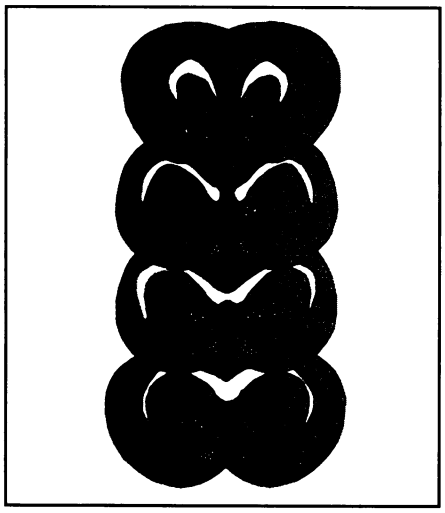

Four sections of the rat brain. The circles and crosses show injection sites of drugs designed to activate or block the D2 dopamine receptor. Circles show where the drugs influenced withdrawal symptoms, and crosses show where the drugs did nothing. The circles are all in the brain's nucleus accumbens.

dopamine and withdrawal — not a cause-and-effect relationship, contends Aston-Jones.

To demonstrate how dopamine contributes to the physical effects of going cold turkey, Harris and Aston-Jones gave a dopamine agonist, a compound that mimics dopamine's action, to rats addicted to morphine. The agonist "significantly attenuated all [physical] withdrawal symptoms measured," the investigators assert. The stronger the dose, the milder the symptoms.

Pretreating the rats with a dopamine-receptor antagonist, which blocks the receptors, prevented the agonist from working its magic, they report.

Piping an agonist into the accumbens that targets a specific dopamine receptor, the D2, proved particularly effective at preventing withdrawal symptoms. Giving a similar injection into parts of the brain near — but not in — the accumbens did nothing to stop them. And a different agonist that acts on the D1 receptor sometimes made the physical pangs of not getting the drug worse, Harris and Aston-Jones found.

Finally, blocking dopamine receptors in the accumbens seemed to turn on physical withdrawal symptoms in morphine-dependent animals but not in nonaddicted animals.

Because other researchers have injected opiate antagonists into the accumbens of opiate-addicted animals and produced only mild signs of withdrawal, Harris and Aston-Jones conclude that "the accumbens may not be a major site for the initiation of opiate withdrawal symptoms." Instead, it may help regulate the body's response to getting off opiates.

The findings have "strong clinical implications," argues Aston-Jones, since they show which dopamine receptors influence withdrawal symptoms. Now, he says, researchers need to test drugs known to activate these receptors.

While Wise doubts the new study will result in better treatments for addicts, "I'm sure other people will [say it will]." He explains: "I'm more conservative."

Indeed, Derek van der Kooy of the University of Toronto disagrees with many of the team's conclusions regarding dopamine. His studies suggest that dopamine agonists and antagonists both block the ill effects of leaving drugs behind. Withdrawal involves a change in the firing pattern of the neurons activated by dopamine, his data suggest, not a simple increase or decrease in their activity.

— *T. Adler*

Wine: This stain could mar reputations

Did you ever pour a red wine and notice that a dark red stain appeared to be painted on the inside of the bottle? Well, consumers of Australian reds have been noting such deposits increasingly. Now afflicting some 5 to 10 percent of such wines, these lacquerlike deposits threaten to blemish the growing reputation of Australia's export-dominated wine industry.

Such bottle stains — which also plague some European and American reds — have received scientific scrutiny for decades. But their precise identity resisted an unveiling, largely because the deposits did not dissolve in any of the standard materials used to analyze chemical composition.

Now, borrowing a relatively new chemical assay used by soil scientists, the Australian Wine Research Institute (AWRI) in Glen Osmond has unmasked the culprit. In the just-released August Journal of Agricultural and Food Chemistry, researchers from AWRI and the nearby University of Adelaide describe this deposit as a mix of tannins, red pigments, and grape protein. The tenacious deposit is somewhat comparable to the tannin-based stain that plates the inside of teapots.

The bottle stains are different from the sediment crystals that form in older reds, notes AWRI biochemist Elizabeth J. Waters, who led the new study. "That sediment is almost 100 percent potassium hydrogen tartrate [a salt that's in wine]," she observes, while the bottle stain has no detectable salts.

Some white wines also form deposits — a fluffy haze that settles near the bottom of a bottle. This haze appears to consist of nothing but protein, the new Australian analyses indicate. The red-wine stains, by contrast, contain only about 20 percent protein.

"Wine is a milieu of chemicals that can interact," observes enologist Carlos Muller at California State University at Fresno. These chemicals can slowly polymerize — form long, chainlike molecules — and precipitate. Indeed, chemists had long surmised that the bottle stains were polymers of phenols, such as tannins, Muller notes.

Muller says that the Australian team's "excellent job" has now "advanced the knowledge of these precipitates" — demonstrating that they are made up of things in addition to phenols.

Bottle stains do not affect a wine's flavor or pose a risk to drinkers. Indeed, notes renowned enologist Vernon Singleton, now retired from the University of California, Davis, these deposits suggest a developing maturity. And "while we'd rather a [red] wine mature without it, this [bottle staining] can happen to almost any."

Because several countries refuse to import wine with visible deposits, and because even cosmetic defects make many consumers wary, AWRI has launched a campaign to stamp out the stain. Toward that end, the institute will investigate how wine-processing steps (such as early bottling or excess oxygen) and bottle treatment (such as storage in overly warm conditions) might foster the stubborn deposits. And because these deposits may not precipitate until several years after bottling, Waters' team has developed an overnight and a 2-week process to accelerate a wine's "aging" — and reveal signs of its susceptibility to bottle staining.

— *J. Raloff*

Waters/AWRI

Wine-stained bottle.