

# Pharmacokinetics of Limonene

Based on a 1993 toxicokinetics study, the therapeutic effects of inhaled limonene for a single session likely last for a few hours, though a slow elimination phase suggests potential longer-term tissue accumulation. Some effects, such as reduced anxiety, may require consistent, repeated inhalation to remain effective.

## Immediate and short-term effects

- **Rapid metabolism and elimination:** In a 2-hour human inhalation study, limonene was readily metabolized. While metabolites reached peak concentration in 1–2 hours and were quickly eliminated, a slow elimination phase was also observed.
- **Peak effects:** The most significant and noticeable effects, such as a reduction in anxiety, can occur shortly after an acute exposure. A study involving acute exposure to limonene found that the sedative and anxiolytic effects were no longer present after one week without repeated exposure.

## Chronic and long-term effects

The duration of therapeutic effects can change with consistent, repeated exposure:

- **Long-term anti-inflammatory effects:** Some animal studies indicate that daily limonene inhalation over several weeks (7 to 30 days) is needed to produce significant anti-inflammatory effects.
- **Reduced effectiveness with chronic use:** Interestingly, one animal study showed that while acute limonene exposure produced anxiolytic effects, repeated exposure

over a week did not. This suggests that the body may develop a tolerance, and the effects may not persist without repeated dosing.

- **Accumulation in tissue:** The slow elimination phase of limonene observed in human studies indicates it can accumulate in adipose (fatty) tissues over time. This might contribute to some extended effects, although the full impact of this tissue accumulation is not yet understood.

## Summary of effect duration

The duration of limonene's effects depends on the specific therapeutic goal:

Therapeutic effect	Onset	Duration
Anxiety reduction	Quick	Hours after acute inhalation; does not persist long-term.
Inflammation reduction	Requires consistent exposure	Weeks of consistent daily inhalation required for significant effects.
THC-induced anxiety mitigation	Quick	Lasts for the duration of the THC session (e.g., 6 hours in a clinical study).
Enhanced alertness	Quick	Shortens reaction time for light stimuli immediately after inhalation.