# Biotech In focus

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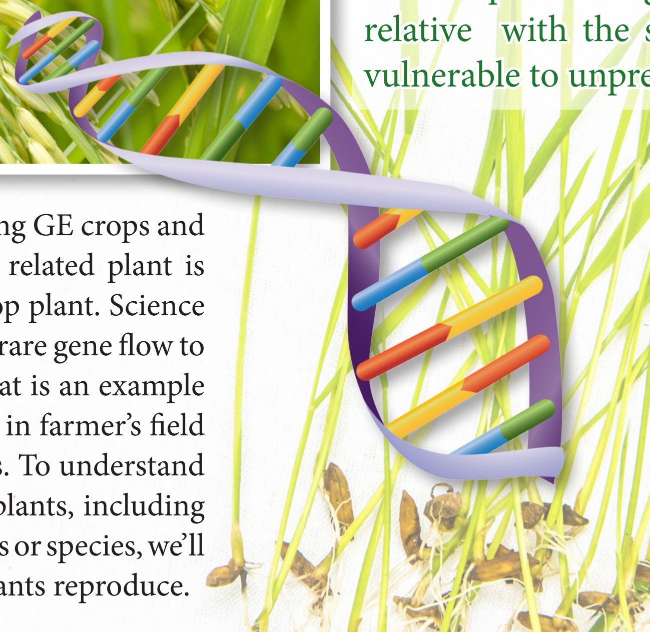
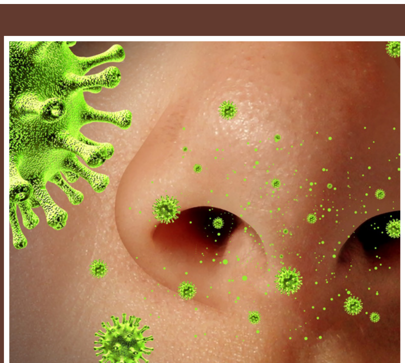
## Is there potential for movement of genes between GM plants and others?

Traits that are useful in a crop plant can be beneficial, neutral, or even harmful to a wild plant of the same or very closely related species. For example, a weedy cousin of a crop plant that acquires a herbicide resistance trait by gene flow from GE crops might be more successful and harder to control. A crop that flowers at a predictable time might help farmers plan their growing season, but a wild relative with the same trait might be more vulnerable to unpredictable weather events.



It is possible that genes may move among GE crops and other closely related plants. A closely related plant is generally of the same species as the crop plant. Science has found that under certain condition rare gene flow to another species does occur: bread wheat is an example of a species that arose 10,000 years ago in farmer's field from genes from three different species. To understand how genes might move between crop plants, including GM crops, and wild closely related plants or species, we'll first need to consider how flowering plants reproduce.



Have you ever inhaled a flower's perfume and found yourself sneezing? You might have had a too-close encounter with **pollen**, the powdery grains that carry a plant's male **gametes** (reproductive cells). Even if you're allergic to pollen, you can't live without it. That's because most flowers must be pollinated to produce **fruit**. In plant science terms, fruits include many of the crops we call vegetables (such as tomatoes, peppers, and squash), as well as nuts, beans, and grains such as corn (maize), wheat, and rice.

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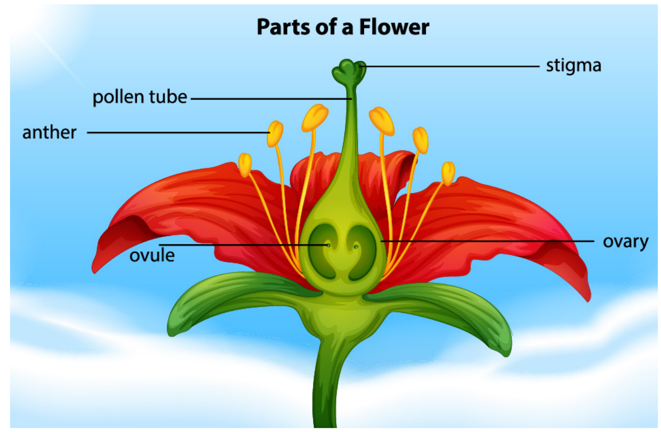
# Making Fertile Seeds

Some flowers contain only male or female parts, but most flowers have both. The male **anthers** produce the pollen, and the female **ovaries** produce **ovules** that contain the female gametes. Pollen grains are released from an anther and are moved by animals or wind to the upper surface of a compatible stigma, the pollen receiving structure on the flower, and **pollination** thus occurs. The pollen grains then grow tubes that tunnel through the tube that goes from the stigma to the ovaries to reach the ovules, where the male and female gametes combine (**fertilization**). The fertilized ovule becomes a seed that can grow a new plant.




Many steps can go wrong during pollination and fertilization. The pollen and ovules must be from the same or closely related plant species to make fertile seeds; if corn pollen lands on a papaya stigma, or papaya pollen on a corn stigma, nothing happens. The anther must be releasing pollen at the same time the stigma is ready to receive pollen, because most pollen remains viable for only a brief time. Some plants pollinate and fertilize themselves, while others need another plant's pollen to make seeds.

## Unintented Transfer

The term **pollen drift** is often used to describe the unintended transfer of pollen among different crop varieties or between crop plants and wild closely related plants, almost always of the same species. The probability that pollen drift will result in **gene flow**, producing fertile plants with new combinations of traits, depends on the farmer's crop, any nearby wild relatives or crop varieties that have escaped and become **feral** (through the accidental spread of seeds, for example), and how the pollen is released and transferred.

## Resulting Hybrids

Researchers (Schafer and others, 2011), have found rare feral canola plants near roadsides in North Dakota that contain genes from two different herbicide-tolerant GM canola varieties, suggesting that the two varieties have bred together. In 2003, pollen from test plots of a herbicide-resistant GM turfgrass crop that had not yet been deregulated for sale pollinated wild grasses in Oregon. The resulting hybrid plants, along with plants from escaped crop seeds, have established a population of herbicide-resistant grasses that persists today.

## Minimizing Flow

Using isolation distances to limit the movement of pollen between crops, planting at different times, choosing crop varieties that flower at different times, and controlling weeds can help minimize the likelihood of gene flow among different crop varieties or between crops and their wild relatives.

**The impact of pollen drift and gene flow isn't defined by whether one of the cross-breeding plants is transgenic. For example, in Switzerland, gene flow from conventionally bred alfalfa—a valuable forage crop—to some varieties of a related native plant has resulted in loss of the native plant's unique traits, a process called genetic swamping. Regardless of the process by which a crop is bred, we must weigh its benefits against its risks when determining whether and how it should be grown.**

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