The Role of Enzymes in Food Intolerances, Gut Issues & Autism

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What are enzymes?
- Specialized proteins that catalyze chemical reactions
- Not changed or destroyed during the reaction
- Specific for a single function
- Many thousands of different enzymes
  - Metabolic - inside cells, difficult to affect
  - Digestive - Breakdown proteins, carbohydrates, fats
    - Pancreatic (animal)
    - Plant-based (Fruits, fungi, bacterial)

Digestive enzymes
- Necessary to break down whole foods into absorbable form
- Found in saliva, stomach, pancreas and intestine
- Produced by probiotic bacteria in colon
- Both pancreatic and plant-based enzymes available in oral form
- Plant-derived enzymes offer advantages over pancreatic enzymes

Autism can affect the gut
- Inflammation
- Malabsorption, decreased peristalsis
- Developmental delay
- Food allergies and other immune system problems

Some foods not tolerated in autism
- Wheat (gluten protein)
- Dairy (casein protein and/or lactose sugar)
- Soy protein
- Certain carbohydrates, e.g. lactose, raffinose
- Polyphenolic compounds, oxalates, lectins

Food intolerances not limited to autism
- Non-celiac gluten intolerance
- IBS
- ADHD
- Diverticulitis
- Food allergies of non-anaphylactic nature
Restoring gut health

- Provide healthy environment for probiotic bacteria
- Reduce inflammation as well as the cause
- Eliminate potential future allergen production

Restrictive diets often helpful

- Gluten-free Casein-free diet (GFCF)
- Specific Carbohydrate Diet (SCD)
- Low Oxalate Diet (LOD)
- Body Ecology Diet (BED)
- Gut and Psychology Diet (GAPS)

Oral enzymes complement diets

- Many diets now incorporate oral enzyme supplements
- Enzymes often used as alternative to some diets
- Enzymes can often achieve same goals as diets
  - More specific
  - Faster
  - Less costly, more convenient

Diets may also be difficult

- Nutritional Insufficiency?
- Family lifestyles
- Cost and availability

Anecdotal observations associated with enzyme use

- Speech starts or improves dramatically
- Better eye focus and contact
- Less stimming
- Improvements often noted by unknowing third parties
- Bowel movements improved
- Positive benefits often increased for those on diets
- Benefits are dependent upon many factors

How do enzymes help?

- Break down proteins differently, more thoroughly
- Prevent production of exorphin and other peptides
- Requires optimal blend of protease and peptidase enzymes
- Function in stomach, no peptide absorption occurs
- Modify polyphenolic compounds
- May mimic enzymes produced by probiotics?
- Break down carbohydrates
- Modify effect of stomach/pancreatic enzymes
**Figure 1.** Example: DPP IV peptidase

- Only known enzyme to degrade exorphin casomorphin
- Produced by cells in GI tract
- Found in commercially available protease blends (Houston, 1999)

**Figure 2.** Proteins: Digestive formation of casomorphin

**Figure 3.** DPP IV effect on casomorphin

**Figure 4.** Blocked peptide formation by multiple proteases

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### Proteins: Digestive formation of casomorphin

**Bovine Casein**

```
xxx-xxx-tyr-pro-phe-pro-glu-pro-ile-xxx-xxx
```

1. **Pepsin**

2. **Elastase**

**Casomorphin**

### DPP IV effect on casomorphin

**Bovine Casein**

```
xxx-xxx-tyr-pro-phe-pro-glu-pro-ile-xxx-xxx
```

1. **Pepsin**

**DPP IV**

**Elastase**

**No casomorphin formed!**

### Blocked peptide formation by multiple proteases

**Bovine Casein**

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xxx-xxx-tyr-pro-phe-pro-glu-pro-ile-xxx-xxx
```

1. **Pepsin**

2. **Elastase**

**DPP IV**

**No casomorphin formed!**
Enzymes may allow tolerance to many types of foods

- Some indications of help with oxalates and lectins
- More obvious help for foods high in polyphenolics
- Apparent function is through modification of polyphenols, not degradation

Polyphenolic compounds

- Very abundant in diet, several hundred identified in foods
- Chief interest is due to antioxidant potential
- Modulate the activity of wide range of enzymes/receptors
- Research areas mainly focus on role in oxidative stress
- Certain enzymes convert polyphenolics to absorbable form

Enzyme dosing

- Experimentation encouraged, no toxicity, safe dosing
- Try taking enzymes at beginning of meal
- Base dosing on size of meal, not body weight or age
- May be taken with most medications or other supplements
- Effective with first dose for digestive results

Reasons to try enzymes

- Results often seen faster than with diet
- Inexpensive
- No special medical attention or testing required
- May be a better fit to a family’s lifestyle, less stress
- Studies are good, but not necessary to find out if helpful for your situation

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