National Institute on Drug Abuse
Advancing Addiction Science

Synthetic Cannabinoids (K2/Spice)

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What are synthetic cannabinoids?

Synthetic cannabinoids are human-made mind-altering chemicals that are either sprayed on dried, shredded plant material so they can be smoked or sold as liquids to be vaporized and inhaled in e-cigarettes and other devices. These products are also known as herbal or liquid incense.

These chemicals are called *cannabinoids* because they are similar to chemicals found in the marijuana plant. Because of this similarity, synthetic cannabinoids are sometimes misleadingly called "synthetic marijuana" (or "fake weed"), and they are often marketed as safe, legal alternatives to that drug. In fact, they are not safe and may affect the brain much more powerfully than marijuana; their actual effects can be unpredictable and, in some cases, more dangerous or even life-threatening.

Synthetic cannabinoids are part of a group of drugs called new psychoactive substances (NPS). NPS are unregulated mind-altering substances that have become newly available on the market and are intended to produce the same effects as illegal drugs. Some of these substances may have been around for years but have reentered the market in altered chemical forms, or due to renewed popularity.

False Advertising

Synthetic cannabinoid products are often labeled "not for human consumption." Labels also often claim that they contain "natural" material taken from a variety of plants. However, the only parts of these products that are natural are the dried plant materials. Chemical tests show that the active, mind-altering ingredients are cannabinoid

compounds made in laboratories.

Manufacturers sell these products in colorful foil packages and plastic bottles to attract consumers. They market these products under a wide variety of specific brand names. Hundreds of brands now exist, including K2, Spice, Joker, Black Mamba, Kush, and Kronic.

For several years, synthetic cannabinoid mixtures have been easy to buy in drug paraphernalia shops, novelty stores, gas stations, and over the internet. Because the chemicals used in them have no medical benefit and a high potential for abuse, authorities have made it illegal to sell, buy, or possess some of these chemicals. However, manufacturers try to sidestep these laws by changing the chemical formulas in their mixtures.

Easy access and the belief that synthetic cannabinoid products are "natural" and therefore harmless, have likely contributed to their use among young people. Another reason for their continued use is that standard drug tests cannot easily detect many of the chemicals used in these products.

How do people use synthetic cannabinoids?

The most common way to use synthetic cannabinoids is to smoke the dried plant material. Users also mix the sprayed plant material with marijuana or brew it as tea. Other users buy synthetic cannabinoid products as liquids to vaporize in e-cigarettes.

How do synthetic cannabinoids affect the brain?

Synthetic cannabinoids act on the same brain cell receptors as THC (*delta-9-tetrahydrocannabinol*), the mind-altering ingredient in marijuana.

So far, there have been few scientific studies of the effects of synthetic cannabinoids on the human brain, but researchers do know that some of them bind more strongly than

marijuana to the cell receptors affected by THC, and can produce much stronger effects. The resulting health effects can be unpredictable and dangerous.

Because the chemical composition of many synthetic cannabinoid products is unknown and may change from batch to batch, these products are likely to contain substances that cause dramatically different effects than the user might expect.

Synthetic cannabinoid users report some effects similar to those produced by marijuana:

- elevated mood
- relaxation
- altered *perception*—awareness of surrounding objects and conditions
- symptoms of *psychosis*—delusional or disordered thinking detached from reality

Psychotic effects include:

- extreme anxiety
- confusion
- *paranoia*—extreme and unreasonable distrust of others
- *hallucinations*—sensations and images that seem real though they are not

What are some other health effects of synthetic cannabinoids?

People who have used synthetic cannabinoids and have been taken to emergency rooms have shown severe effects including:

- rapid heart rate
- vomiting
- violent behavior
- suicidal thoughts

Synthetic cannabinoids can also raise blood pressure and cause reduced blood supply to the heart, as well as kidney damage and seizures. Use of these drugs is associated with a rising

number of deaths.

Are synthetic cannabinoids addictive?

Yes, synthetic cannabinoids can be addictive. Regular users trying to quit may have the following withdrawal symptoms:

- headaches
- anxiety
- depression
- irritability

Behavioral therapies and medications have not specifically been tested for treatment of addiction to these products. Health care providers should screen patients for possible co-occurring mental health conditions.

Points to Remember

- Synthetic cannabinoids refer to a growing number of human-made mind-altering chemicals sprayed on dried, shredded plant material or vaporized to produce a high.
- Synthetic cannabinoids are sometimes misleadingly called "synthetic marijuana" (or "fake weed") because they act on the same brain cell receptors as THC, the mind-altering ingredient in marijuana.
- The effects of synthetic cannabinoids can be unpredictable and severe or even life-threatening.
- The only parts of synthetic cannabinoid products that are "natural" are the dried plant materials. Chemical tests show that their active ingredients are human-made cannabinoid compounds.
- Synthetic cannabinoid users report some effects similar to those produced by marijuana:
  - elevated mood
  - relaxation
  - altered perception

- symptoms of psychosis

- Synthetic cannabinoids can also cause serious mental and physical health problems including:
  - rapid heart rate
  - vomiting
  - violent behavior
  - suicidal thoughts
- Synthetic cannabinoids can be addictive.
- Behavioral therapies and medications have not specifically been tested for treatment of addiction to these products.

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