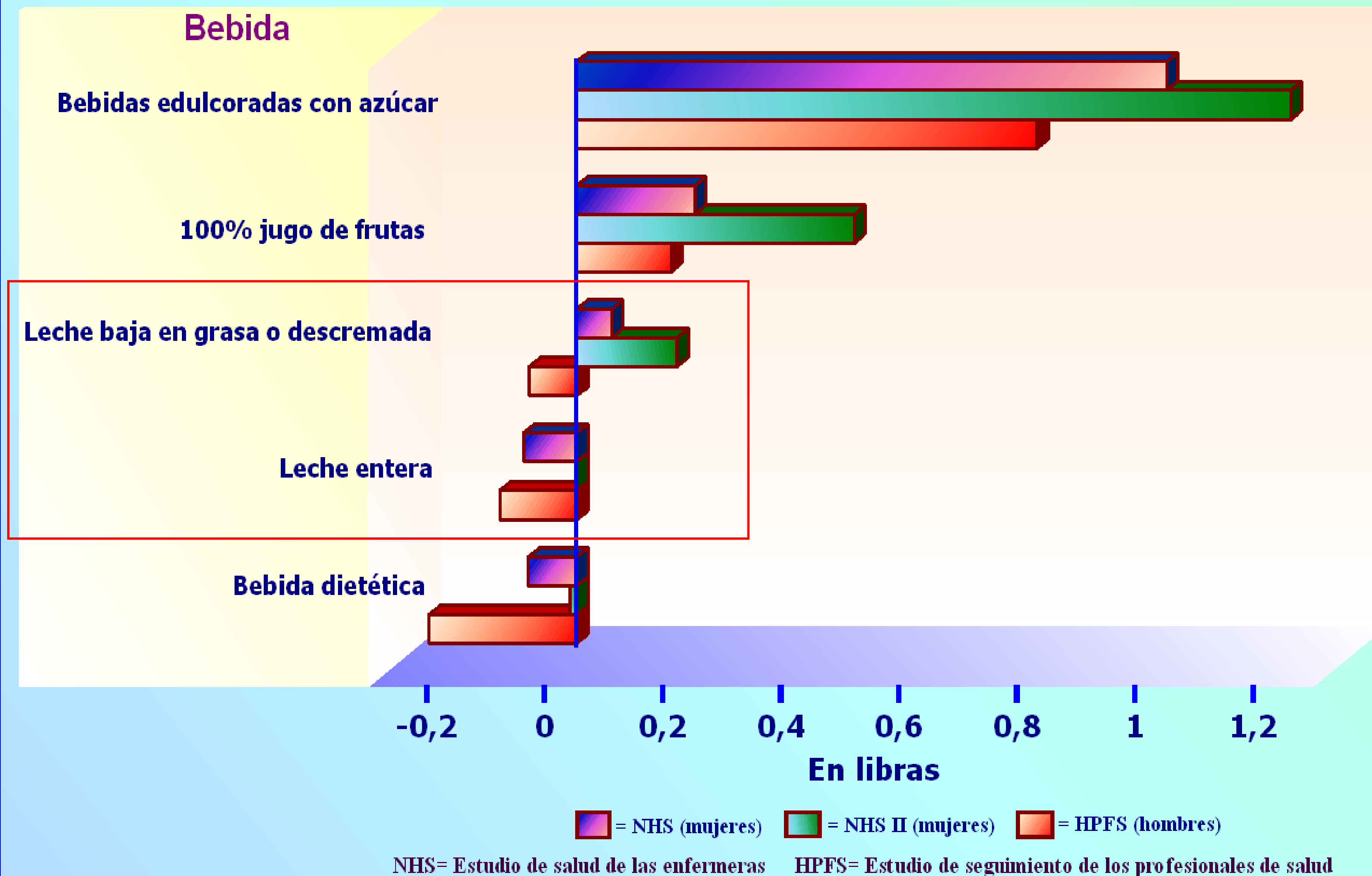
CONCLUSIONS

Specific dietary and lifestyle factors are independently associated with long-term weight gain, with a substantial aggregate effect and implications for strategies to prevent obesity. (Funded by the National Institutes of Health and others.)

Cambios en el peso asociados al incremento del consumo diario de alimentos durante un período de 4 años



Cambios en el peso asociados al incremento del consumo diario de bebidas durante un período de 4 años



Conclusiones

- Debemos considerar a la dieta de manera integral para evaluar potenciales efectos inflamatorios en el organismo, especialmente a nivel intestinal.
- La mal nutrición por exceso (obesidad) produce una inflamación subclínica crónica
- Una dieta de menor calidad (poco variada y no saludable) se puede asociar a inflamación gastro intestinal
- El consumo de lácteos no genera un incremento en la respuesta inflamatoria en el intestino.
- Los lácteos fermentados (yogurt y queso) se asocian a un efecto neutro o protector frente a la inflamación intestinal en personas sanas y se deben realizar mas estudios en pacientes con patologías inflamatorias intestinales.

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CONGRESO
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Lácteos e inflamación ¿mito o realidad?

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