Monoamine Oxidase Inhibitors (MAOI), Tyramine and Drug Interactions (Abbreviated)

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Key Facts
General Summary

This is an abbreviated version of the full monograph on my website (where comprehensive references may be found) which may be studied by those requiring more detailed information. That has full details of the tyramine content of a large range of foods and detailed explanations of drug interactions.

Interactions between **monoamine oxidase inhibitors (MAOI)** and other drugs are now well understood [1] and there is more data on the tyramine in foods, and also on how much is likely to constitute a problem [2].

Concentrations are given as milligrams (mg) of tyramine per kilogram (kg) or litre (L).

For those who already follow healthy eating amounts and patterns an MAOI low tyramine diet involves few changes.

There is some variation of tyramine sensitivity between individuals. Therefore, a small proportion of people may get a measurable, but not problematic, blood pressure elevation with only 10 mg of tyramine, but most people need to have 25-50 mg (in a meal) to get a significant rise in BP. For a detailed analysis of the evidence relating to tyramine dose and blood pressure see refs [1-4], the MAOI section of the website, and the full monograph.

Learn what 10 g or 100 g of cheese looks like. Healthy amounts of cheese are around what is safe tyramine-wise: very few contain more than 25 mg/100 grams, so a large 50 g portion (a healthy portion is just 25 g) contains only 12 mg of tyramine and that is not a problem, even in tyramine-sensitive individuals.

Monitor blood pressure while on MAOIs: buy a BP monitor (upper arm or wrist type).

Even if excessive tyramine is ingested and BP increase occurs, serious consequences are very unlikely (see here). That will usually mean nothing more than monitoring blood pressure for 1-2 hours. Hasty treatment of high BP by inexperienced doctors risks doing more harm than good. Sub-lingual nifedipine should not be used: see website & full monograph for details of advice about treatment of hypertensive episodes (urgencies). There is a PDF explaining blood pressure monitoring. There are two main reasons for BP monitoring:

1) variation in the population: some people will get more marked reactions of BP elevation with relatively smaller doses of tyramine. It will tell you if you are tyramine sensitive and alert you to the need to be careful about diet

2) BP drop on standing is the best measure of the effectiveness of a given dose and essential to optimal speed of adjustment to the final effective dose (see info re an App for mobiles that makes a graph of your BP readings).

Introduction

These drugs are called **M**ono-**A**mine **O**xidase **I**nhibitors (**MAOI**s). This covers both food and drink, and drug interactions, for those taking MAOIs.

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Keep some means of identifying the fact that people are on MAOIs, like with insulin/epilepsy.

Advice on MAOIs should ideally come from specialist psycho-pharmacologists, general psychiatrist may have insufficient knowledge to manage MAOIs optimally.

Tyramine

Tyramine formation in foods requires the presence of micro-organisms with amino acid decarboxylase enzyme activity. Modern food production techniques have mostly eliminated such bacteria from the food supply chain. Tyramine increase has a lot to do with freshness and storage conditions.

Symptoms of Blood Pressure Reactions?

A reaction is an increase of BP over 30-60 minutes and usually shows first as a forceful thumping heartbeat. Pulse usually becomes **slower**. If blood pressure goes up to 180 mm Hg or more severe headache is usual. Tightness in the chest, paleness (pallor) may occur. Symptoms may last for about two hours.

Tyramine in Foods and Beverages

Few foods, except cheese, and Soya sauce, have high tyramine and any BP reaction is proportional to the amount that is consumed: it is a dose-related effect. For detailed data and references see website & full monograph.

Cheeses

Most cheeses now have low tyramine levels (< 10 mg/kg), whether they are hard, semi-hard, acid-curd or soft, that includes almost all commercial, low-priced, processed, and supermarket cheeses whose tyramine levels are <200 mg/kg, usually in the range of 0-50 mg/kg).

Normally non-matured cheese styles, like Brie, are released after 2-4 weeks and have low tyramine levels. Even mature cheeses like Parmigiano Reggiano and Cheddar usually contain <150 mg/kg.

Non-Matured Cheeses, Yogurt

Un-ripened cheese styles: **these have no tyramine**, e.g. curd styles, *fromage frais*, mascarpone, cream, ricotta, mozzarella, cottage cheeses, *bocconcini*. Mozzarella, Ricotta.

Marmite, Bovril, Promite, Vegemite etc.

It is likely that changes in the way these products are now prepared have lowered the tyramine content; level ~320 mg/kg of tyramine. A teaspoon of marmite would have only a couple of milligrams.

Soy sauce

Most supermarket Soy sauces have less than 200 mg/l. Normal 'condiment' quantities (10-20 ml) therefore would have <5 mg and are safe. But caution is required as levels ay sometimes be much greater.

Meat and Fish Products

Fresh and frozen meat and meat products are safe. **Fresh** liver has no tyramine, but it can spoil quickly if refrigerated badly (i.e. >4 deg.). Similarly, liver pate (and similar meat or fish pastes) are safe if freshly made and properly refrigerated.

Meats, Preserved

Dry cured products: Parma ham, prosciutto etc are safe.

Fermented sausages

Improved starter cultures result in much diminished tyramine content. Most salami types are <100 mg/kg so a normal portion will have no more than 5 mg.

Pizza

It depends what you put on it. But (see cheese and salami above) the total tyramine load is very unlikely to be problematic.

Wine and Beer

Wine is safe. Modern hygienic production methods have made excessive tyramine concentrations rare.

A little caution is warranted with 'boutique' and open fermented beers, rare examples can be high. **This is especially relevant since such beverages may be taken on an empty stomach and therefore absorbed much more quickly.**

MAOIs: Interactions with Other Drugs

Myth: MAOIs have many dangerous interactions with other drugs.

Yet there are only two interactions: just SRIs and releasers (ISAs).

The potentially risky interactions with MAOIs are:

1. Serotonin syndrome, caused by (S)SRIs + MAOIs

2. Blood pressure elevation, caused by tyramine in food, or by the other releasers like ephedrine & pseudoephedrine.

Anti-Depressant Drugs

Any drug that works as a serotonin reuptake inhibitor (SRI) is potentially dangerous (possibly fatal) if combined with an MAOI, including: sertraline, fluoxetine, paroxetine, fluvoxamine, citalopram, escitalopram, clomipramine or imipramine, or SNRIs like milnacipran, venlafaxine, desvenlafaxine, duloxetine.

NB Of the TCAs **only clomipramine and imipramine are SRIs, and therefore contra-indicated**.

On ceasing SRI antidepressants to start MAOIs, washout intervals varying between one and five weeks may be required. No washout is required for TCAs (other than clomipramine and imipramine), or mirtazapine, mianserin, trazodone or reboxetine, because they are safe taken together with MAOIs.

Risky Analgesics

The risk is that of serotonin toxicity (ST), because some act as weak SRIs, as explained in detail in my papers, pethidine (aka meperidine) tramadol, tapentadol, especially, are a significant risk for anyone on MAOIs. Dextromethorphan, (dextro)propoxyphene and pentazocine are also best avoided. Other opioids are safe.

It is safe to have an anaesthetic whilst on MAOIs.

It is safe to have adrenalin at the dentist.

Ceasing Treatment

This advice on diet and possible interacting drugs should be followed for a minimum of two weeks (six weeks in some situations) after ceasing MAOIs (between one and three days in the case of moclobemide).

References

1. Gillman, P.K., *Advances pertaining to the pharmacology and interactions of irreversible nonselective monoamine oxidase inhibitors.* Journal of Clinical Psychopharmacology, 2011. **31**(1): p. 66-74.

2. Gillman, P.K., *"Much ado about nothing": monoamine oxidase inhibitors, drug interactions, and dietary tyramine.* CNS Spectr, 2017: p. 1-3.

3. Gillman, P.K., S. Feinberg, and L. Fochtmann, *Revitalizing monoamine oxidase inhibitors: A call for action.* CNS spectrums, 2019: p. http://dx.doi.org/10.1017/S1092852919001196.

4. Finberg, J.P. and P.K. Gillman, *MAO A or B inhibition and dopamine levels*. 2018.