
## Propionates E280-283 an emerging issue

Propionates are currently regulated as E280 propionic acid, E281 sodium propionate, E282 calcium propionate, E283 potassium propionate, principally in breads. Increasingly it is hidden in unregulated amounts an ingredient called cultured wheat, cultured flour, cultured wheatflour, cultured dextrose, cultured whey, fermented wheat, fermented flour, fermented wheatflour, fermented dextrose, fermented whey, or starter culture. Of the 19 ways in which propionate preservatives can be added to food, only 8 are regulated and must appear as additives. The rest are hidden and so are in unregulated amounts.

It is used in

- Oil emulsions GMP
- Fruit and vegetable spreads including jams, chutneys and related products GMP
- Flour products (including noodles and pasta) 4000MPL (in Australia, lower in other countries)
- Solid formulated supplementary sports foods 400MPL
- Fruit and vegetable juices and fruit and vegetable juice products 400MPL
- Formulated Beverages GMP
- Sauces and toppings (including mayonnaises and salad dressings) GMP

Recent research describes neurotoxicity of propionates linked to autism and dementia. A review is required.

Propionates occur naturally in the human body, so in the 1980s food authorities considered them safe and they were approved for use as a preservative. However if you eat processed food, you eat 2-3 times more propionate each day than is produced naturally in your body (8, 9).

In the US, brain researchers (1) now say “Excess levels of propionate appear to be problematic”. Such levels of propionates can occur due to

- a metabolic disorder called propionic acidemia whose prevalence is poorly understood
- propionate preservatives in diet
- medications that metabolise to propionic acid

Since approval as a food preservative, studies have linked these chemicals to:

- behaviour and attention problems in children (2) based on the Lancet report of behavioural effects on children of propionic acid by Swain et al (3) at Royal Prince Alfred Hospital in Sydney. It has never been refuted by further studies.

- autistic type changes in the brains of both rats (4,5) and humans (6). Propionate-treated rats are now used as an animal model of autism in research https://youtu.be/6ejL1B3pVpA . Scientists have even suggested that eating this additive during pregnancy may be linked to autism (6)

- diabetes and obesity A 2019 Harvard study (7) on humans and mice found that a meal containing a low dose of propionate led to a significant increase in plasma levels of propionate in healthy humans and exposure to propionate preservatives resulted in insulin resistance in humans and chronic exposure in mice resulted in insulin resistance and weight gain, with propionate appearing to act as a “metabolic disruptor” that could be contributing to the dramatic increases in diabetes and obesity.

- dementia Emerging evidence from researchers at the Department of Neurosurgery and Brain Repair, Morsani College of Medicine, University of South Florida (1) suggests that "excess propionate may play a role in dementia, particularly in Alzheimer’s disease”

Therefore, further evaluation of the metabolic consequences of propionate consumption is urgently required (10).

regards

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The Food Intolerance Network is a free service with over 19,000 families mostly in Australia and New Zealand and provides independent information about the effects of food on behaviour, health and learning ability in both children and adults, and support for families using a low-chemical elimination diet free of additives, low in salicylates, amines and flavour enhancers (FAILSAFE) for health, behaviour and learning problems.

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1. Killingsworth J et al, Propionate and Alzheimer's Disease (2021). Front Aging Neurosci, 2021 Jan 11;12:580001. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7831739/

2. Dengate S and Ruben A, Controlled trial of cumulative behavioural effects of a common bread preservative (2002). J Paediatr Child Health, 2002,Aug;38(4):373-6. https://www.ncbi.nlm.nih.gov/pubmed/12173999

3. Swain A et al, Salicylates, oligoantigenic diets, and behaviour (1985). Lancet,1985 Jul 6;2(8445):41-2. https://pubmed.ncbi.nlm.nih.gov/2861485/

4. A M Brusque et al, Effect of chemically induced propionic acidemia on neurobehavioral development of rats (1999). Pharmacol Biochem Behav, 1999;64(3):529-34. Propionic academia can be chemically induced by feeding propionic acid to rats and was shown to cause long term developmental delay. https://pubmed.ncbi.nlm.nih.gov/10548267/

5. MacFabe DF et al. Neurobiological effects of intraventricular propionic acid in rats: possible role of short chain fatty acids on the pathogenesis and characteristics of autism spectrum disorders (2007). Behav Brain Res, 2007,10;176(1):149-69. https://pubmed.ncbi.nlm.nih.gov/16950524/

6. Abdelli A et al, Propionic Acid Induces Gliosis and Neuro-inflammation through Modulation of PTEN/AKT Pathway in Autism Spectrum Disorder (2019). Sci Rep, 2019,19;9(1):8824. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6584527/ Also reported in Medical News Today: Could processed foods explain why autism is on the rise? For the first time, scientists have found a molecular connection between a common food preservative, neuronal disruption, and autism spectrum disorder. The findings suggest that there may be a link between the consumption of processed foods during pregnancy and the rise of autism. https://www.medicalnewstoday.com/articles/325546

7.Tirosh A et al, The short-chain fatty acid propionate increases glucagon and FABP4 production, impairing insulin action in mice and humans (2019). Sci Transl Med, 2019 Apr 24;11(489):eaav0120. Quote: chronic consumption of propionate leading to an increase in insulin levels might in turn lead to an increase in food intake, weight gain, and insulin resistance https://pubmed.ncbi.nlm.nih.gov/31019023/ Also reported in Harvard Gazette: Could a popular food ingredient raise the risk for diabetes and obesity? Consumption of propionate, an ingredient that's widely used in baked goods, animal feeds, and artificial flavorings, appears to increase levels of several hormones that are associated with risk of obesity and diabetes, according to new research led by the Harvard T.H. Chan School of Public Health in collaboration with researchers from Brigham and Women's Hospital and Sheba Medical Center in Israel. See also https://www.hsph.harvard.edu/news/press-releases/could-a-popular-food-ingredient-raise-the-risk-for-diabetes-and-obesity/

8. Morrison D. J., Preston T. (2016). Formation of short chain fatty acids by the gut microbiota and their impact on human metabolism. Gut Microbes 7, 189–200. https://pubmed.ncbi.nlm.nih.gov/26963409/ It is estimated that in a human being who weighs 85 kg, the gut microbiota produce approximately 29.5 mg/kg of propionate each day via fermentation. Therefore about 2.5g are produced in a body of this size.

9. Martínez Steele E, Baraldi LG, Louzada MLDC, et al (2016). Ultra-processed foods and added sugars in the US diet: evidence from a nationally representative cross-sectional study. BMJ Open 2016;6:e009892. https://bmjopen.bmj.com/content/6/3/e009892

10. Morris A. (2019). Metabolic safety of common preservative under scrutiny. Nat Rev Endocrinol. 2019 Jul;15(7):378. https://www.nature.com/articles/s41574-019-0217-3

The effects on consumers are briefly collected here, with links to more reports https://www.fedup.com.au/news/blog/harm-from-bread-preservative-confirmed#reports

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