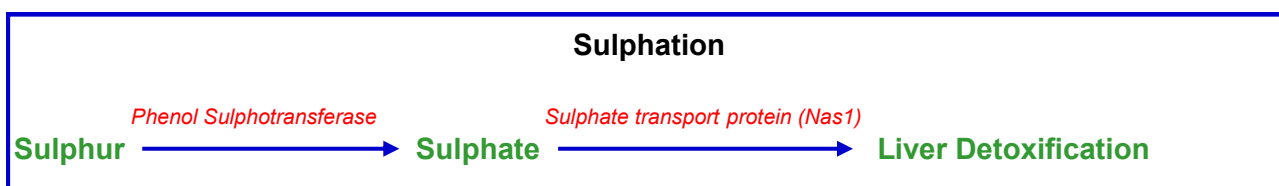


# Phenol Sensitivity

Phenols are chemicals found in basically all foods. The "phenol" category contains quite a few subgroups, that are both food and non-food. For example, **salicylate** is a subgroup of phenol. There are other chemicals found in foods that can cause similar symptoms as phenols, including **amines**, even though they are not technically "phenol".

Potentially over 80% of ASD children have a deficiency in a key detoxification pathway. The pathway involves using sulphur in the form of sulphate (known as **sulphation**). The enzyme involved is **phenol sulphotransferase (PST)**, and helps eliminate phenols from the body.



This detoxification pathway processes other phenolic compounds including salicylates, artificial food colourings, artificial flavourings, and some preservatives. Besides requiring PST, research has found that salicylates further suppress the activity of any PST enzyme present, making matters worse. Food dyes also have been shown to inhibit the PST enzyme.

Feeding large amounts of sulphur and phenolic-based foods to PST deficient children will cause a build up of phenols, amines, salicylates, and other toxic substances normally cleared by the PST enzyme.

## Symptoms Of Phenol Sulphotransferase (PST) Defect

If the sulphation pathway is not functioning well, a person may not be able to process phenolic compounds as fast as they consume them. There is a cumulative effect. When the phenols start backing up in the system, it can cause a myriad of negative reactions and symptoms.

- |   |                          |
|---|--------------------------|
| ⊖ night waking for several hours, night sweats, difficulty sleeping | ⊖ red cheeks/ face/ ears |
| ⊖ dark circles under eyes   | ⊖ lethargy               |
| ⊖ irritability, hyperactivity, aggression                           | ⊖ inappropriate laughter |
| ⊖ self-injurious behaviour, head banging                            | ⊖ diarrhoea              |
| ⊖ eczema, and other skin conditions.                                |                          |

**Only a few of these symptoms need to be present**

It appears that this sub optimal activity of PST activity is a function of low plasma sulphate levels rather than of deficits in the actual enzyme. Thus, any food or chemical that requires or uses up sulphate during its breakdown will make the situation worse. Common foods that can cause this problem include apple juice, citrus fruit juices, chocolate, and paracetamol (Tylenol™). This detoxification pathway processes other phenolic compounds including salicylates, artificial food colourings, artificial flavourings, and some preservatives.

**Many colouring materials, whether of natural or synthetic origin, possess phenolic groupings.** Acetaminophen (paracetamol - Panadol, Tylenol) is also detoxified by this pathway, which is why we see either hyperactivity or lethargy in children with a severe PST problem, when given acetaminophen. Therefore Panadol should be avoided for kids with a PST problem. Acetaminophen also depletes glutathione, therefore should be avoided, especially with vaccinations.

PST/sulphate deficiency also impairs the metabolism of classical neurotransmitters such as **serotonin and dopamine**; impairs breakdown and metabolism of the bile pigments bilirubin and biliverdin; and **decreases secretion of pancreatic enzymes and bile** from the gall bladder and biliary tract into the intestines. This would result in low uptake of certain vitamins and other nutrients from the intestines; reduced activity of gastrin (and subsequent **reduced secretion of stomach acid, mucus, and pepsin in the stomach**), and, probably, **reduced production of secretin** further downstream.

**Excess boron** interferes with the metabolism (breakdown and excretion) of phenols. Boron is found in **apples, pears, grapes, nuts, leafy green vegetables, and legumes**. Supplying these substances, especially apples, pears, and grapes, or their juices in **large amounts** to PST deficient children, will cause a build up of phenols, amines, salicylates, and other toxic substances normally cleared by PST.

The 'bottleneck' can be cleared in one of two ways. One is reducing the amount of phenols and toxins entering the body. This is the basis of the **Failsafe diet** and the **Feingold diet**. These diets remove the hard-to-process artificial colourings, flavourings and preservatives. The second method of enhancing the detoxification process is to **supply more sulphate**. This increases the ability to process toxins out of the body. **Sulphate may not be absorbed well from the gut**, so simply giving more sulphur directly by swallowing supplements may not produce satisfactory results. Therefore a way to get sulphate into the body is through **Epsom salt baths**. Many parents report that giving **Epsom salt baths** is beneficial to help their child's body process phenols. Sulphate is thought to circulate in the body up to about nine hours.

Some parents have found supplementing with **molybdenum** has helped with phenols.

Generally more **sulphur, magnesium**, and **molybdenum** are helpful in processing phenols.

**Vitamin B6 and/or P-5-P can aggravate the PST** problem of some children, by making it difficult for the child to process phenols. **B6 in the form of P5P (pyridoxal-5-phosphate) inhibits PST (phenol sulphur-transferase) activity**. This could be why some children show adverse effects when supplements high in P5P are started. However the same study showed that increasing magnesium supplementation reverses this inhibition. Dr Rosemary Waring's research has shown that B6 can inhibit human sulfotransferases, but they are activated by magnesium, so that **if you have at least a 1:1 mix of B6:Mg** there is no problem. This is why, if you have a problem with B6, try to see if taking magnesium will help.

The main source of free sulphate in the body is the amino acid **cysteine**, which is obtained from the breakdown of protein. One of the sulphur containing amino-acids used for this purpose is **taurine, which is reported to have an anti-opioid effect**.

For limited periods, **use of herbs that enhance liver enzyme action** seems to be beneficial to those with the PST/sulphoxidation problem.

Supplementation with **digestive enzymes (pancreatic enzymes)** seems particularly beneficial for those suffering the PST/sulphate problem.

**Cranberry juice** has been anecdotally reported to reduce or even eliminate these effects. Whether this due to the sulphur content of the juice or some other mechanism including placebo remains to be determined.