MAOI DIET SHORT 2022

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, in parallel with these peer-reviewed publications [1, 2]. The monograph 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, and there is more data on tyramine amounts in foods, and on how much is likely to constitute a problem.

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

> For those who already follow healthy eating patterns in appropriate amounts, the low-tyramine MAOI 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 (BP) 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 BP, see refs [3-6], the MAOI section of the website, and the full monograph.

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

Monitor BP 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 unlikely. That will usually mean nothing more than monitoring BP 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 detailed advice about the treatment of hypertensive episodes (urgencies). There is a PDF explaining BP monitoring. There are two main reasons for BP monitoring:

1. variation in the population: some people will get more 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 extra careful about diet.

2. BP drop on standing is the best measure of the effectiveness of a given MAOI dose, and helpful to optimise speed of adjustment to the final effective dose.

Introduction

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

> Patients are advised to carry a means of identifying that they are on an MAOI, like with insulin/epilepsy

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Advice on MAOIs should ideally come from specialist psycho-pharmacologists — general psychiatrists 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. Non-fermented foods do not have any tyramine unless they are spoiled: tyramine increase is all about freshness and storage conditions.

Symptoms of BP 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 BP goes up to 180 mmHg or more, severe headache is common. Tightness in the chest, paleness (pallor) may occur. Symptoms may last for about two hours.

Tyramine in foods and beverages

Only food that is prepared using microbial maturation techniques, e.g., cheese, soy sauce, and some salami, can develop high tyramine levels. Any BP reaction is proportional to the amount of tyramine that is consumed: it is a dose-related effect. For detailed data and references see website & full monograph and papers.

Cheeses

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

Non-matured cheese styles, like Brie, 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*.

Marmite, Bovril, Promite, Vegemite, etc.

It is likely that changes in the way these products are now prepared have lowered the tyramine content below the level (measured in the 1970s) of ~300 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 tyramine — but caution is required as levels may sometimes be 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 C). Similarly, liver pâté, and

similar meat or fish pastes, are safe if properly refrigerated; but may become unsafe if left partly-used in a fridge for a week or two.

Preserved meats

Dry-cured products are safe: parma ham, prosciutto, saucisson sec, etc., because they are dry-cured, not fermented, products.

Fermented sausages

Most 'fermented' salami types are <100 mg/kg: a normal portion will have no more than 5 mg tyramine. The starter cultures that are now commonly used have no decarboxylating microorganisms, resulting in much-diminished tyramine contents.

Pizza

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

Wine and beer

In this context, the safe and sensible use of alcohol is what would ensure that you are legally fit to drive a motor vehicle or operate machinery. Wine and spirits are 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 in tyramine content. This is especially relevant since such beverages may be taken on an empty stomach and are thus absorbed more quickly

MAOIs: Interactions with other drugs

Myth: MAOIs have many dangerous interactions with other drugs.

> Yet there are only two interactions: 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 releasers like ephedrine & pseudoephedrine [see full list here].

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, vilazodone, vortioxetine, clomipramine, or imipramine, or SNRIs like milnacipran, venlafaxine, desvenlafaxine, duloxetine.

> Of the TCAs, it is only clomipramine and imipramine that have significant SRI potency, and are therefore contra-indicated

On ceasing SRI antidepressants to start MAOIs, washout intervals varying between one and six weeks may be required — this depends on which drug was ceased. No washout is required for: TCAs (other than clomipramine and imipramine); or mirtazapine; mianserin; trazodone; or reboxetine; all these are safe taken together with MAOIs.

Risky analgesics

The risk is that of serotonin toxicity (ST), because some opioids are weak SRIs, as explained in detail in our recent anaesthetics review paper [7] (which you can provide to your surgeon or anaesthetist if they are concerned). Best avoided are; pethidine (aka meperidine) tramadol, tapentadol, methadone, dextromethorphan, (dextro)propoxyphene and pentazocine. However, one dose of such drugs is unlikely to precipitate a serious reaction.

> Safe opioids are codeine, oxycodone, morphine, buprenorphine, fentanyl

NSAIDs like ibuprofen, and all other non-opioid painkillers, are safe.

It is safe to have an anaesthetic whilst on MAOIs (see review paper [7] for explanation).

Local anaesthetics and adrenaline in dentistry

Adrenaline is not contra-indicated: it may be preferred to use the less concentrated form of local anaesthetic with 1:200,000 concentration of adrenaline, as is recommended for those with heart trouble. Alternatively local anaesthetics without adrenaline are available such as 3% Citanest® DENTAL with Octapressin® 30 mg/mL of prilocaine hydrochloride and 0.54 µg/mL of felypressin.

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

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7. Van den Eynde, V., H. Rosenbaum, and P.K. Gillman, *Expert Opinion on Anesthetic Considerations For Patients Receiving a Classic Monoamine Oxidase Inhibitor.* Anesthesia & Analgesia, 2024. **139**(4): p. 863-866.