portable, handheld ultrasound units are now available. In 1988, Filly, in an editorial, called ultrasound the stethoscope of the future but was concerned about its use in untrained hands. In 2002, Dodd encouraged teaching the technique of ultrasound usage to medical students beginning in the gross anatomy laboratory and ending in ward rounds and senior electives. In 2003, Greenbaum projected that in the near future “medical students will also be buying a ‘sonoscope’” in addition to a stethoscope. He envisioned the sonoscope as enhancing the physical examination of all patients. With the advent of smaller, better-quality, and less-expensive machines, and medical schools beginning to provide technical training for their students, the use of point-of-care ultrasound is increasing, with applications in physical diagnosis, screening, and guiding procedures. Small, portable, handheld ultrasound units are now inexpensive enough for this to be a reasonable addition to a clinician’s everyday armamentarium. Little, however, has been written about use of this technology in obese patients or about the upper limits of its usefulness. Because ultrasound penetrates fluid and solid organs well, it may be useful in the physical examination of the obese patient.

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In Reply: We agree with Dr Dixon that technological advances, such as sonoscopes, may be able to alleviate some of the limitations of the physical examination for obese patients. However, we have concerns about the potential widespread use of the sonoscope in routine clinical practice. For example, handheld ultrasound machines have not yet been well studied, especially in the generalist’s hands. The quality of an imaging test depends on the performance and the interpretation, and sonography is a difficult imaging technique to master. If an examiner has a suspicion about an abnormality on physical examination, it may be preferable to order an ultrasound study performed by someone who is properly trained. Another problem with sonoscopes is the cost. Although the price of a handheld device has decreased over the past several years (in 2003 the cost was more than $15,000 compared with present-day costs that range from $4,000 to $10,000), the cost remains high. For many clinical settings, the marginal benefit of the added diagnostic information likely does not justify the added cost of the device, the time it adds to the physical examination, or the cost of false-positive and incidental findings requiring additional follow-up.

We would like to emphasize that the potential for bringing new technology to the physical examination should not be viewed as a substitute for developing strong physical examination skills. The routine physical examination remains part of standard practice because it is quick, cheap, and readily available. It also helps to formulate hypotheses and can allow a physician to quickly rule in or out competing diagnoses. For the most part, the tips and maneuvers that we raised in our article are simple, inexpensive, and easily mastered. Using such techniques to strengthen physical examination skills and promoting the judicious use of imaging technology may allow physicians to provide high-quality patient care while insulating against rising health care costs.

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RESEARCH LETTER

Prevalence of Levamisole in Urine Toxicology Screens Positive for Cocaine in an Inner-City Hospital

To the Editor: Cocaine use is prevalent in the United States. Recently, we encountered multiple patients at our institution with unexplained agranulocytosis or cutaneous vasculitis. All had used cocaine contaminated with levamisole. Although levamisole is known to be present in cocaine specimens, it is not clear how often levamisole exposure from cocaine use leads to systemic levamisole absorption. The objective of this study was to determine the prevalence of levamisole in urine toxicology screens positive for cocaine in a 500-bed public safety-net hospital with 160,000 unique patient users in 2010.

Methods. Consecutive urine toxicology samples received by the hospital laboratory that tested positive for cocaine by immunoassay (Syva EMIT II; Siemens Healthcare Diag-
nistics, Deerfield, Illinois) were sent to the Colorado Department of Public Health for comprehensive drug analysis (including levamisole) using gas chromatography–mass spectrometry (GC/MS). Proportions of samples (and 95% confidence intervals [CIs]) positive for cocaine, levamisole, and other drugs of abuse were calculated. The study was approved by our institutional review board with a waiver of informed consent. No patient identifying, demographic, or clinical data were collected. JMP version 8.0 was used for statistical analysis (SAS Institute, Cary, North Carolina).

Results. Three hundred samples were obtained from April 14, 2010, to July 13, 2010. Although all of the samples were positive for cocaine by immunoassay; only 249 of 300 samples (83%; 95% CI, 78%-87%) were positive for cocaine by GC/MS. Of the samples positive for cocaine by GC/MS, 194 of 249 (78%; 95% CI, 73%-83%) contained levamisole. Of the samples negative for cocaine by GC/MS, 9 of 51 (18%; 95% CI, 10%-30%) contained levamisole. The overall proportion of samples positive for levamisole was 203 of 300 (68%; 95% CI, 63%-73%). The most common other drugs found in the specimens were opioid analgesics (methadone, n=134, 45% of samples; codeine, n=50, 16%; heroin/6-monoacetylmorphine, n=17, 6%; morphine, n=15, 5%; and oxycodone, n=15, 5%).

Comment. This study demonstrates that levamisole used to adulterate cocaine was systemically absorbed by cocaine users and, in 1 institution, was common in urine samples positive for cocaine. The 17% of samples positive for cocaine by immunoassay but negative by GC/MS may be due to degradation of cocaine metabolites during storage. The low incidence of levamisole present in samples alone without cocaine may indicate a more rapid degradation or excretion of cocaine metabolites compared with levamisole metabolites.

Although developed as an antihelmintic agent, levamisole has also been used to treat various autoimmune disorders and cancers in humans. Levamisole increases T-cell activation and proliferation, neutrophil mobility, adherence, and chemotaxis and increases the formation of antibodies to antigens. The US Drug Enforcement Agency (DEA) first detected levamisole in cocaine bricks in 2003. DEA data indicate that 44.1% of drug specimens tested in 2008 contained levamisole, increasing to 73.2% in 2009. The reason for cutting cocaine with levamisole is unclear but likely because levamisole is a widely available, cheap white powder thought to increase the euphoric and stimulatory effects of cocaine by increasing brain dopamine levels and forming amphetamine-like metabolites. Unfortunately, levamisole can result in life-threatening agranulocytosis, leukoencephalopathy, and cutaneous vasculitis.

This study is limited because it was a single-center study; no clinical data on patients were collected; and although we attempted to collect consecutive samples, it is possible that some were missed. Given the high prevalence of levamisole in the cocaine supply, physicians should consider levamisole exposure in cocaine users with unexplained agranulocytosis, leukoencephalopathy, or cutaneous vasculitis.

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