Drink Well & Evidence Base

15.00 – 15.30
The a2 Milk story: provenance and science

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Further information is available from the charity Food and Behaviour (FAB) Research at www.fabresearch.org

A1 and A2 beta-casein

• The natural / original form of the milk protein Beta-casein is the ‘A2’ form – a chance genetic mutation affecting European cows (≈ 5000 years ago) led to the ‘A1’ version.

• Consumption of standard ‘A1’ cows’ milk is ‘linked with’ many different health conditions and symptoms, involving:
  – Guts & Digestion
  – Brains & Behaviour
  – Immune System functioning

Cows’ milk – A1 and A2


Digestion of A1 milk produces BCM-7 (beta-casomorphin-7) an opioid peptide.

A2 cows’ milk (or goats’, sheeps’ milk, etc) may be tolerated by some people who are adversely affected by A1 cows’ milk. (NB – NOT those with classic milk protein allergy, nor those suffering from lactose intolerance)

BCM-7 is released from incomplete digestion of A1 types of beta casein

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A1 vs A2 beta-casein

- They differ by just one amino acid out of 209 (histidine rather than a proline at position 67).
- This causes the release on digestion of substantial amounts of beta-casomorphin-7 (BCM-7), a peptide, i.e. protein fragment.
- All dairy products containing A1 beta-casein release BCM-7 on digestion.
- BCM-7 is a proline-rich opioid which binds to mu-opioid receptors.
- BCM-7 stimulates production of mucins (the proteins that make mucus sticky).

There is no controversy about any of the above. However, there is controversy as to the implications of all of this.

A1 vs A2

- Compared with the A2 (original) form, A1 milk consumption is linked with:
  - Digestive problems
  - Eczema, asthma, rhinitis (chronic stuffy nose), otitis media (glue ear) etc
  - Type 1 Diabetes
  - Heart disease
  - Infant development, Sudden Infant Death (SIDS)
  - Some behaviour, mood and ‘neurodevelopmental’ disorders

Type 1 Diabetes

- Population studies show strong association.
- Animal data – some support.
- Cohort study (Finland): > 540ml milk/day linked with 5 x risk of developing T1D in those at genetic risk (p<0.01).
- People with T1D have enhanced antibodies to beta-casein, particularly A1.
- Babies fed ‘casein hydrolysate’ vs standard formula have reduced antibodies relevant to T1D.

NO PROOF (i.e. controlled trials in humans)

Food-derived ‘Opioid’ peptides

Morphine
Bovine BCM7
Human BCM
Alpha-gliadin

The ‘Hierarchy’ of Scientific Evidence for ‘Cause-and-Effect’

Systematic reviews / Meta-analyses of RCTs
Randomised Controlled Trials (RCTs)
Non-randomized controlled trials
Open trials
Case reports
Expert opinion
Personal / anecdotal

Evaluating Scientific Evidence

- Observation
  - When systematic → Data
- Plausible theory / mechanism
  - Fits with existing knowledge / ‘makes sense’
- Evidence of Association
  - Population studies (epidemiology)
    - ‘Case-control’ studies
- Evidence of Causality
  - Animal studies (controlled trials)
  - Controlled trials in humans
A1 beta-casein and Heart Disease

Human population studies + evidence from animal studies.
NO PROOF from human RCTs

A1 beta-casein and gut health

- Two recent animal studies have shown that A1 beta-casein (vs A2)
  - Causes gut inflammation
  - Slows digestive transit time
  Haq et al 2013 – Eur J Nutr
- A very recent controlled trial in humans also found significant effects of A1 vs A2 on gut function

What About the Brain?

Recent evidence that food-derived opioid peptides – esp BCM-7 from bovine (A1) beta-casein:
- Have powerful effects on gene expression (‘epigenetics’
- Can reduce glutathione levels (important in protecting brain cells from ‘oxidative stress’)

FAB Research Conferences
Audio/Video Library - www.fabresearch.org

Feeding Better Behaviour, Learning and Mood – Guts, Brains and the Nutrition Connection
March 2014

Childhood behavioural and learning difficulties – the Overlap
Dyslexia
ADHD
Autistic Spectrum
Dyspraxia

• These diagnoses are descriptions – they are not explanations.
• Difficulties are dimensional, affecting > 20% of UK school children

Psychological / Psychiatric Disorders
Schizophrenia
Depression
Bipolar Disorder
Anxiety Disorders

Diagnoses are descriptive – based on behaviour, not etiology
Conditions are dimensional – i.e. continuous with normal function
Comorbidity is high, adding to heterogeneity within each
Need for a Multi-level approach

- Behaviour
- Thinking
- Feelings
- Emotions
- Physiology / Biochemistry

Adapted from Alan Watkins MD, ‘Complete Coherence’

Nutrition in disorders of mood, behaviour and cognition – many different issues

1. Blood sugar regulation problems
2. Fatty Acid deficiencies / imbalances
3. Micronutrient deficiencies or imbalances
4. ‘Anti-nutrients’ and toxicity issues
5. Food allergies / intolerances
6. Gut dysbiosis / digestion & malabsorption issues

Food Allergies vs Intolerances

- Conventional medical testing for allergy (IgE) will NOT identify other possible ‘intolerance’ reactions
- Many other forms of ‘adverse food reaction’ exist, but these can be difficult to identify
  - Food poisoning (‘one-off’ but some effects may persist)
  - Failures of digestion / detoxification
  - Possible relevance of IgG not proven
    - (may depend on food quantity, IgA defences, ‘leaky gut’ etc)
- Food cravings / ‘addictions’ - possible intolerance?
  - Many practitioners regard ‘craved’ foods as prime suspects for investigation.

‘Exclusion’ Diets

- In practice - the only reliable way to assess adverse food reactions is systematic exclusion of all suspect foods, then staged re-introduction
  - Difficult and time-consuming.
  - Specialist input / supervision needed
- Specialist help should always be sought before excluding any major foods from a child’s diet
  - Otherwise, this can add to nutrient deficiencies / imbalances

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Milk and Dairy Products

- Adverse reactions to ‘milk and dairy’ are commonly suspected, but reflect many different potential issues
  - Classic cows’ milk protein allergy (should always be tested for to rule this out)
  - Lactose (milk sugar) intolerance (low-lactose milks, or lactase enzyme supplements may help)
- Excluding all milk increases risks for nutrient deficiencies
- ‘A1’ cows’ milk intolerance -
  - Apparent ‘addiction / craving’ for cows’ milk / dairy products?
  - Tolerance for human breastmilk, and milk from other animals (goat, sheep, buffalo, camel?)

Importance of Milk in the diet

Valuable dietary source of
- Calcium
- Iodine
- Potassium
- Phosphorus
- Vitamin D
- Vitamin B12,
- Vitamin A
- Vitamin B (esp riboflavin and niacin)
These nutrients can be obtained from other foods, but many have better absorption through milk.

Mis-identification of Cows’ Milk Allergy


- 381 infants avoiding Cows’ Milk Protein (CMP) were identified, of whom:
  - 138 (36%) had an adverse health condition related to CMP, and of these:
    Just 66 (17%) had antibody-confirmed milk allergy
  - The remaining 243 (64%) were branded ‘mislabelled CMP allergy’

Restrictive Diets May Make Things Worse


Autistic children on ‘GF-CF’ vs unrestricted diets
- Both had more signs of protein malnutrition than non-autistic controls.
- Many autistic children in both groups lacked amino acids needed to make key neurotransmitters
- These deficiencies were more pronounced in those following the GF-CF diet.

Summary and Conclusions (1)

- Not all cows’ milk is the same
  - Ordinary cows’ milk contains A1 beta-casein - the ‘mutant’ form of this major milk protein
  - Human milk contains the A2 form (as do all other animal milks: goat, sheep, buffalo, donkey, camel etc)
- A2 milk is the original form
  - Easily digested
  - Does NOT give rise to the opioid peptide, BCM-7
- Genetic testing is the only way to find out if any cow’s milk will contain A1 beta-casein
Summary and Conclusions (2)

• Compared with A1 milk beta-casein, A2 consumption is associated with:
  – Less gut inflammation
  – Faster digestive transit time
  – Fewer digestive symptoms / ‘intolerance’ reactions
  – Lower risks for:
    • Type 1 diabetes*
    • Allergies (asthma, eczema etc) and other immune / autoimmune disorders*
    • Heart disease*
    • Some behaviour / mood disorders*

* Association studies only: no definitive proof from human RCTs.

Summary and Conclusions (3)

• Many people exclude milk and dairy products believing they have ‘allergy’ or ‘intolerance’
  1) Cows’ milk protein (CMP) allergy (IgE) ?
  2) Lactose (milk sugar) Intolerance ?
  3) A1 beta-casein (opioid peptide) intolerance ?

• This can lead to important nutrient deficiencies unless the diet is very well-planned
• Only classic CMP allergy gives good grounds for excluding all milk and dairy products

Further Information

For details of this and related research see

Food And Behaviour Research
www.fabresearch.org