

Gene breakthrough sparks 'home-brewed morphine' fears

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The papers in the journal PLOS ONE and Nature Chemical Biology describe key steps towards bio-engineering yeast that would feed on sugar and exude opiates and other therapeutic drugs

Scientists on Monday said they had unlocked a pathway for producing opiates from genetically-engineered yeast but feared the discovery could one day be a bonanza for drug lords.

Other experts agreed, saying anyone with basic skills could use such a

yeast to churn out morphine, codeine and drugs using a simple home-brew beer kit.

[The discovery, published](#) in the scientific journal *Nature Chemical Biology*, comes on the heels of a study published last month in the journal *PLOS ONE*.

Together, the papers describe key steps towards bio-engineering yeast that would feed on sugar and exude opiates and other [therapeutic drugs](#).

The goal is to provide cheaper and possibly less addictive painkillers from a dependable source, as compared to the poppy.

In Monday's study, synthetic biologists at the University of California at Berkeley inserted an enzyme gene from beets to coax yeast into converting tyrosine—an amino acid easily derived from sugar—into a compound called reticuline.

Reticuline is a molecular "hub", meaning it is the springboard for making morphine, codeine and oxycodone, as well as anti-spasmodic drugs like papaverine.

The team did not go on to make these drugs, but the process of going from reticuline to codeine and morphine in yeast is already known. What had been missing in the knowledge chain was getting from tyrosine to reticuline.

The discovery may be a boon in pharmaceuticals, but it also "dramatically speeds up the clock for when home-brewing drugs could become a reality," the researchers cautioned.

"We're likely looking at a timeline of a couple of years, not a decade or more, when sugar-fed yeast could reliably produce a controlled

substance," said John Dueber, who co-led Monday's paper.

"The time is now to think about policies to address this area of research. The field is moving surprisingly fast, and we need to be out in front so that we can mitigate the potential for abuse."

Make-your-own morphine?

A group of leading academics rammed home a similar message.

In a [bluntly-worded commentary](#) in *Nature*, the leading journal of the Nature group, the trio said the way was now open for engineering a yeast strain that would do the whole drug-making trick.

That, in turn, offered golden opportunities for criminals if this strain fell into the wrong hands.

"In principle, anyone with access to the yeast strain and basic skills in fermentation would be able to grow morphine-producing yeast using a home-brew kit for beer-making," said the commentary, headed by Kenneth Oye, a political scientist at the Massachusetts Institute of Technology (MIT).

"If the modified [yeast strain](#) produced 10 grams of [morphine](#), users would need to drink only one to two millilitres of the liquid to obtain a standard prescribed dose."

In addition to tighter lab security and tougher laws, the trio called for yeast strains to be engineered to produce drugs with limited street value, such as the painkiller thebaine.

Strains could also be engineered so that the [yeast](#) requires unusual food or laboratory conditions to thrive, thus raising the technological bar for

gangs.

But another commentator wondered if the genie was not already out of the bottle.

"One would not have to obtain the safeguarded strain," Christopher Voigt, an MIT professor of biological engineering, was quoted as saying by Britain's Science Media Centre.

"The information in this paper, combined with DNA synthesis, could be readily applied to rebuild the strain without ever gaining access to the physical DNA or strain from the authors."

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