aged. "Most important to us is to educate our staff at all levels, so that anyone who comes between the patient and the protocol—doctors, nurses, pharmacists, or anyone else—will understand the objectives and the expectations and what is beyond the realm of acceptability," he says. This means bringing the three groups together regularly to confer on the maximum daily chemotherapy dose for each patient. The institute will eventually purchase a fully computerized drug ordering system with the capability of "locking out" doses higher than protocols allow, Sallan adds, but it hasn't yet found a completely reliable system.

Changes like these will help protect against the opportunities for error created by Dana-Farber's research mission, say other medical researchers. "A high chemotherapy dose at a hospital where no dose-intensification programs are under way is more likely to be recognized as out of line. At a research institution, it's more likely to be missed," explains DeVita, now director of the Yale Comprehensive Cancer Center and head of a committee recruited by Dana-Farber to evaluate the institute's own review of the overdose cases.

DeVita says Dana-Farber is a "fine institution" that is "doing a lot of new things" to minimize such hazards. But while the new oversight committees and fail-safe checks are "appropriate," says M. D. Anderson's Raber, the crucial test will be whether future deviations "are reported quickly to the highest levels of the institution, so that they can be acted upon." At M. D. Anderson, Raber says, the Dana-Farber case has inspired administrators to "re-engineer" the oversight of clinical trials to include more staff involvement. "Physicians and nurses should never be giving care they're uncomfortable with just because the protocol says that's the way it should be done."

But the problems that lead to medical errors go beyond simple staff communication and are quite widespread, according to the *JAMA* reports, published on 5 July. Investigators from the Harvard School of Public Health and Boston's Massachusetts General Hospital (MGH) and Brigham and Women's Hospital (BWH) tracked mistakes in medication orders on 11 hospital floors at MGH and BWH, both affiliated with Harvard Medical School. The investigators detected 264 such errors over 6 months, only 83 of which were intercepted by attentive nurses or pharmacists. (Of the 181 nonintercepted errors, 39 resulted in injuries, although none were fatal.)

Physicians' written orders specifying the wrong dose, the wrong drug, or the wrong frequency of administration accounted for the largest slice of the errors, some 49%. But this form of human error isn't going to go away, says the study's lead investigator, Lucian Leape, a former surgeon now at Harvard School of Public Health, and hospitals must find effective ways of dealing with it. "What we have done from time immemorial is try to prevent medical error by making people ever more careful," says Leape. "We've got to get beyond that. Many errors are multifactorial and systemic rather than primarily individual." Because one of the hospitals lacked standardized forms, for example, drugs that provoked allergic reactions often slipped past as many as six separate checks of patients' allergies. Centralized and standardized records and computer systems that flag dose deviations are potential solutions, he says.

"These are not bad physicians and pharmacists. They are caught up in the same damn problems that are happening all over the country," says Michael Cohen, director of the Pennsylvania-based Institute for Safe Medication Practices, which tracks medication errors for several nursing and pharmacy journals. According to Yale's DeVita, even the most high-tech treatment centers are vulnerable to disaster unless checks against medication errors are "universally applied and unavoidable." In the wake of Lehman's death, that's a prescription research hospitals are very anxious to fill.

**–Wade Roush**

SUSTAINABLE DEVELOPMENT

# China Meeting Signals New Commitment

**BEIJING**—Environmentalism has never been a popular cause in China. Chairman Mao Zedong said environmental problems afflicted only capitalist countries, and Chinese officials bristled when foreigners suggested the country's rapid growth threatened the planet. "They used to say that if other countries were so concerned about acid rain and ozone depletion from coal, they should pay for the improvements," says one Western environmental specialist in Beijing.

But such hostility is fading. One clear sign emerged last week when the Chinese government, along with the Massachusetts Institute of Technology (MIT) and Beijing's Qinghua University—one of China's foremost science institutions—sponsored a 3-day international conference on sustainable development and the environment. Chinese officials took the occasion to demonstrate a high-level commitment to the cause. Deng Nan, physicist and vice minister of China's State Science and Technology Commission, said China is dedicated to international cooperation on environmental issues. Deng, the daughter of ailing Chinese senior leader Deng Xiaoping, also said that "the implementation of China's sustainable development will mainly depend on our own efforts."

The chief vehicle for China's efforts through the next century is Agenda 21, an initiative derived from the 1992 Rio meeting that moves away from a pattern of high input, high consumption, and high pollution. Its $4.1 billion budget assumes a 40% contribution from outside sources to pursue 62 research projects ranging from an experimental clean-technology paper mill in Shandong Province to a sustainable development computer network connecting Chinese universities to themselves and to sites in North America, Europe, and Japan.

The conference included reports by Chinese and foreign scientists that explored several pressing environmental problems. Chemical engineer Masayoshi Sadakata of Tokyo University cited findings that as much as 30% of the acid rain observed in western Japan can be traced to Chinese sources. But he noted that the use of existing wet-process coal scrubbing technology designed for industrial facilities will not solve the problem, because water is scarce in China and most coal is burned in small home stoves.

Instead, Sadakata is developing a coal briquette for home use that is formed under high pressure and contains added limestone. Although the briquettes are less effective than wet-processing technology in reducing sulfur dioxide emissions, he believes they are much more likely to have a significant impact on China's overall emissions.

In another presentation, MIT urban planner Alice Amsden said that the only way China can meet the projected cost of environmental recovery and protection is by tapping into the profits from continued economic growth. "A no-growth scenario holds no hope for the environment," she said. China's current 5-year plan to spend $4 billion on pollution controls falls far short of what is needed, she added, noting that it excludes the cost of developing new technologies and training people to use them and covers only a portion of the factories and work sites that need to be cleaned up.

Agenda 21 has also earmarked money for public awareness, in the hope that the interest shown by the central government will percolate down to the lower levels. The challenge is to show that the goals of the initiative are not incompatible with the country's hunger for prosperity. "Environmental protection is for many Chinese a big phobia," admits the program's coordinator, geologist Wang Qiming. "We are trying to teach people that they can conform with the needs of sustainable development and still make money."

**–Ted Plafker**

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