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Research Links Male Cannabis Use to Sperm Changes and Higher Early Miscarriage Risk

The strongest evidence points to sperm epigenetic changes and a higher risk of early pregnancy loss with weekly male marijuana use, while some proposed links to embryo arrest in IVF remain biologically plausible rather than conclusively proven in humans.

Health / **Published On April 14, 2026 10:50 AM /**

Staff Consortium **April 14, 2026**

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Research cited from Duke University and Boston University, along with animal studies, clinical observations in IVF laboratories, and commentary from reproductive endocrinologist Dr. Natalie Crawford, supports concern that regular cannabis use by men can affect sperm before conception and may be linked to a higher risk of early pregnancy loss.

At the same time, the evidence is more nuanced than some summaries suggest. The strongest human findings point to changes in sperm epigenetics and an association with miscarriage, while some broader claims about IVF embryo arrest remain biologically plausible but not conclusively proven in humans.

One of the clearest findings involves sperm epigenetics, often described as the instructions that help determine when genes turn on and off. Duke researchers led by Susan Murphy reported that regular cannabis use was associated with altered DNA methylation patterns in human sperm, particularly in genes involved in development. Those changes were not described as breaks in the DNA sequence itself, but as epigenetic alterations that can influence gene expression. The study also found that the higher the concentration of THC in a man's urine, the more pronounced some of the sperm methylation changes appeared to be.

The Duke group also highlighted DLGAP2, a gene discussed in the research as a developmental concern. In a later paper, the researchers reported altered methylation at DLGAP2 in sperm from cannabis users and found related methylation changes in the brains of offspring from THC-exposed male rats. That animal work strengthened the argument that paternal THC exposure may have effects that extend beyond the user, at least in experimental models.

The material also points to IVF lab observations sometimes described informally as embryos appearing normal early and then arresting later in development. That idea is tied to older explanations of embryonic development that placed major paternal genome activation around the 4- to 8-cell stage, often around day 3. But newer human embryo research indicates that embryonic genome activation begins earlier than once thought, at the one-cell stage, even if activity remains low at first and rises later. That means the phrase "day 3 crash" may describe a clinical pattern observed in practice, but it should not be presented as a formal published diagnosis or as a settled cannabis-specific outcome in human IVF studies. The more cautious conclusion is that cannabis-related sperm changes and DNA fragmentation offer a plausible mechanism that could contribute to embryo arrest, but that link has not been conclusively established in human IVF outcome research.

The strongest human outcome data cited in the material come from the Boston University PRESTO study, a prospective cohort of 1,535 couples trying to conceive. In that study, 19 percent of pregnancies ended in spontaneous abortion overall. Male marijuana use of at least once per week during the preconception period was associated with about twice the risk of spontaneous abortion compared with no male use, and the association remained when the female partner did not use cannabis. The association was strongest for losses before 8 weeks' gestation. Those findings support concern about paternal exposure, especially early in pregnancy, but they still reflect an observational association rather than proof that cannabis directly caused each loss.

The material is also on solid ground in noting that THC exposure today is higher than it was decades ago. Federal potency monitoring data show average THC content in seized cannabis plant material rising from 3.96 percent in 1995 to 16.14 percent in 2022, while other reviews have documented a broader long-term increase in potency. That trend matters because older studies were often conducted in a lower-potency cannabis environment.

On reversibility, one full cycle of sperm production is commonly described as taking roughly 74 to 90 days. A 2021 Duke follow-up study found that 77 days of abstinence reduced many of the cannabis-associated epigenetic changes seen in sperm, though not all of them disappeared. In public comments about the research, Dr. Murphy urged caution, saying, "We don't know whether they are going to be permanent. I would say, as a precaution, stop using cannabis for at least six

months before trying to conceive.” The material also states that Dr. Crawford gives similar clinical advice, recommending that patients stop cannabis use and wait at least one full spermatogenic cycle, and ideally longer, when trying to optimize fertility.

The limitations are important. The underlying evidence shows biologically plausible mechanisms and meaningful associations, but not absolute proof of causation in every case. Observational studies cannot eliminate every possible confounding factor, and the human epigenetic studies were relatively modest in size. The material also correctly notes that many couples conceive healthy children while using cannabis, and that risk likely varies by dose, frequency, potency, genetics, and other factors. In the Boston University study, lower or less frequent use showed weaker associations than weekly use.

That more cautious framing is also closer to current fertility guidance. The American Society for Reproductive Medicine says marijuana has been inconsistently associated with fertility and IVF outcomes, while also advising clinicians to encourage reduction or cessation during preconception because safety has not been established. In other words, the evidence does not support saying cannabis definitively causes every fertility or IVF problem discussed online, but it does support treating male preconception use as a meaningful reproductive risk factor rather than a harmless habit.

The bottom line from the material remains largely intact, with one important adjustment in tone: current evidence supports quitting cannabis well before trying to conceive, whether naturally or through IVF, because the research raises credible concerns about sperm changes and early pregnancy loss. But the science is strongest on sperm epigenetics and miscarriage association, and more tentative on some of the broader clinical claims that have grown around those findings.