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that methadone is "... legal, a 'medicine' prescribed by physicians, whereas heroin is illegal, a 'drug'. . ." A more accurate answer would be that methadone is better because of its longer period of action and oral effectiveness. Stabilization can be achieved with a daily dose of a constant amount. The patient is able to function normally without euphoria or other narcotic effects and therefore can live a normal life. The authors state only the similarities between the effects of heroin and methadone in single doses while ignoring the essential differences between their long-term effects.

Methadone patients are described as "somewhat somnolent," they "tire more easily," "require more sleep than do nondrugged individuals," have reflex reactions that are "somewhat abnormal," "perspire more profusely," are often constipated, and suffer from impotence. Some patients have reported these symptoms during the early months of methadone treatment, but this is not the long-term picture presented by the thousands of patients who are being maintained. The authors ignore the detailed studies that have shown reaction time and motor coordination (1-3), vigilance (2), and intellectual functioning (1) to be in the normal range in patients stabilized on methadone (4).

The statement that the blockade effect of methadone does not have any effect on nonopiate drug use is true, but certainly not relevant to a discussion of its value in treating heroin addiction. Neither methadone nor any other medication could be a panacea for all drug abuse problems.

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References

The treatment of drug addicts is too important to both the addicts themselves and to the society in which they live to let the article by Lennard et al. go unanswered. To my knowledge, no physicians actively engaged in using methadone as a therapeutical aid believe methadone to be a "solution" to heroin addiction. It does give real assistance to the heroin addict in relieving narcotic hunger. This tangible relief is the biggest asset methadone offers. For the vast majority of heroin victims, group therapy, a closed residential setting, and role model activity are simply not enough. But with methadone in the therapeutic setting, actual changes can and do occur.

It is absurd to ask whether methadone is better or worse than heroin. Can there be any question of the potential danger of regular intravenous and subcutaneous injections of heroin, usually with unsterilized equipment? There is a rapid buildup of tolerance to heroin, but not to methadone (1). Methadone dissolved in fruit-flavored liquid is rarely sold in the black market, and its abuse can be almost completely controlled. My experience and that of other clinicians affiliated with the Illinois Drug Abuse Program is that an individual whose methadone dosage has been constant for four or more weeks cannot be identified as a methadone patient, with the following exceptions: (i) constipation (which can be relieved...

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<th>Sample Vol. (mL)</th>
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<td>14.5</td>
<td>3.3 47.7</td>
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<tr>
<td>Brand A</td>
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with diet and regular laxative) and (ii) diminution of the sex drive (a variable effect).

The symptoms of muscle cramps, diaphoresis, tachycardia, and insomnia reported by Lennard, Epstein, and Rosenthal are signs of abrupt withdrawal or occur during the initial phase of giving up heroin and during the adjustment of the methadone dose level. I currently oversee more than 70 persons in a methadone withdrawal program which began over 3 months ago, and no patient has yet required hospitalization for withdrawal symptoms. At this point approximately 20 percent of this group has been abstinent for at least 6 weeks. In a properly run withdrawal group the physician in attendance can usually handle any symptomatology.

In the Illinois Drug Abuse Program there is no derogation of the work of therapeutic communities. Indeed, much inspiration comes from the Gateway House in Chicago. But only the most highly motivated addicts can gain access to these facilities. The vast majority of addicts are unable to qualify because they cannot "clean up," that is, abstain from heroin. This is the Catch-21 of drug abuse programs. Those who are ready to give up heroin and are able to endure heroin withdrawal constitute a small, select population. But the many thousands of addicts who have come to the point of wanting to stop deserve the assistance methadone can afford. That such assistance is required is attested to by the fact that there are many more people in methadone programs than in therapeutic communities.

A valid case can and must be made against perpetual methadone maintenance. It is a callous, cost-accounting approach to human life, ethically wrong, and based on the unsupported belief that the addict's physiology is permanently altered.

SYDNEY G. BILD
4819 South Kimbark Street
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References

It would have been much more informative and helpful to Science readers if co-author Mitchell S. Rosenthal, who was noted as being the director of the Phoenix House programs in New York, had described the successful efforts of Phoenix House in helping narcotic addicts. I, for one, would view any favorable results with a feeling of pleasure. It would not trouble me to hear that a program that I was not personally involved with had produced favorable results.

Unfortunately Rosenthal and his associates do not appear to feel the same way. They seem determined that the addict must be helped in the special way that is of particular interest and importance to them. The religious fervor of their article makes it clear that no report of favorable results with methadone would alter their antidrug dogma. This dogma appears to be more important to the authors than either the well being of the community or of the addict.

I sincerely hope for the success of the Phoenix House programs. I have read and heard mixed reports on their effectiveness, but have never questioned their usefulness or worth as long as there are addicts who are motivated to achieve abstinence and who demonstrate a readiness to remain in Phoenix House-type treatment programs.

The addiction problem is going to be with us for a long time and we cannot wait for a panacea that will be the perfect answer. Not all addicts have the same needs or similar motivation. There is plenty of room in the drug treatment field for a broad spectrum of treatment programs. Scientific study of these possible programs can only be hampered by moralistic arguments and an antidrug crusade.

ROBERT L. MARCUS
50 West 96 Street, New York 10025

Those who persist in ignoring history are dooming themselves to repeat it. The arguments in the preceding letters in support of the use of methadone to control heroin addiction were advanced 70 years ago to support use of heroin to control morphine addiction.

We find ourselves in the same position today, having to speak out against the use of methadone, as those who seven decades ago warned against the use of heroin for this purpose. As the discussion of seven decades ago extolling the virtues of heroin and its hazards seems to be virtually identical with that heard on the subject of methadone, we thought it would be useful to recall the former discussion.

A letter that appeared in the New York Medical Journal (1) from Maurice B. Ahlborn in 1901 advised:

That heroin will take the place of morphine without its disagreeable qualities, I am convinced, as I have repeatedly
quieted morphomaniacs whose cravings were awful, with a few injections of it which did not nearly represent the amount of morphine prescribed. There seems to be no craving for the heroine awakened by its continued use, as the subsequent gradual withdrawal after its substitution for the morphine has been attended with no particular craving and only in one case of twenty-three years' standing have I seen any tendency to increase the dose of the substituted drug.

Heroin was listed in Squibb's Materia Medica (2) as "a remedy of much value . . . and it is also used as a mild anodyne and as a substitute for morphine in combating the morphine habit" (2).

As for the side effects of heroin, James R. L. Daly reported in the Boston Medical and Surgical Journal of 22 February 1900 (3):

It [heroin] possesses many advantages over morphine . . . it is not a hypnotic; there is no danger of acquiring the habit . . . it does not weaken the respiratory apparatus . . . it does not cause unpleasant disturbance of the stomach or intestines . . . [and] the ratio of the therapeutic dose to the toxic dose is considerably smaller than that of morphine.

There were many advocates of heroin at that time. E. H. Sickler, writing in Medical Age in January 1902, said of heroin, "Its continued administration does not give rise to any craving" (4). E. Y. Johnson said in the American Practitioner and News of December 1901 that heroin "given to a morphine habitue in place of the usual drug satisfies the craving and seems to destroy it finally without any longing for the new drug" (5).

The argument advanced against heroin in an article written in 1902, "The heroin habit another curse" by George E. Petey (6), applies equally well to those who are presently defending and justifying the use of methadone.

. . . Many articles have appeared in medical literature during the last two years lauding this new agent . . . but somehow hermits, in its praise seem to have been misled by the claim of its promoters, that even its prolonged use does not result in the formation of a habit.

When we consider the fact that Heroin is a morphine derivative, being the diacetyle of morphine, and that in this form it retains almost all of the properties of the salt from which it is derived, it does not seem reasonable that such a claim could be well founded. It is strange that such a claim should mislead any one or that there should be found among the members of our profession those who would reiterate and accentuate it without first subjecting it to the most critical tests, but such is the fact.

We cannot ignore, as do the enthusiastic proponents of methadone, the considerable effects of the adoption of the methadone maintenance model on a large scale. Reports are mounting that the expansion of methadone programs has been accompanied by an increase in deaths due to methadone. In some cities (Washington, D.C.; Buffalo; and Minneapolis), mortality related to the use of methadone approaches or equals that attributed to heroin (7). Methadone is readily available in the streets of New York and is replacing heroin as the opiate drug most widely bought and sold illegally (8). Unhappy consequences will surely follow unless we consider more carefully the long-range effects of a policy that undertakes to introduce potent psychoactive drugs into the community on a wide scale. Once the machinery to carry out a policy has been set in motion, it may not be possible to reverse its course before it is too late. How can physicians, policy-makers, and others who opt for such a policy justify their contribution to such outcomes?

Strategies and approaches that permit "no exit" need special scrutiny. The use of chemical solutions (methadone and its addicting potential) to solve chemical problems surely falls into this category. Problems that have diverse roots in social, economic, and human conditions require the development of social, economic, and human strategies for their solution. Phoenix House represents one such strategy (9). The use of chemical agents to combat the use of other chemical agents treats the problem as if it were its own solution.

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**RECENT DEATHS**

Armand J. Eardley, 71; former dean, College of Mines and Mineral Industries, University of Utah; 7 November.

Emma L. Fisk, 80; professor emeritus of botany, University of Wisconsin, Madison; 9 November.

Richard T. Frost, 45; former vice president, Reed College; 9 November.

George W. Heise, 84; retired associate director of research, National Carbon Co. Laboratories, Ohio; 28 September.

Frank S. Horvath, 80; former professor of medicine, Georgetown University; 9 November.

Arthur Lejwa, 77; former professor of basic science, Long Island University; 27 October.

Heinz H. Magendanz, 73; former associate professor of cardiology, Tufts University; 6 November.

Leroy K. Pinnell, 62; dean emeritus of education, Eastern New Mexico University; 25 October.

Clement J. Schneider, 44; vice president for academic affairs, Creighton University; 20 October.

**Research News**

X-ray Astronomy (III): Searching for a Black Hole

Of all the objects conceivably traveling through empty space, nothing would be more difficult to detect than a solitary black hole. No light comes from it, and the odds against seeing a black hole pass between the earth and some distant star are impossibly great. No one ever expects to see an isolated black hole, but a black hole in the vicinity of a normal star might at least give some clue to its presence.

When it was discovered last year that unusual objects orbiting other stars were emitting x-rays, questions about how a black hole might be identified suddenly became urgent. In 1967 I. S. Shklovsky of the Shterenberg Astronomical Institute in Moscow had suggested that if gas were drawn into a neutron star or a black hole the gas would become hot enough to radiate x-rays. The ideas of Shklovsky and Zel'dovich were only qualitative and fragmented descriptions of what might happen near a black hole. It is now becoming clear, from theoretical studies, how a black hole could radiate x-rays if it pulled matter off a close companion star. The matter would probably form a disk rapidly rotating about the black hole, and the x-ray emissions from the disk would be neither steady nor pulsed, but would probably fluctuate rapidly. In only 1 year the ideas talked about in the early 1960's have been examined, refined, and extended to the point that a coherent picture of how a black hole might radiate x-rays is emerging.

The satellite UHURU has discovered many x-ray sources orbiting other stars, but the source most often suggested as being a black hole is Cygnus X-1. The x-rays from Cygnus X-1 fluctuate extremely rapidly and randomly, as might be expected for a black hole trapping matter. A series of related observations with optical and radio telescopes seems to indicate that the x-ray source is so massive that it is probably a black hole, according to current theories of collapsed stars (Science, 3 November 1972). Objections have been raised to the claim, but the case is fairly strong and its significance as a motivation for further experiments and further study of black holes has been enormous.

Questions about the mass of Cygnus X-1 may be answered by further experiments, but questions about the sort of x-ray emissions expected from black holes can only be answered by theoretical calculations. The properties of an isolated black hole are now fairly well understood (Science, 19 March
FORTHCOMING EVENTS

April


16–18. Liquid State—Van der Waals Centenary, Kent, England. (Meetings Officer, Inst. of Physics, 47 Belgrave Sq., London SW1X 8QX England)

16–18. Nonlinear Elasticity, Madison, Wis. (G. G. Moran, Mathematics Research Center, Univ. of Wisconsin, 610 Walnut St., Madison 53706)


16–20. Great Lakes Research, 16th conf., Intern. Assoc. for Great Lakes Research, Columbus, Ohio. (C. E. Herdendorf, College of Biological Sciences, Ohio State Univ., Columbus 43210)


19–21. Southern Soc. for Philosophy and Psychology, Knoxville, Tenn. (M. Loeb, Dept. of Psychology, Univ. of Louisville, Louisville, Ky.)

20–21. Illinois State Acad. of Science, Urbana. (N. R. Brewer, ISAS, 5757 S. Drexel Ave., Chicago)


23–25. Instrument Soc. of America, 19th analysis instrumentation symp., 14th chemical and petroleum instrumentation symp., Process Measurement and Control Div. symp., St. Louis, Mo. (J. L. Kern, Monsanto Co., 800 N. Lindbergh St., St. Louis 63166)


25–27. The Ocean, Nuclear Energy, and Man, American Nuclear Soc. and Marine Technology Soc., Palm Beach Shores (Singer Island), Fla. (M. J. Ohanian, Dept. of Nuclear Engineering, Univ. of Florida, Gainesville 32601)


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**May**


1-4. Virginia Acad. of Science, Williamsburg. (R. C. Berry, 5907 Brookfield Rd., Richmond, Va. 23227)

2-4. International Conf. on Surgical Care, Royal College of Surgeons, Dublin, Ireland. (H. O'Flanagan, Irish Medical Assoc., 10 Fitzwilliam Pl., Dublin 2)


2-6. Protides of Biological Fluids, 21st colloquium, Brugge, Belgium. (Colloquium on Protides of the Biological Fluids, Simon Stevin Instituut, Jerusalemstraat 34, B-8000 Brugge)


3-5. Society for American Archaeology, San Francisco, Calif. (R. E. W. Adams, Univ. of Texas, Suite 250, 4242 Piedras Dr., San Antonio 78228)

3-5. American Assoc. for the History of Medicine, Cincinnati, Ohio. (G. Miller, Howard Dittrick Museum of Historical Medicine, 1100 Euclid Ave., Cleveland, Ohio 44106)

3-5. Eastern Psychological Assoc., Washington, D.C. (M. Benimoff, Dept. of Psychology, Glassboro State College, Glassboro, N.J. 08028)

3-6. Christian Medical Soc., Dallas, Tex. (H. W. Robinson, 3909 Swiss Ave., Dallas 75214)

3-6. Association of Clinical Scientists, Tampa, Fla. (F. W. Sunderman, Jr., Univ. of Connecticut, School of Medicine, Box G, Farmington 8932)


4-5. Minnesota Acad. of Science, Northfield. (M. I. Harrigan, MAS, 3100 38th Ave., S., Minneapolis, Minn. 55406)

4-5. North Dakota Acad. of Science, Grand Forks. (B. G. Gustafson, Div. of Continuing Education, Univ. of North Dakota, Grand Forks 58201)

4-6. American College of Apothecaries, St. Louis, Mo. (D. C. Huffman, Jr., 5291 Rock Ridge Rd., Memphis, Tenn. 38128)

4-5. Drosophila Research Conf., De Kalb, Ill. (L. Mittler, Dept. of Biological Science, Northern Illinois Univ., De Kalb 60115)

4-6. American Acad. of Psychoanalysis, Honolulu, Hawaii. (J. Barnett, AAP, 40
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