# Causes of Nausea and Vomiting

## Introduction

This section of Module II covers the specific causes of nausea and vomiting. Once the cause of a patient's vomiting is known, it is often possible to select an antiemetic drug that is relatively specific for the mechanism involved.

Because nausea and vomiting in a given patient can result from more than one mechanism, more than one antiemetic agent may be needed. For example, radiation therapy can cause vomiting:

- by the production of circulating emetic substances that stimulate the chemoreceptor trigger zone (CTZ); or,

  Chemoreceptor trigger zone: the part of the brain that is responsible for nausea

- by a direct action on specific organs, producing stimuli carried by afferent nerves to the vomiting center (VC).

  Vomiting center: the part of the brain that receives input from various areas of the body and coordinates the vomiting process

Drugs can cause vomiting:

- by stimulating the CTZ (eg, opiates such as morphine; certain chemotherapeutic drugs);

- by irritating the gastric mucosa (eg, aspirin); or,

  gastric mucosa: the mucous membrane that lines the stomach

- by causing gastric stasis (eg, morphine).

  gastric stasis: a delay in the downward passage of the stomach contents

In the two examples immediately above -- gastric irritation and stasis -- the stimuli are carried to the VC by the vagus and other afferent nerves.

It is estimated that at least half of cancer patients suffer from nausea and vomiting. Common causes include chemotherapeutic drugs, opiates, and other drugs; radiation; metabolic disturbances, such as uremia and hypercalcemia; and pressure and obstruction caused by tumors.

Figure 2.1-1 shows the pathways by which several important stimuli cause nausea and vomiting, as discussed briefly below.

**Stimuli Mediated by the CTZ**

- stimuli produced by various drugs, such as apomorphine, morphine, some digitalis derivatives, certain cancer chemotherapy agents, narcotic analgesics, and general anesthetics
- toxins, such as those produced in food poisoning and radiation therapy
- certain metabolic disturbances, eg, diabetic ketoacidosis, uremia, and hypercalcemia

**Stimuli Mediated by the Vagus and Other Nerves**

- excessive irritation, overdistension, or overexcitation of the gastrointestinal tract, especially the duodenum
- the effects of certain drugs (eg, erythromycin) on the

some cancer chemotherapeutic agents stimulate the CTZ, others the VC

diabetic ketoacidosis: a condition in which ketone bodies (acids) accumulate in the body as a result of uncontrolled diabetes

uremia: a kidney condition in which byproducts of protein metabolism accumulate in the blood

hypercalcemia: an excess of calcium in the blood (not unusual in cancer patients)

gastrointestinal tract

O visceral pain caused by ulcers, cancer, colic, appendicitis, heart attack, gastrointestinal obstruction, etc.

visceral: pertaining to the internal organs of the body

O gastric stasis induced by anticholinergics, opiates, tricyclic antidepressants, or aluminum-containing antacids; or by toxic levels of alcohol

O radiation (including radiation therapy)

**Stimuli Mediated by the CNS**

O psychic stimuli, eg, unpleasant odors, sights, or thoughts

"nauseating" smells, sights, or thoughts can cause nausea and vomiting

O fear, anxiety

many patients receiving chemotherapy or radiation therapy suffer from anticipatory nausea and vomiting (a conditioned response in which nausea and vomiting develop before the administration of chemotherapy or radiation therapy)

**Stimuli Mediated by the Inner Ear**

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|---|---|
| O movements of the head, neck, and eye muscles | in some people, motion stimulates receptors in the inner ear; impulses are transmitted to the cerebellum, then to the CTZ |
| O infections and diseases involving the ear | |

**Stimuli Mediated by Midbrain Receptors**

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|---|---|
| O increased intracranial pressure | swelling of the brain caused by tumors or inflammation is a relatively rare cause of vomiting; often such vomiting is projectile (the vomitus is ejected with great force) and is not associated with nausea |

**Other Stimuli**

O self-induced vomiting, as in bulimia and anorexia nervosa

O viral hepatitis (the mechanism involved is unknown)

O pregnancy (it is not known whether the stimuli are mediated by the CTZ or go directly to the VC)

**Summary**

Many different stimuli are involved in the development of nausea and vomiting. For example, radiation therapy produces circulating emetic substances that stimulate the CTZ, but radiation also has visceral effects that stimulate the VC via nervous pathways. Similarly, drugs can stimulate the CTZ, which in turn stimulates the VC. Or, the visceral effects of drugs can stimulate the VC through nervous pathways.

The following stimuli are mediated by the major pathways: the effects of certain drugs, toxins, and metabolic disturbances -- the CTZ; GI distension, certain drugs, gastric stasis, visceral pain, and radiation -- the vagus and other nerves; anxiety and other psychic stimuli -- the CNS; motion sickness and certain conditions involving the ear -- the inner ear; and intracranial pressure -- midbrain receptors.