Gluten in “gluten free” foods

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Affiliations:

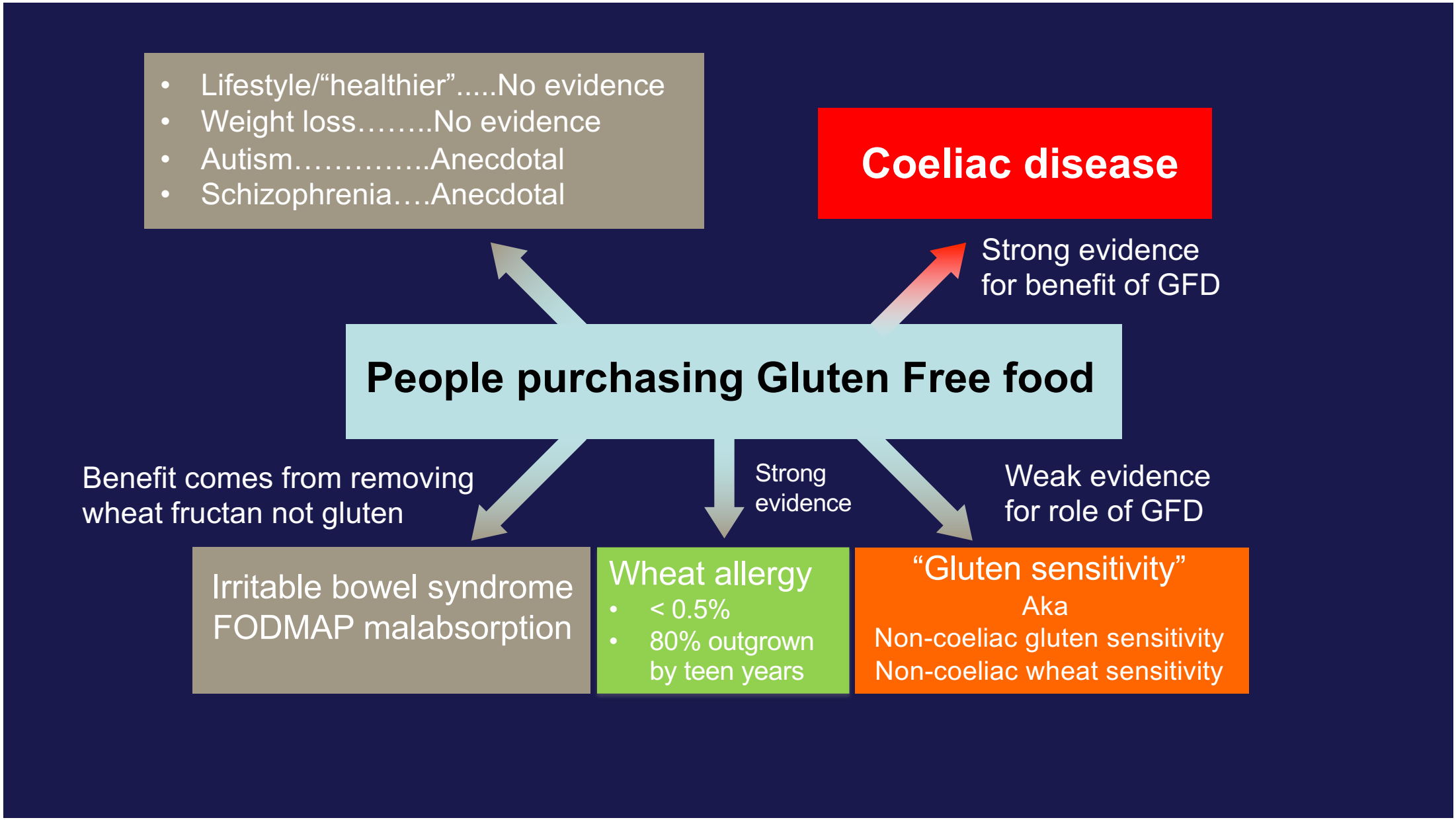
Murdoch Childrens Research Institute
Healthier Kids. Healthier Future.

The Royal Melbourne Hospital

Coeliac Australia

ImmusanT
DOMINANCE IN IMMUNOTHERAPY

Disclosure: Consultant & Inventor on patents


• Lifestyle/"healthier".....No evidence
• Weight loss……..No evidence
• Autism……..Anecdotal
• Schizophrenia….Anecdotal
Coeliac disease
Strong evidence for benefit of GFD
People purchasing Gluten Free food
Benefit comes from removing wheat fructan not gluten
Strong evidence
Weak evidence for role of GFD
Irritable bowel syndrome FODMAP malabsorption
Wheat allergy
• < 0.5%
• 80% outgrown by teen years
"Gluten sensitivity"
Aka
Non-coeliac gluten sensitivity
Non-coeliac wheat sensitivity

An immune-mediated systemic disorder elicited by gluten in genetically susceptible people

Dietary gluten

- Wheat, rye, barley, oats

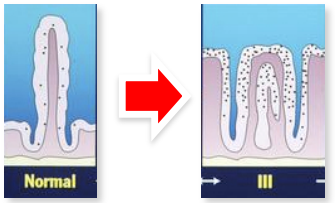
HLA-DQ2/8 and other genes

Environmental factors

- Microbiome + others

- **Globally 1-2%**
- **1 in 70 Australians**
- **Rising prevalence**
- **Increasing in Asia**

- Circulating autoantibodies
- Small intestinal villous atrophy



- **Elevated morbidity and mortality**
- **Impaired quality of life**
- **Only treatment – lifelong and strict gluten free diet**

Singh et al, Clin Gastro Hepatol 2018; Anderson, BMC Med 2013; Lohi et al, Aliment Pharm Therapeutics 2007; Vilppula et al, BMC Gastro 2009

An immune-mediated systemic disorder elicited by gluten in genetically susceptible people

HLA-D
other g

Environmental fa
- Microbiome + oth

Immune
- Autoimmune thyroid disease
- Type 1 diabetes
- Addison's disease
- Pernicious anaemia (↓ B12)
- Sjogren's syndrome
- Alopecia (hair loss)
- Lupus (SLE)
- IgA deficiency

Gastrointestinal
- Microscopic colitis
- Pancreatic insufficiency
- Persistently elevated liver enzymes
- Autoimmune hepatitis
- Primary biliary cirrhosis
- Primary sclerosing cholangitis

Bone, joints, nerves
- Low-trauma fracture & osteoporosis
- Joint pain/swelling
- Nerve problems
- Epilepsy
- Migraines

Other
- Dermatitis herpetiformis
- Dental enamel defects
- Infertility, recurrent miscarriage
- Depression
- Down's syndrome
- Turner's syndrome
- Lymphoma (Non-Hodgkin's)

Adapted from NICE clinical guideline 86. National Institute for Health and Clinical Excellence, 2009

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- **Rising prevalence**
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What is a safe threshold for gluten intake in coeliac disease?

- Uncontrolled trials and global expert opinion – supportive of < 20 mg/kg gluten (ppm)
- Meta-analyses: insufficient data to define a safe level *(Akobeng, APT 2006; Cochrane Review 2016)*
- Only a single RDBPCFC study: *(Catassi et al, 2007)*
  - 3 month challenge of gluten 50mg/d (n=13), gluten 10mg/d (n=13) or placebo (n=13)
  - 1 patient clinical relapse (vomiting, diarrhoea) at 10mg/d - dropped-out
  - After 3 months,
    - Placebo: 11/13 improved villous (Vh:CrD) healing;
    - 10mg/d: 6/13
    - 50mg/d: 2/13 (significant deterioration compared to placebo)
- Daily consumption of 50mg is likely to have adverse effects in most
- Daily consumption of 10mg may have adverse effects in some
- The symptomatic, serologic and histologic response to gluten exposure is *highly* heterogeneous
- An adequately powered RDBPCFC study with accurately defined gluten challenge is needed

The clinical challenge:
Why does the gluten free diet often fail?

- Full healing of the small intestine seen in only 50% of people with coeliac disease after 5 years on a GFD
- This is despite good to excellent adherence to a gluten free diet

(Newnham et al, J Gastroenterol Hepatol 2015)

One explanation: inadvertent gluten exposure

Is eating out risky?

- Unannounced inspections by Environmental Health Officers
- 127 randomly selected food outlets that had declared gluten free items on menu
- 158 food samples tested for gluten and a series of knowledge and practice questions asked
- Findings:
  - Detectable gluten in 14/158 (9%) – 5 items were >80ppm
  - Poor knowledge about gluten and GF
  - Lack of staff training predicted non-compliance
  - Franchisee predicted better compliance

  - In 2014 non-compliance was 20%, 2015 was 15%

Halmos et al. Medical Journal of Australia 2018 (June)

What about gluten contamination of manufactured GF foods?

- International studies
  - 20-32% of sampled labelled or naturally GF products contain > 20ppm

(Thompson, J Am Diet Assoc 2010; Sharma, J Agric Food Chem 2013; Lee, J Food Prot 2014; Farage, Public Health Nutr 2016)

- Australian studies limited
  - NSW Food Authority report (2011): gluten present in 5% of 222 gluten-free labelled food items (3 items >20 ppm – bread mix, cereal product and a ready-to-eat meal)

  - Imported GF manufactured goods (N=169; 14% had detectable gluten but all “<1.1ppm”)

(Forbes, Med J Aust 2016)

The study

- Top 300 foods with “gluten free” claim identified from a consumer activity database (Aug 2017) – The Nielsen company
- 256 items purchased from 16 retail supermarkets, 10 independent supermarkets and one speciality health food supermarket
- Foods homogenised on day of purchase and a sample sent to NMI
- Sequence recorded to allow detection of contamination from a preceding positive sample

- All samples assayed in duplicate (RIDASCREEN R5 gliadin kit, R-Biopharm) – LOQ 5ppm; LOD 1ppm
- If gluten detected, fresh sample of food purchased and reassessed

- All positive samples re-tested with AgraQuant G12 gluten kit (Romer)

Results

Gluten content of “gluten-free” manufactured foods

	Assay	
	RIDASCREEN R5 (gliadin)	AgraQuant G12 (gluten)
Food item	Gluten (ppm): initial test	Gluten (ppm)
Fruit/muesli bar	< 5.0	6.4
Noodles	5.0	10
Cracker	6.0	6.5
Fruit/muesli bar	10	9.0
Cracker	19	14
Rice snacks	24	21
Dry pasta	49	51

NA = not applicable (product recalled by manufacturer); ppm = parts per million.

Halmos et al, MJA 2018 (Nov)

Results

Gluten content of "gluten-free" manufactured foods

	Assay		
	RIDASCREEN R5 (gliadin)		AgraQuant G12 (gluten)
Food item	Gluten (ppm): initial test	Gluten (ppm): follow-up test	Gluten (ppm)
Fruit/muesli bar	< 5.0	< 1.0	6.4
Noodles	5.0	14	10
Cracker	6.0	13	6.5
Fruit/muesli bar	10	21	9.0
Cracker	19	5.0	14
Rice snacks	24	NA	21
Dry pasta	49	8.0	51

NA = not applicable (product recalled by manufacturer); ppm = parts per million.

Halmos et al, MJA 2018 (Nov)

Results

Gluten content of "gluten-free" manufactured foods

	Assay			
	RIDASCREEN R5 (gliadin)			AgraQuant G12 (gluten)
Food item	Gluten (ppm): initial test	Gluten in standard serving (mg)*	Gluten (ppm): follow-up test	Gluten (ppm)
Fruit/muesli bar	< 5.0	—	< 1.0	6.4
Noodles	5.0	0.38 (single serving, dry; 75 g)	14	10
Cracker	6.0	0.09 (2.5 crackers; 15 g)	13	6.5
Fruit/muesli bar	10	0.40 (one bar; 40 g)	21	9.0
Cracker	19	0.48 (one cracker; 25 g)	5.0	14
Rice snacks	24	0.48 (single serving; 20 g)	NA	21
Dry pasta	49	3.1 (0.5 cup, dry; 62.5 g)	8.0	51

NA = not applicable (product recalled by manufacturer); ppm = parts per million. * Standard serving size based on nutrition information panel for product. ◆

Halmos et al, MJA 2018 (Nov)

Outcomes

- Companies informed
- Media release driven by Medical Journal of Australia
- Food Safety Unit, DHHS informed
- Consumer response

What next?

- Detectable gluten across batches suggests better processes may be needed
  - Is testing of every batch feasible and warranted?
  - How are outsourced ingredients managed?

- A safe threshold of gluten needed as basis for defining “gluten free”
- A “no detectable” definition is not a feasible long-term approach

→ High-quality RCT feeding study planned to establish a set-point

- Dialog between food industry, food scientists, clinicians/dietitians, and consumer representatives like Coeliac Australia important
- Managing patient/consumer anxiety (major challenge)
- Coeliac Australia – Food Industry Advisory Committee

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Coeliac Australia

coeliac uk
live well gluten free

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