Ethylene is thought of as the “aging” hormone in plants. It is a small hydrocarbon gas. While naturally occurring, it can also occur as a result of combustion and other processes. Sources of ethylene include: ripening fruit, exhaust from internal combustion engines/ heaters, smoke including cigarettes, welding, rotting vegetation, natural gas leaks, manufacturing plants of some kinds. You can’t see or smell ethylene. Ethylene will cause a wide range of effects in plants, depending on the age of the plant and how sensitive the plant is to ethylene. Ethylene effects include: fruit ripening, induction of flowering, loss of chlorophyll, abortion of plant parts, stem shortening, abscission (dropping) of plant parts, epinasty (stems bend), and dormancy. It can be produced when plants are injured, either mechanically or by disease.

Ethylene can be either good or bad, depending on what commodity you work with. It is used in a positive manner in fruit ripening for example. It can also cause damage

Ethylene Effects and the Benefits of 1-MCP

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**lock.** The 1-MCP stops the “lock” from turning so the door can’t open. It is in this way, that 1-MCP acts as an ethylene inhibitor in plants.

Because gases are often difficult to handle, 1-MCP was put into a solid formulation. The powder, when mixed with water, will release 1-MCP gas into the enclosed area. Depending on temperature and other conditions, this will happen over the course of about an hour. It is expected that an easy-to-use, one-step kit will be provided with the commercial product when it becomes available.

A typical postharvest scenario might be to enclose a plant product in an airtight container/room. 1-MCP gas would be released into the air in the container/room and penetrate the commodity. After a short period of time (6 to 24 hours), the commodity would be returned to air or controlled atmosphere. The product would then continue on the postharvest route. 1-MCP is a safe product that leaves no detectable residue. It can be used by small or large operations.

The success of 1-MCP treatment depends on a number of things. The concentration of the 1-MCP gas must be sufficient to saturate the receptors and compete with any ethylene present. The treatment time must be long enough for the gas to release and penetrate the plant tissue. The temperatures at which the treatment takes place will influence the length of time needed for treatment. Done properly, there is no problem in using 1-MCP to treat products in cold storage—it can also be used at room temperature, although this will not allow for optimum postharvest life. Monitoring the cold chain is a good idea. Maturity of the plant product will effect the results. If fruit is too ripe or flowers too old, 1-MCP will not work well. In some cases, the effect of 1-MCP is permanent. In other plant products, the effects of the 1-MCP treatment can wear off and this depends, in part, on the concentration of 1-MCP applied.

1-MCP can be a very valuable tool when incorporated into a good postharvest program.
Ethylene receptors are embedded in the cell. Ethylene molecules in the air bind onto the receptors. The ethylene molecule acts like a key, "unlocking" the receptor. A chemical signal is sent to the cell, and the ethylene molecule releases.

Molecules of 1-MCP also bind to the ethylene receptors. However, 1-MCP does not "unlock" the ethylene receptor so no message is sent. The 1-MCP is not released, so molecules of ethylene are unable to bind to the receptor. Eventually, new ethylene receptors may be formed, and the cells regain sensitivity to ethylene.

Figure 1. Binding of ethylene molecule with the receptor "unlocks" the receptor and leads to a chemical reaction in the plant tissue (diagram by Jenny Bower, Dept. of Pomology, UC Davis).

Figure 2. When 1-methylcyclopropene (1-MCP) binds to the ethylene receptor, it does not "unlock" the receptor and remains locked to the receptor preventing the binding of ethylene and the chemical reaction does not occur (diagram by Jenny Bower, Dept. of Pomology, UC Davis).