

# Motion sickness

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Motion sickness is a common disorder and GPs are often asked about its management. The cause is generally considered to be a mismatch of vestibular and visual sensations. Appropriate management includes education, awareness of preventive strategies and recommendation of appropriate medication.

Motion sickness is a clinical condition characterised by abdominal discomfort, increased salivation, restlessness, nausea, vomiting, pallor and cold sweats. This is usually accompanied by cardiovascular, respiratory, musculoskeletal, sensory, performance and emotional responses familiar to everybody reading this article. Homer and other historical figures described the condition, and the word 'nausea' is derived from the Greek word for ship – *naus*.

The symptoms and signs of motion sickness range from mild to severe in intensity and arise as a consequence of the perception of types of real or apparent motion. Aside from man, primates and a number of other animal species have been shown to suffer from motion sickness. In all cases, the response is a normal result of exposure to an abnormal situation or stimulus.

Car sickness occurs in roughly 58% of children,<sup>1</sup> space-motion sickness in 50% of shuttle astronauts, and air sickness in 29% of pilots.<sup>2</sup> Of the general population, 5% are severely affected by

motion sickness, 5% minimally, and the remaining 90% somewhere in between. In other words, just about everyone suffers from this condition at some time in his or her life.

## Types of motion causing sickness

The many different types of motion causing sickness include travel by sea, air, train, car, swing, space, camel and elephant,<sup>3</sup> and in fact virtually anything that moves. Other environmental stimuli that can cause motion sickness include exposure to artificial environments such as flight simulators, amusement park rides and planetarium or Imax theatres.

A form of motion sickness occurs once exposure has ceased, such as sailors returning to dry land; this is known as mal de débarquement. Symptoms can even occur looking down a microscope at a moving slide, which may explain this author's aversion to histology practical sessions in medical school.

## Factors increasing susceptibility

Susceptibility to motion sickness appears to be increased:

- with recent ingestion of food
- in aerobically fit men
- in women in general, especially if near the time of menstruation or during pregnancy

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- in women using the oral contraceptive pill
- in early teens
- in those predisposed to anxiety, flushing, nausea or migraine
- in Chinese compared with European-Americans.<sup>4</sup>

The condition is more common in younger people, peaking at 12 years, and less common in those aged under 2 years or over 50 years.

## Causes of motion sickness

The cause of motion sickness has not been precisely delineated but is generally considered to be a mismatch of vestibular and visual sensations. Our perception of movement arises from processing information derived from visual input, vestibular input and our expectations based on experience. The vestibular input system includes the semicircular canals, which detect angular acceleration, and the otolith organs, which sense translational acceleration.

Symptoms occur usually with acceleration in a direction perpendicular to the longitudinal axis of the body, thus explaining why head movements away from the direction of motion are so provocative. Vertical oscillatory motion (appropriately called 'heave') at a frequency of 0.2 Hz is most likely to cause

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motion sickness and would be experienced on board a ship with a roll rate of five seconds. The incidence of motion sickness is much less at higher frequencies, thus explaining why symptoms are more common riding on camels and on ships than riding on horseback or windsurfing.<sup>2</sup>

### Treatments for motion sickness

It is not surprising that in view of the immense range of motions involved and individual susceptibility, published randomised controlled trials on therapies for motion sickness *per se* have shown variable benefit. However, there is acceptable evidence for the use of medications to control the symptoms of motion sickness.

The vomiting centre is triggered in part as a result of high levels of dopamine or acetylcholine. Therefore, most medications used to prevent or treat symptoms target these neurotransmitters. Sympathomimetic medications are also known to help. The medications can be divided into antidopaminergic, anticholinergic and antihistamine classes.

It is vital to be aware of the many side effects, precautions and contraindications of these medications. This is especially important for the traveller who will be on an aeroplane or ship and unlikely to be able to access medical care readily. The side effects common to all these medications, and of which travellers need to be made aware before departure, include:

- dry mouth
- blurred vision
- drowsiness
- exacerbation of prostatic symptoms
- intraocular hypertension.

Prochlorperazine (Stemetil, Stemizine) and metoclopramide (Maxolon, Pramin) are known to cause tardive dyskinesia or oculogyric crisis in about 1% of patients; this percentage is much higher in children and young adults and more likely to occur with excessive doses. It may be prudent to ensure travellers have tried these medications before they use them when

| Table. Commonly used medications for motion sickness  |   |
|---|---|
| Medication  | Dosage and comments   |
| <b>Antidopaminergics</b>  |   |
| Metoclopramide HCl (Maxolon, Pramin)  | Adults ≥ 20 years: 10 mg qid  |
| Prochlorperazine (Stemetil, Stemizine)  | Adults: 5–10 mg tds   |
| Promethazine (Phenergan, Avomine, Nyal Plus + Allergy Relief Elixir, Gold Cross Antihistamine Elixir, Progan) | Adults: 12.5–25 mg qid. Children: 2–6 years, 5 mg qid; 6–12 years, 10 mg qid                                      |
| <b>Anticholinergics</b>   |   |
| Hyoscine hydrobromide (Kwells, Travacalm HO)  | Adults: 0.3 mg (one tablet) qid. Children: 2–7 years, quarter tablet qid; 8–12 years, half tablet qid             |
| <b>Antihistamines</b>   |   |
| Diphenhydramine HCl (Unisom Sleep Gels, in various cough medicine liquids)                                    | Adults: 50–100 mg qid. Children: 6–12 years, 25 mg qid  |
| Dimenhydrinate (Dramamine)  | Adults: 50–100 mg qid. Children: 2–6 years, 6.25–12.5 mg tds; 6–8 years, 12.5–25 mg tds; 8–12 years, 25–50 mg tds |
| Cyclizine (Marezine)  | 50 mg daily. Not currently available in Australia   |
| Meclizine (Dramamine II)  | 50 mg daily. Not currently available in Australia   |
| <b>Alternative remedies</b>   |   |
| <i>Zingiber officinale</i> (Ginger root tablets)  |   |
| Acupressure on P6 (Neiguan)   |   |

they are in remote areas. As these medications affect the central nervous system, consideration should be given to interaction with concomitant medications.

Thus, it is important to consider each traveller's individual circumstances in deciding which medication to recommend. This includes consideration of the type of travel, length of exposure to the type of travel, past and current medical history, age and pregnancy status. The traveller's past experiences need to be taken into account, and it is important to emphasise that for highly susceptible individuals, prophylaxis is preferable to treatment.

Side effects are not always unwanted – for example, it may be appropriate to recommend an antihistamine medication known to cause somnolence if this is

desired, or as an aid in drying up a post-nasal drip or blocked Eustachian tube syndrome.

The most effective preventive medication is a mixture of dexamphetamine and hyoscine (not currently available in Australia), followed by hyoscine hydrobromide tablets (Kwells, Travacalm HO) or patches (not currently available in Australia). Because travellers often access these medications overseas, it is important to be aware of the indications and potential problems of medications that are not available here. Commonly used medications for motion sickness are listed in the Table.<sup>2,4,5</sup>

Cognitive behavioural therapy (CBT) may be of great value for frequent travellers, provided they are prepared to put time and effort into working together

### Avoiding or minimising motion sickness

- Avoid exposure to the causative situation as much as possible
- Stay in a central location on a boat or ship or in an aeroplane
- Sit in the front seat of a car or central position in the rear seat, or drive rather than be a passenger
- Focus on a stable horizon or external object
- Avoid jerky, sudden movements when driving
- Eat a light meal then avoid food for three hours before departure
- Avoid heavy meals, dairy products and foods high in protein, calories or salt
- Avoid alcohol, smoking and strong smells
- Have access to cool, fresh air
- Avoid visual stimuli (e.g. reading, watching videos)
- Limit head movements (e.g. press head into the headrest)
- Lie in a supine position with eyes closed
- Have cognitive behavioural therapy with a psychologist
- Take medications for prevention and treatment
- Note that habituation or adaptation will occur with increasing length of exposure to the causative situation

with an appropriate psychologist.<sup>2,4-6</sup> A program comprising a few individual or group sessions is available from some psychologists and selected members of the Travel Clinics Australia group.

Alternative therapies include acupuncture and ginger, neither of which has been consistently shown to be effective on its own, nor more effective than prescribed or over-the-counter medications.

However, it is clear from published trials that some travellers do derive benefit from some of these therapies.

### Final comments

It is worth noting that an early review in *The Lancet* reported that everything that could be carried, worn or swallowed was prescribed for motion sickness at some time.<sup>4</sup> Today's traveller alleviates motion

sickness with a combination of preventive strategies (see the box on this page) and medications.

Physiological adaptation remains the only other option for the long term traveller, until either our bodies mutate or someone comes up with alternative means of transport. MT

### References

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