Wine sanitisers

Quality can be sensitive to trace impurities but a new method has been found for drawing them out with the help of a magnetic field

Cabernet Sauvignon

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Fine wines are delicately balanced arrangements of a great variety of constituents — that is the reason why particular grape and specific regions are known for quality wines. Disturbing the proportions in what makes up the wine can damage its flavour and bouquet.

Chen Liang, Renata Ristic, Vladimir Jiranek, and David W Jeffery, from the University of Adelaide, Glen Osmond, Australia write, in the *Journal of Agricultural and Food Chemistry*, of an innovative method to clean wine of unwanted constituents that have got in because of harvesting the grapes too early or if the climate was too cool. The technique first uses nanometre-scale agents that bind to target molecules and then a way to pull these agents out, along with the offending molecules, without bleeding the wine of other good things.

Fermentation of the sugar in fruit gives rise, apart from alcohol, to many other substances. Quality wine arises because the fruit started out with the correct mix of sugars and other substances, the yeast used gave rise to the correct mix of alcohols and other things, like esters, aldehydes, different aromatic and volatile substances, the right level of acid, tannin and such "congeners" as they are called. The quality of soil where the vines are grown; the climate while the grapes ripen, and then the conditions during fermentation and maturation affect the final product.

Once basics, like the strain of grape and yeast, and the conditions of cultivation are assured, the wine makers' craft is able to take care of uncertainties and compensate for minor variations. For instance, if there has been unusual weather or the grape juice, halfway through fermentation, shows a higher level of acid, vintners have methods of compensation and controlling the course of fermentation. Even after the wine is ready, some wines can be blended to correct deficiencies. There is even a practice of planting a mix of strains of vines, so that one kind of variation in one strain can be offset by the opposite variation in another. These measures, however, are surface-level adjustments that remedy bulk qualities of the wine, so long as the basic constituents are there in largely correct proportions. If there are basic deficiencies, like when the strain of grape is not suited for wine, or beer yeast has been used for making wine, it develops deficiencies that cannot be managed. The reason for this is that the number of factors and substances that give wine its final quality cannot even be assessed and attempts to correct some factors affects other factors and results in no improvement. This is also the reason that there can be no such thing as synthetic wine — only nature has been able to create conditions in specific regions of the world, and then come traditional wine-making methods.

On the other hand, there are, at times, problems with wine that do have a largely specific cause. If such causes can be identified, there could be ways of eliminating them, but many methods cannot be used, generally because they may interfere with other constituents of the wine. The team at the University of Adelaide considers a category like this, of substances known as MPs (alkylmetoxypyrazines), which "impart vegetative and herbaceous aroma nuances to wines." These are important trace constituents of popular grape varieties, like Sauvignon Blanc and Cabernet Sauvignon, the paper says. But if the wine has too much of MPs, they can suppress the "fruity and floral aroma bouquets" and even contribute their own unpleasant "off flavours".

This problem with MPs is often faced, the paper says, when grapes are harvested before they are fully ripe, so as to make low alcohol wines, or when the grapes have ripened at lower temperatures. As for dealing with elevated MP levels, the paper says, possible methods are warming the grape juice or additives. Warming does reduce MPs but it induces undesirable aromas. And additives, like bentonite, oak chips, deodorised oak chips and activated charcoal, are either not effective or they remove other congeners along the MPs.

The team then investigated the use of synthetic, polymer (chain structure) molecules, which can have a made-to-order molecular structure, so called molecularly imprinted polymers. These polymers can be designed to attach themselves to specific surface features of other, known molecules. As this action is like the antibodies of the animal immune systems, which neutralise pathogens by forming "lock and key" fits with the intruder's cell envelope, these polymers are also known as "plastic antibodies". They have been widely used in analytical and biochemical applications where selective binding to particular molecules is called for, the paper says.

Nano-size polymer particles were generated, with the help of an MP-template molecule, so that the particles could form bonds with MPs if brought into contact with them. Along with imparting this structure to the polymers, they were also treated with iron oxide particles that could connect to the polymer chain. The result was nano-particles that would attach to MP molecules and had a component that could respond to a magnetic field. The polymer particles, attached to MP molecules, could then be drawn out the wine medium with the help of a magnetic field and this would not affect any other molecule in the wine.

The team spiked Cabernet Sauvignon grape juice, both before and after fermentation, with a potent MP that is found in grapes and wines. The juice was then treated with magnetic molecularly imprinted polymers, and with controls of magnetic but non-imprinted polymers and the polymer polylactic acid, which has MP clearing potential. The result, the paper says, was that the magnetic and imprinted polymer had powerful MP cleaning effect, down to the threshold of detection by the senses. The treatment had a significant effect on other volatile compounds too, the paper says, but did not decrease the overall aroma or fruity character of the wine.

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Swatting killer rocks away

Nasa and the US Government have revealed plans to protect the Earth from asteroids that could wipe out entire continents

ANDREW GRIFFIN

Nasa has revealed its plan to protect Earth from asteroids that could wipe out entire continents. The world needs better ways of spotting asteroids and then swatting them out of our way, according to a major new report issued by many of the most important bodies in the US. It would take years to build the space craft experts hope would be able to move an asteroid out of our way, but knowing when one is coming would at least give people time to evacuate the area, the report warns.

There is no immediate threat from a killer rock. But some scientists fear that we might not know about one until a very late stage — and so the White House has requested better plans to ensure we are safe from them. The report was issued by the National Science and Technology Council, which includes participation from Nasa along with federal emergency, military, White House and other officials.

Nasa's planetary defence officer Lindley Johnson said scientists have found 95 per cent of near-Earth objects measuring a kilometre (0.62 miles) or bigger but the hunt is on for the remaining five per cent and smaller rocks that could still inflict big damage.

Nasa has catalogued 18,310 objects of all sizes — just over 800 are 140 metres or bigger. There is no quick solution if a space rock is suddenly days, weeks or even months from striking, according to Johnson, but such short notice would give the world time to evacuate the area it might hit.

Ground telescopes are good at picking up asteroids zooming into the inner solar system and approaching from the night side of Earth, Johnson said. What is difficult to detect are rocks that have already zipped past the sun and are heading out of the solar system, approaching from the day side.

That is apparently what happened in 2013 when an asteroid about 20 metres in size suddenly appeared and exploded over Chelyabinsk, Russia, damaging thousands of buildings and causing widespread injuries.

An asteroid double or even triple that size exploded over Tunguska, Russia, in 1908, levelling 770 square miles of forest. According to the report released last week, casualties could be in the millions if a similar event struck New York City. A giant space rock wiped out the dinosaurs when it smacked into Mexico's Yucatan peninsula 65 million years ago.

Johnson stressed it would take years to attempt to turn away a potential killer asteroid — several years to build a spacecraft then another few years to get it to the target. Ideally, he would like at least 10 years' notice.

A mission to defend Earth could involve hitting the asteroid or comet with big, fast moving robotic spacecraft in the hope of changing its path, or in the worst case, launching a nuclear device not to blow up the asteroid but to superheat its surface and blow off enough material to divert it.

All that involves current technology, Johnson said, "Part of what this action plan is about is to investigate other technologies, techniques for both deflection and disruption of the asteroid."

Scientists hope to learn more about asteroids from a pair of missions currently under way. Nasa's Osiris-Rex spacecraft will reach the asteroid Bennu later this year and return samples in 2023, and Japan's Hyabusa 2 is closing in on the asteroid Ryugu, with samples to be returned in 2020.

Forget about sending astronauts, Hollywood style, as Johnson said, "It makes a good movie, but we did not see in our study any technique that would require the involvement of astronauts." Missions like this lasting months or years make it difficult if not impossible for humans, given current technology.

The independent

Is that a UFO?

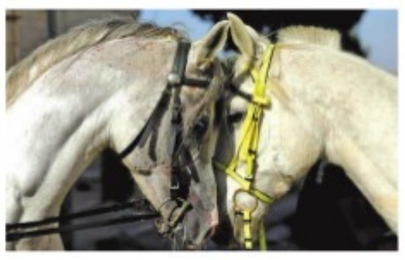
A spectacular rocket launch lit up the night sky over a World Cup stadium, prompting Russians to joke that aliens had journeyed to Earth to watch the football. The Soyuz-2.1b carrier rocket blazed a trail through the air after it was fired from Plesetsk space centre early on Monday morning.

Footage showed showed an eye-catching display visible from Nizhny Novgorod, where Sweden played South Korea hours later. The sight prompted fevered speculation among onlookers. "Is that a rocket, a fireball or a UFO over Nizhny Novgorod? Talk to me comrades, I'm worried," wrote one social media user. "The aliens have arrived for the World Cup," said another. A third asked, "What the h**l was that? It doesn't look like anything I've previously seen."

The Soyuz-2.1b launched from the space centre in Mirny, Arkhangelsk, at 12.46 am on 18 June. It was carrying a Glonass-M navigation satellite, which separated from the rocket about 10 minutes after take-off and later entered orbit. In a statement Russia's Defence Ministry said. "At 12.46 am Moscow time on Sunday, a unit of the Space Forces of the Russian Aerospace Forces has conducted a successful launch of the Soyuz-2.1b carrier rocket with the Glonass-M satellite from Launch Pad 4 of the Plesetsk space centre."

PLUS POINTS

Heightened perception



Horses are able to read human emotions by collating the tone of voice and facial expressions, new research has found. Scientists adapted a technique used to assess mental development in infants and showed the horses images of happy or angry human faces. At the same time the animals listened to recordings of either praising or scolding voices.

On some occasions during the test the images matched the sound and at other times it did not. The results, reported in the journal Scientific Reports, showed that horses reacted twice as fast when they were surprised that the voice and face were at odds with each other.

The animals' response to an "expectancy violation" suggests that they are able to integrate facial expressions and vocal tones to perceive human emotions, the scientists said.

Lead researcher Ayaka Takimoto, from Hokkaido University in Japan, said, "Our study could contribute to the understanding of how humans and companion animals send and receive emotional signals to deepen our relationships, which could help establish a better relationship that emphasises the wellbeing of animals."

In 2015, Sussex researchers compiled a "dictionary" of horse facial expressions. They said the animals had a "rich repertoire of complex facial movements", many of which were similar to those of humans. Last year further research suggested horses could read human body language, even when they did not know the person.

The independent

Benefits of 'brain tingles'

Autonomous Sensory Meridian Response — the relaxing "brain tingles" experienced by some people in response to specific triggers, such as whispering, tapping and slow hand movements — may have benefits for both mental and physical health, according to new research.

In the first study of its kind into the physiological underpinnings of ASMR, researchers from the University of Sheffield in the UK found that those who experience the phenomenon had significantly reduced heart rates while watching ASMR videos compared to people who do not experience ASMR.

ASMR is the sensation experienced by some people in response to specific sights and sounds, described as a warm, tingling and pleasant sensation starting at the crown of the head and spreading down the body. The "tingles" are typically accompanied by feelings of calm and relaxation.

Giulia Poerio, of the University of Sheffield's department of psychology, said, "Lots of people report experiencing ASMR since childhood and awareness of the sensation has risen dramatically over the past decade due to Internet sites such as *YouTube* and *Reddit*."

In one experiment, the team studied the physiological changes that occurred when participants watched two different ASMR videos and one control (non-ASMR) video in a laboratory setting. Half of those who took part in the study were recruited because they identified as experiencing ASMR, with the other half were recruited as age and gender matched controls, who did not experience ASMR.

In another experiment, over 1,000 participants filled in an online survey after watching a selection of ASMR and control (non-ASMR) video clips, stating how frequently they experienced "tingles" and their emotional response to each video. Those who experience ASMR were also asked also answered questions about their common ASMR triggers and general experiences of ASMR.

Through the study, researchers from the University of Sheffield's department of psychology investigated whether ASMR is a reliable and physiologically-rooted experience with the potential to benefit the physical and mental health of those who experience it. The paper, "More than a feeling: Autonomous sensory meridian response (ASMR) is characterised by reliable changes in affect and physiology" has been published in the journal *PLOS One*. To read the paper, visit http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0196645 or check out https://www.youtube.com/watch?v=Ufyk1z62FVA