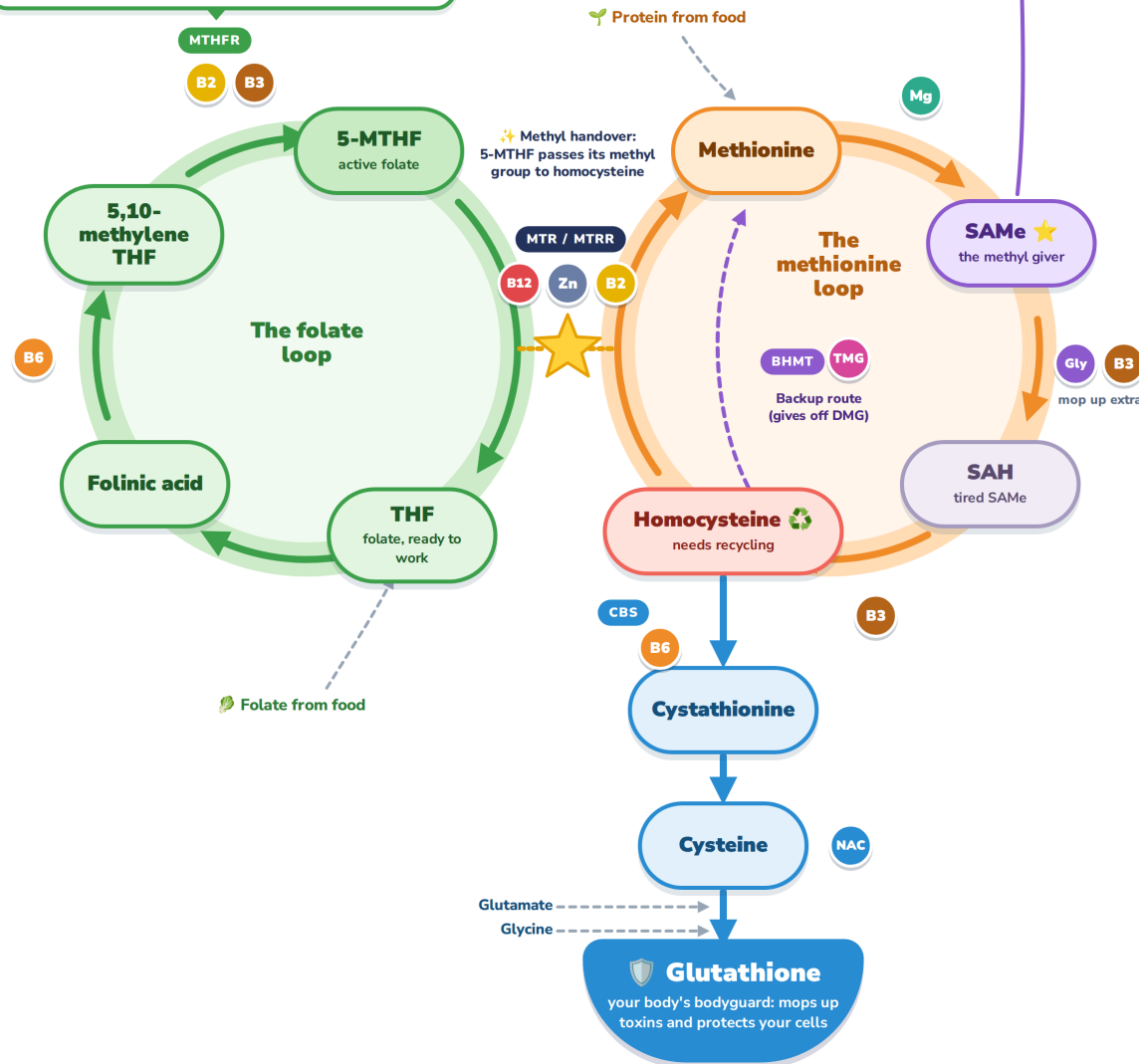


Methylation: your body's recycling loop

Follow the arrows round each loop. The coloured coins are the nutrients that help each step.

🧬 **MTHFR, the step most people ask about.** Common gene changes (such as C677T and A1298C) can cut this conversion by about **20 to 70%**, depending on which copies you carry. Less active folate (5-MTHF) is made, so this step's helpers and food folate matter even more.



Methylation is like two gears turning together. When they turn smoothly, homocysteine is recycled and your mood, hormones and detox all run better!

Meet the helpers

- B9** 🌿 **Folate:** leafy greens, broccoli, legumes
- B12** 🥛 **Vitamin B12:** fortified nutritional yeast*, fortified plant milk, or a B12 supplement
- B6** 🍌 **Vitamin B6:** potatoes, bananas, chickpeas, wholegrains
- B2** 🍄 **Vitamin B2:** mushrooms, almonds, leafy greens
- B3** 🥜 **Vitamin B3:** peanuts, mushrooms, wholegrains
- Zn** 🎃 **Zinc:** pumpkin seeds, legumes, oats, cashews
- Mg** 🍫 **Magnesium:** leafy greens, seeds, legumes, cacao
- TMG** 🥬 **Betaine (TMG):** beetroot, spinach, quinoa, wholegrains
- Gly** 🌱 **Glycine:** legumes, soy, seeds
- NAC** 🧄 **Cysteine & NAC:** garlic, onions, legumes, oats (NAC is a supplement)

*Not all nutritional yeast has B12. Check the label says "fortified with B12".

Tests we use in clinic

Homocysteine (blood): is the recycling keeping up?

SAMe, SAH and the SAMe:SAH ratio: how well are you methylating?

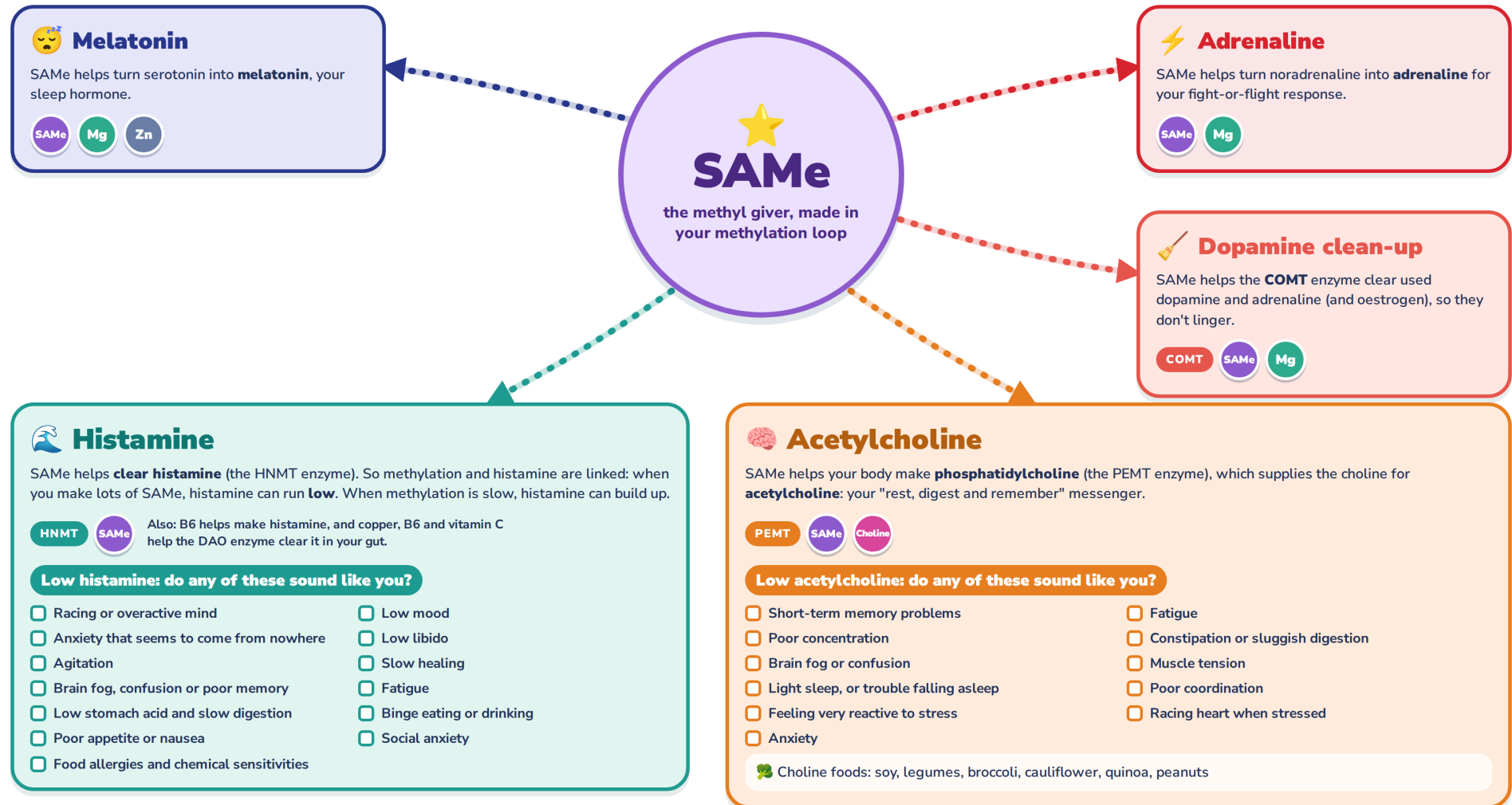
MTHFR, MTR, MTRR and CBS genes: a gene change can slow a step, so its helpers matter more.

Where does SAMe go?

SAMe is the methyl giver from your methylation loop. Follow it out to the brain chemicals it helps make and clear.



SAMe is a busy helper! It hands out methyl groups to make and clear your brain chemicals. That is why methylation can show up as sleep, mood, memory and allergy symptoms.



On your test: SAMe, SAH and the SAMe:SAH ratio show how well you are methylating, and a blood **histamine** level shows whether histamine is running high or low.

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General education, not individual advice. Many things can cause these signs, so talk to your practitioner before starting supplements.

Where does SAME go? Part 2: your body

SAMe doesn't only work in your brain. It hands out methyl groups for energy, your liver, hormones, detox, genes and nerves.



One SAME, lots of jobs! When your methylation loop is turning well, there is plenty of SAME to go around. When it slows, every job gets a smaller share.

⚡ Energy

SAMe's **biggest single job** is making **creatine**, the quick-energy store in your muscles and brain. It can use up to around 40% of your methyl groups. SAMe also helps make **carnitine** and **CoQ10**, which help your cells turn food into energy.

Helpers: **SAMe** **Gly** **Arg** **Mg**

🌱 Plant food has no creatine, so on a plant-based diet your body makes all of it. Arginine comes from pumpkin seeds, peanuts, soy and legumes.

Can show up as: tired muscles, low stamina, brain fatigue

🌸 Hormones

SAMe helps the **COMT** enzyme turn used oestrogen into safer forms, ready to leave your body. If this step is slow, used oestrogen can hang around longer.

Helpers: **COMT** **SAMe** **Mg**

🥦 Broccoli, cabbage and other crucifers help the first step of clearing oestrogen, so COMT has less to do.

Can show up as: PMS, heavy or painful periods, breast tenderness

🧬 Genes

SAMe puts tiny methyl **"sticky notes"** on your DNA that help switch genes on and off. Food and lifestyle change these notes, so **your genes are not your destiny**.

Helpers: **SAMe** **B9** **B12**

🌱 Folate-rich greens and legumes, plus your B12, keep the sticky notes well supplied.

SAMe
the methyl giver, made in
your methylation loop

🍖 Liver & cell walls

SAMe helps build **phosphatidylcholine** (the PEMT enzyme). It makes up the walls of every cell, and helps your liver package up fat and send it out. When there isn't enough, fat can build up in the liver.

Helpers: **PEMT** **SAMe** **Choline**

🌸 Oestrogen helps switch this step on, so choline needs can rise after menopause. Choline foods: soy, legumes, broccoli, quinoa.

Can show up as: fatty liver on a scan, raised liver enzymes

🧪 Detox

SAMe **tags arsenic** (found in rice and some bore and tank water) so your body can pass it out in your urine. Your glutathione bodyguard helps too.

Helpers: **SAMe** **B9** **B12**

🍲 Cook rice like pasta, in plenty of water, then drain it. This removes a good share of the arsenic.

🧵 Nerves

Methylation helps build and repair **myelin**, the protective coating around your nerves, like the plastic coating on a wire. That's one reason low B12 can affect your nerves.

Helpers: **SAMe** **B12** **B9**

Can show up as: tingling, pins and needles, numbness or balance problems: ask your GP to check your B12

🍯 **One pot, many jobs:** all of these jobs share the same pot of SAMe. That's why a slow methylation loop can show up in so many different ways, and why looking after the helper team matters.

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Meet the methylation helper team

Every step in your methylation loops needs its helpers, called cofactors. Each coin here matches a coin on the methylation diagram.



The loops can only turn as fast as their slowest helper. If even one helper is missing, the whole team slows down, even when the others are full!



It's a relay team. If one runner is missing, the baton stops, however fast the others are.



Genes change which helper matters most. With an MTHFR change, B2 and active folate become extra important.



More isn't always better. Taking one helper on its own can push the others out of balance.

B9 Folate

★ **Superpower:** Carries the methyl groups round the folate loop.

Folate loop 5-MTHF

Find it in: leafy greens, broccoli, legumes, asparagus

⚠ **Drained by:** alcohol, the contraceptive pill, some medicines

B12 Vitamin B12

★ **Superpower:** Makes the methyl handover happen, so homocysteine becomes methionine.

MTR Handover

Find it in: fortified nutritional yeast, fortified plant milk, or a supplement

⚠ **Drained by:** plant-based eating without a supplement, low stomach acid, metformin, reflux medicines

B6 Vitamin B6

★ **Superpower:** Sends spare homocysteine down the slide to make glutathione.

CBS Glutathione route

Find it in: potatoes, bananas, chickpeas, wholegrains

⚠ **Drained by:** the contraceptive pill, alcohol

B2 Vitamin B2

★ **Superpower:** Switches on MTHFR, and helps recycle B12. Extra important with MTHFR gene changes.

MTHFR MTRR

Find it in: mushrooms, almonds, leafy greens, fortified plant milk

⚠ **Drained by:** alcohol, the contraceptive pill

B3 Vitamin B3

★ **Superpower:** Powers MTHFR and helps turn SAH back into homocysteine. Also mops up extra SAMe.

MTHFR SAH step

Find it in: peanuts, mushrooms, wholegrains, legumes

⚠ **Drained by:** alcohol; high doses can use up methyl groups

Zn Zinc

★ **Superpower:** Helps the handover enzyme (MTR) and balances copper.

MTR Handover

Find it in: pumpkin seeds, legumes, oats, cashews

⚠ **Drained by:** stress, alcohol, high copper (a high copper:zinc ratio)

Mg Magnesium

★ **Superpower:** Turns methionine into SAMe, the methyl giver. Also helps COMT.

SAMe step COMT

Find it in: leafy greens, seeds, legumes, cacao

⚠ **Drained by:** stress, caffeine, alcohol, heavy sweating, reflux medicines

TMG Betaine & choline

★ **Superpower:** Runs the backup route (BHMT), a second way to recycle homocysteine.

BHMT Backup route

Find it in: beetroot, spinach, quinoa, soy, broccoli

⚠ **Drained by:** alcohol, a struggling liver

Gly Glycine

★ **Superpower:** Soaks up extra SAMe and helps build glutathione.

SAMe → SAH Glutathione

Find it in: legumes, soy, seeds, spirulina

⚠ **Drained by:** used up quickly when SAMe runs high

NAC Cysteine & NAC

★ **Superpower:** The building block for glutathione, your body's bodyguard.

Cysteine Glutathione

Find it in: garlic, onions, legumes, oats (NAC is a supplement)

⚠ **Drained by:** toxins, alcohol, paracetamol and illness all use up glutathione

🧪 **Testing takes out the guesswork:** homocysteine, SAMe and SAH show how well the team is working, and your genes show which helpers need extra support.

💊 **Thinking of supplements?** Dose and form matter (for example methyl-B12 or folinic acid). Please talk to your practitioner first, especially if you take medicines.

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