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.

G. David Dixon, MD
cvdgnomes@aol.com
Department of Radiology
Saint Luke’s Hospital
Kansas City, Missouri

Conflicts of Interest Disclosures: The author has completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.


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 $4000 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.

Ann Willman Silk, MD, MA
awsilk@gmail.com
Internal Medicine Residency Program
University of Pittsburgh Medical Center
Pittsburgh, Pennsylvania
Kathleen M. McTigue, MD, MPH, MS
Center for Research on Health Care
University of Pittsburgh
Pittsburgh

Conflicts of Interest Disclosures: Both authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.


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

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-
The 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 antihelminthic 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. It also acts as a hapten, triggering an immune response resulting in the opsonization and destruction of leukocytes. 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 contained levamisole, increasing to 73.2% in 2009. The report of 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 antihelminthic 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. It also acts as a hapten, triggering an immune response resulting in the opsonization and destruction of leukocytes. 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.

Jennie A. Buchanan, MD
jennie.buchanan3@dhha.org
Department of Emergency Medicine
Denver Health and Hospital Authority and the Rocky Mountain Poison and Drug Center
Denver, Colorado

Kennon Heard, MD
Denver Health and Hospital Authority and the Rocky Mountain Poison and Drug Center
Denver, Colorado

Cynthia Burbach, BS, MPA
Department of Public Health
Denver, Colorado

Michael L. Wilson, MD
Department of Pathology
Denver Health and Hospital Authority
Denver, Colorado

Richard Dart, MD, PhD
Denver Health and Hospital Authority and the Rocky Mountain Poison and Drug Center
Denver, Colorado

Author Contributions: Dr Buchanan had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Buchanan, Heard, Burbach, Wilson, Dart.

Acquisition of data: Buchanan, Heard, Burbach, Wilson.

Analysis and interpretation of data: Buchanan, Heard, Burbach.

Drafting of the manuscript: Buchanan, Burbach.

Critical revision of the manuscript for important intellectual content: Buchanan, Heard, Burbach, Wilson, Dart.

Statistical analysis: Buchanan, Heard, Burbach.

Obtained funding: Buchanan, Burbach, Dart.

Administrative, technical, or material support: Buchanan, Burbach, Wilson.

Study supervision: Dart.

Conflict of Interest Disclosures: All authors completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

Funding/Support: This work was supported by an intramural research grant from the Rocky Mountain Poison and Drug Center. Dr Heard was supported by award K08DA020573 from the National Institute on Drug Abuse.

Role of the Sponsor: The sponsor had no role in the design and conduct of the study; in the collection, analysis, and interpretation of the data; or in the preparation, review, or approval of the manuscript.

Disclaimer: The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Drug Abuse or the National Institutes of Health.

Additional Contributions: We thank Vanessa Simmons, BA, Department of Public Health, Denver, Colorado, for specimen analysis and Brooke Bender, MSPH, Denver Health and Hospital Authority, Denver, for study coordination. Neither received compensation.

4. Drug intelligence brief: Cocaine containing levamisole adversely affecting drug users in the United States. [DEA-10001-levamisole]. Drug Enforcement Administra-


©2011 American Medical Association. All rights reserved.