Protein intake and non-alcoholic fatty liver disease:

a cross-sectional analysis on the National Health and Nutrition Examination Survey

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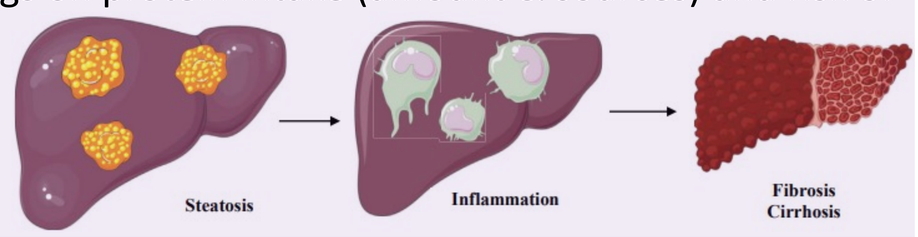
Background

- Non-alcoholic fatty liver disease (NAFLD): presence of >5% hepatic fat without excessive alcohol consumption / viral hepatitis [1]
- Global prevalence: 32.4% [2]
- Firstline treatment is by lifestyle modification, of which diet plays an important role
- Inconsistent findings on protein intake (amount & sources) and risk of NAFLD



Aim

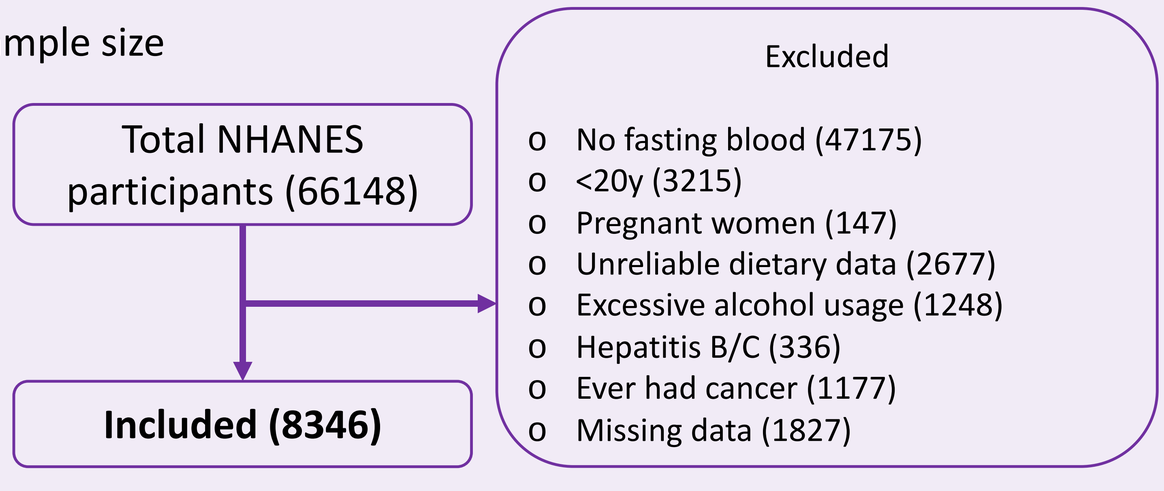
To study the association between intake of different sources of protein on the risk of NAFLD.

Methods

- Data source: National Health and Nutrition Examination Survey (NHANES) 2007 – March 2020 (pre-pandemic) in the US [3]
- Exposure: daily intake (in quantiles of gram) of total, plant, animal, dairy, muscle and egg protein, assessed by two 24hr recalls. Protein types were defined based on USDA Food Coding Scheme [4].
- Outcome: NAFLD, defined as US fatty liver index (USFLI) $\geq$ 30 [5]
  - Traditional diagnostic procedures (biopsy, ultrasound, magnetic resonance imaging) are difficult to perform in large-scale studies.
  - USFLI is a validated formula involving age, race, waist circumference and 3 blood parameters (fasting glucose, fasting insulin and gamma-glutamyl transferase).
- Multivariable logistic regression, adjusted for:
  - Sex, age, race, education, income
  - Smoking status, physical activity
  - Intake of total carbohydrates, fat, alcohol, fibre (in gram)
  - Protein types were further adjusted for each other.
- All analyses accounted for the complex survey design of NHANES.

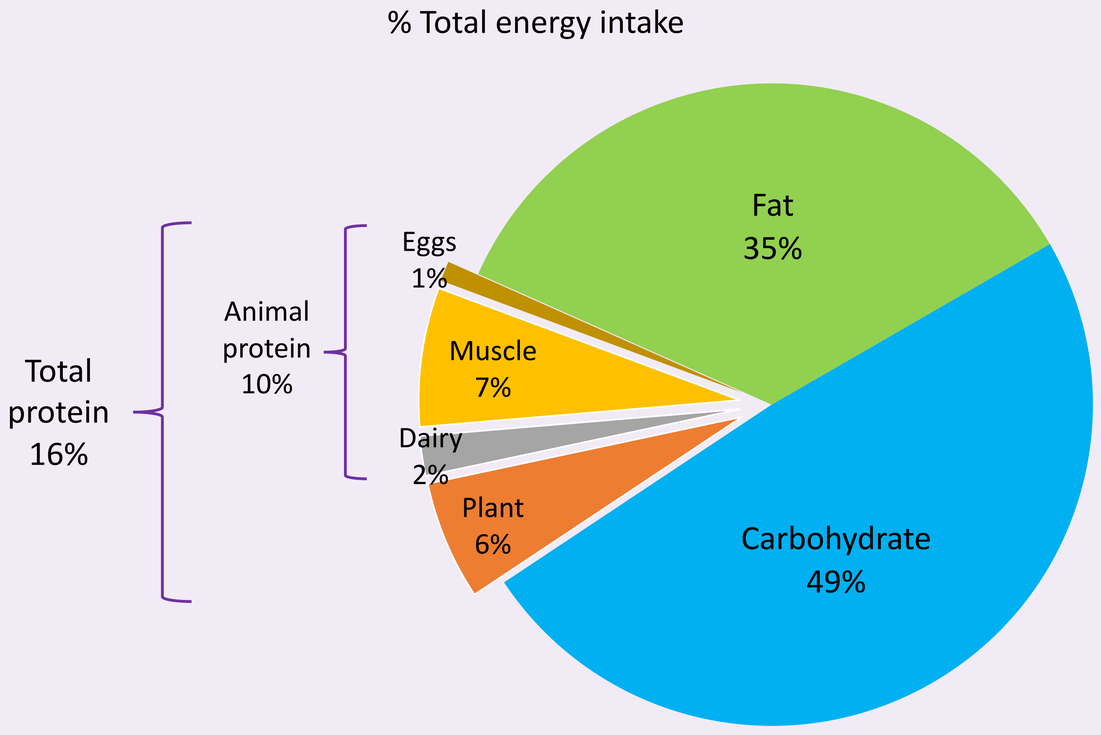
Results

- Sample size



Results

- Subject characteristics



	Weighted Mean
NAFLD (%)	33.6
Male (%)	47.8
Age (y)	46.4
Race (%)	Hispanic (14.6), White (66.7), Black (11.0), Others (7.7)
Education (%)	High school or below (37.2), above high school (62.8)
Income to poverty ratio	3.0
Smoking status	Current (16.4), former (23.6), never (60.0)
Physically active (%)	67.2
Total energy intake (kcal/day)	2050.9
Alcohol (g)	3.0
Fibre (g)	17.2

- Association between protein intake and NAFLD

Protein types	Odds ratio (95% confidence interval)		
	Q2 vs Q1	Q3 vs Q1	Q4 vs Q1
Total	0.94 (0.78-1.14)	1.10 (0.92-1.33)	1.15 (0.91-1.45)
Plant	1.01 (0.82-1.24)	1.05 (0.87-1.28)	1.25 (0.96-1.63)
Animal	1.13 (0.94-1.35)	1.02 (0.85-1.22)	1.19 (0.99-1.44)
Dairy	**0.81 (0.67-0.98)**	**0.72 (0.59-0.87)**	**0.68 (0.54-0.86)**
Muscle	1.06 (0.90-1.25)	1.11 (0.91-1.34)	1.19 (0.96-1.49)
Eggs	/	/	1.00 (0.86-1.17)

Conclusion

Our analysis of this large population-based sample indicated that the risk of NAFLD may be associated with a dietary pattern poor in dairy protein, independent of other risk factors.

References:
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